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CONFERENCE ABSTRACTS

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***Health and medicines information***

## Rare diseases and therapeutic strategies

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**Background:** Rare diseases disrupt the lives of a significant number of people who suffer from them every day. The position of people suffering from rare diseases is not treated equally in all societies, we are referring primarily to developed and less developed societies. The position of patients suffering from rare diseases in more developed societies is somewhat better compared to societies that, due to their smaller financial capabilities, can allocate less money for the treatment of patients. For the above reason, it is necessary to develop pharmacoeconomic models of drug funding for rare diseases.

**Objective:** The primary goal of this research is to investigate and point out the possibilities of more significant allocation of funds to improve the conditions and quality of life of patients suffering from rare diseases.

**Method:** We conducted a literature review to determine what is known from the existing literature on the treatment and treatment strategies of patients with rare diseases in Bosnia and Herzegovina. The search used medical databases (Medline) and internet search engines (Google Scholar, PubMed). The following keywords were used in the search: rare diseases, pharmacoeconomic models, orphan drugs, rare disease program.

**Results:** The topic focuses on the complex relationship between different actors in the health sector, especially in the context of rare diseases that represent a specific challenge for health policies. In Bosnia and Herzegovina, as in many other countries, patients with rare diseases often suffer from low availability of innovative therapies due to a number of obstacles, including high drug costs, lack of information, and inefficient health insurance systems. It is necessary to develop a system that would connect mutual cooperation between pharmaceutical companies, ministries of health and health insurance funds in order to contribute to improving the availability of these therapies. There is also a significant possibility of implementing joint initiatives that could facilitate better coordination and communication between these actors, with the aim of ensuring timely and adequate access to the necessary medical solutions for patients. It is necessary to work on the establishment of institutional mechanisms for the promotion of rare diseases in Bosnia and Herzegovina. Primarily to work on the creation of new programs for rare diseases for the coming periods. Civil society organisations can be a credible partner to ministries and public health institutions. It is not only about medicines, but also about the social status of patients and their families. The fact is that not only the sick member is affected, but the whole family, often also the healthy child and the parents. Rare diseases require a completely different way of life.

**Conclusion:** Based on examples of good practice from other countries where synergistic approaches have led to the improvement of the availability of treatment for rare diseases, develop concrete recommendations and strategies to strengthen cooperation between pharmaceutical companies, ministries of health and health insurance funds, in order to improve the availability of innovative therapies, increase the efficiency of the health system and improve the quality of life of patients with rare diseases.

## Analysis of pharmacists' perception regarding the services of the medicines information centre of the Portuguese pharmaceutical society

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**Background:** The Medicines Information Center (CIM) of the Portuguese Pharmaceutical Society (PPS) was created in 1984 with the aim of providing pharmacists with latest evidence-based information about medicines and therapeutics. Over the years, it has continuously endeavored to develop activities that address the needs of the members of the PPS.

**Objective:** Our objective was to evaluate pharmacists' perceptions regarding the various activities provided by CIM, including their satisfaction with each service, and gather suggestions for improvements and potential new activities.

**Method:** A survey (Google Forms) was conducted between the 16th and the 31st of March 2024. It was posted on the PPS's website and sent by email to pharmacists who gave consent to be contacted. The questions addressed their knowledge and use of the services provided by CIM, as well as their perceptions of the activities carried out. Suggestions for improvement were also requested.

**Results:** The survey was sent to 17.935 pharmacists, with 534 responses received (3% response rate), primarily from pharmacists aged 35-44 years (31%) and working in community pharmacy (65.7%).

Among the respondents, 81% reported knowing CIM and, of those, 40% contact it regularly, with the majority reaching out at least 1-2 times per year (57%). The average ratings for the usefulness and clarity of the responses provided were 4.65 (1 – "Inadequate" to 5 – "Very useful") and 4.61 (1 – "Not clarified" to 5 – "Completely clarified"), respectively, with 64% of respondents considering that the response time was faster than expected. The main areas in which support has been requested include the correct and safe use of medicines, bibliographic support for professional interventions, equivalents of foreign medicines, and extemporaneous formulations.

Regarding CIM's publications, Boletim do CIM is the most well-known (95.6%) and the most widely read [average = 3.63: (1 – "Never" to 5 – "Always")], followed by e-Publicação (64.4% and 3.03, respectively). The topics covered were considered useful [average = 4.83: (1 – "Not useful" to 5 – "Very useful")].

The topics covered in CIM à Tarde sessions were considered relevant [average = 4.41: (1 – "Not relevant" to 5 – "Very relevant")]; however, only 10.1% of respondents attended. Regarding other website contents, Atualidade terapêutica is the most well-known (50.1%) and considered the most useful (74.7%).

The overall satisfaction with CIM's services was positive [average = 7.69: (1 – "Not satisfied" to 10 – "Extremely satisfied")], with a high likelihood of recommendation [average = 8.15: (1 – "Not probable" to 10 – "Extremely probable")].

Among the suggestions, the most highlighted was the need to improve service promotion.

**Conclusion:** The survey results indicate the need to improve pharmacist's knowledge regarding CIM and the services it provides. Nonetheless, users express a positive opinion regarding CIM's performance and the contents it produces. The low response rate poses a significant limitation.

## Mechanisms underlying heatwave or high-temperature-induced headaches and migraines

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**Background:** Rising global temperatures, primarily driven by anthropogenic climate change, have increased the frequency and intensity of heatwaves which are recognised as triggers for headaches and migraines. Epidemiological evidence suggests a positive correlation between higher temperatures and emergency department (ED) visits for headache and migraine with a 5℃ rise linked to a 1.075-fold increase in ED vistis. While the precise pathophysiological mechanisms remain incompletely understood, current evidence suggests that heat exposure triggers specific physiological processes implicated in headache and migraine pathogenesis. The present study aims to evaluate the mechanisms through which heat exposure contribute to headache and/or migraine.

**Method:** A comprehensive literature search was conducted using PubMed, Embase, and Google Scholar databases, for studies examining the mechanism underlying heat or high-temperature-induced headaches and migraines. The search used the keywords heatwaves, hot weather, high temperature, headache and migraines.

**Results**: Numerous studies indicate that as temperatures rise, the likelihood of experiencing headaches and migraines increases, suggesting a direct link between thermal stress and the onset of these conditions. The underlying mechanisms

probably involve a complex interplay of environmental factors, neurobiological and physiological responses. The transient receptor potential (TRP) channels are widely expressed in the trigeminal system and brain regions which are linked to migraine. Their activation, particularly TRPV1 and TRPV4 triggers neurogenic inflammation through by releasing pro-inflammatory agents like calcitonin gene-related peptide (CGRP) and substance P (SP), contributing significantly to migraine development. TRPV1 is activated at high temperatures exceeding 43°C, while TRPV4 responds to moderate heat ranging from 24°C to 35°C and also modulated by protease-activated receptor 2 which sensitises meningeal nociceptors to mechanical stimulation. Extreme heat can disrupt internal temperature control, resulting in heat stroke, dehydration, and hyperthermia. Dehydration from excessive sweating can alter homeostasis, leading to brain tissue shrinkage and dural venous stretching provoking secondary headaches including migraine. Moreover, dehydration can impair salt and water metabolism, resulting in hypoxia, reduced blood volume and oxygen delivery to the brain enhancing headache onset. Heat-induced vasodilation increases skin and cerebral blood flow for heat dissipation, releasing pro-inflammatory mediators and altering neurotransmitter levels, triggering migraines/headaches. Prolonged sun exposure can lead to heat-related headaches and migraines. High temperatures due to prolonged sun exposure can exacerbate migraine attack by stimulating cutaneous thermoreceptors and altering CGRP and nitric oxide release in skin nerve fibers. Additionally, the synergistic effect of high temperatures and air pollution has been shown to elevate the risk of migraine by ~18%, indicating that environmental factors can compound the physiological responses to heat. Hormonal fluctuations, particularly involving serotonin, can be influenced by weather changes, contributing to the onset of migraines through mechanisms that involve vasoconstriction and subsequent vasodilation of cerebral blood vessels.

**Conclusion:** The mechanisms linking heatwaves and high temperatures causing headaches and migraines are multifaceted, involving TRP channel activation, dehydration effects, vasodilation responses, neurogenic inflammation and hormonal fluctuations. A comprehensive understanding of these mechanisms and their complex interactions is essential for developing effective management strategies for susceptible individuals, especially as climate change continues to exacerbate extreme heat events.

## Development of a social mobilisation project for pharmacists to improve health population

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**Background**: In Portugal, during the COVID-19 pandemic, 5,000 micro-influencers, including pharmacists, were recruited by the Portuguese Directorate General of Health to act as trusted sources of information in their communities. This innovative approach helped the country to achieve one of the highest COVID-19 vaccination rates in the world. This success highlighted the need to develop a structured project that would continue to empower pharmacists to play a key role in increasing public health promotion. In alignment with this, and FIP Development Goal 11 “Impact and Outcomes”, which focuses on the pharmaceutical workforce’s impact in health systems and health improvement, the South and Autonomous Branch (SARB) of the Portuguese Pharmaceutical Society (PPS), in partnership with the Portuguese Directorate General of Health, began the development of a social mobilisation project for pharmacists.

**Objective:** To describe the design of a structured project to empower pharmacists to become trusted sources of information within their communities, enabling them to have an active role in social mobilisation for public health.

**Method:** This new project followed the same approach as the previous COVID-19 initiative, using the social mobilisation model. In health, the social mobilisation model refers to a collaborative process involving various micro-influencers to reliably transmit information and foster behaviour changes that promote and protect health. In order to design and implement this new social mobilisation project for pharmacists, a thorough analysis of national health assessment documents and strategic plans was conducted to identify key health needs and priorities for the coming years. Based on these findings, priority themes have been identified to address some of the most pressing public health challenges in the country, ensuring that the project is aligned with national health strategies and maximises its impact on the community. With these priority themes identified, an empowerment training program will be developed to equip pharmacists with the necessary skills and knowledge to actively engage in public health promotion.

**Results:** Based on the identified priority topics, an asynchronous online training program was aligned and organised into four key modules: (1) Empowering pharmacists as micro-influencers, (2) Promoting healthy lifestyles, (3) Non-communicable diseases, (4) Seasonal health and Vaccination. The training program is currently in the development phase and will be launched in the first half of 2025.

**Conclusion:** The social mobilization of pharmacists' project is expected to positively impact pharmacists to act as micro-influencers in their community. By using social mobilisation strategies, pharmacists can actively engage with the population, disseminate accurate health information, and contribute to behaviour change. Future evaluation will assess participation rates and the perceived impact of the training on pharmacists' daily practice.

## Enhancing health literacy in older adults: Development and impact assessment of the Healthy Generation Senior project

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**Background:** The South and Autonomous Regions Branch (SARB) of the Portuguese Pharmaceutical Society (PPS) launched in 2012 the Healthy Generation Project, aiming to promote health literacy among young people aged 10 to 14. Focused on responsible use of medicines, diabetes management and prevention of addictive behaviours and dependencies, the project engaged youth pharmacists and MSc Pharmaceutical Sciences students, as trainers to deliver educational sessions in schools. Over 500 schools were involved, impacting more than 100,000 students and around 4,800 teachers. In response to the growing need for health literacy among the older population1, the project was reformulated and relaunched in 2016 as "Healthy Senior Generation Project" and became fully operational in 2020, focusing on empowering seniors to adopt healthier behaviours.

**Objective:** The aim of this study is to describe the development of the Healthy Generation Senior Project and evaluate its overall impact.

**Methods:** To implement the project, the SARB developed an online training platform offering courses that enable pharmacists and student members of PPS (final two years of the MSc in Pharmaceutical Sciences) equipping them with the necessary materials to conduct health education and informational sessions. Since 2020, content has been available on diabetes and the responsible use of medicines, followed by cardiovascular diseases in 2021, respiratory and endocrine diseases in 2023, and mental health in 2024. After completing the training, participants become trainers, enabling them to schedule and deliver community sessions. SARB can also receive community requests and allocate trainers accordingly. To assess the project's impact, SARB gathers data through the platform, requiring trainers to report the topics covered, the number of participants reached, their willingness for further training (yes/no), and an impact evaluation on a scale of 1 to 5 (1 being minimal and 5 being significant).

**Results:** Since the project's inception, 462 trainers have been trained, conducting 173 sessions and impacting 5,715 individuals. Notably, 76% (n=132) of the sessions focused on diabetes (n = 67) and the responsible use of medicines (n=65). In 2024, the Mental Health topic, which was only introduced this year, became the second most addressed theme that year (n=306 individuals). Additionally, 49 feedback submissions were received from trainers, with 96% (n=47) of them reporting positive receptiveness to further training. Regarding the impact of the sessions, trainers assigned an average perception score of 4.92.

**Conclusion:** The results demonstrate a positive impact, conducting 173 sessions and impacting 5,715 individuals. The trainers' average perception score of 4.92 further supports the effectiveness of the sessions. Additionally, the overwhelmingly positive feedback, with 96% (n=47) of trainers expressing receptiveness to further training, suggests sustained interest and potential for future expansion. In this context, SARB intends to increase the number of available courses to cover more topics, as well as improve its capacity to measure the project's impact more effectively.

## A comparative analysis of e-label regulation status between Republic of Korea and Japan

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**Background:** E-labels, which provide electronic drug information, are becoming a global trend. They can quickly deliver the most up-to-date drug information to healthcare professionals and consumers. However, it is essential to carefully consider the adoption of e-labels from various perspectives, as there are concerns that they may create gaps in access and negatively affect the public health of digitally vulnerable populations. Many countries around the world are currently conducting pilot programs or initiating discussions about the implementation of e-labels. Notably, South Korea and Japan have already enacted legislation to provide e-labels and have outlined specific details through subordinate regulations. This study aims to explore how the legal framework for e-labels has been established in these two countries, as well as to analyse the regulatory elements necessary for their effective operation. The study results will provide valuable data that other countries can reference when considering the introduction of e-labels at the national level.

**Methods:** This study aimed to identify the legal framework for providing e-labels in South Korea and Japan. The status of e-labels was analysed by reviewing guidelines and press releases issued by regulatory agencies in each country. Our analysis focused on several aspects of e-label operations, including the types of products covered, the delivery methods used, whether paper leaflets are being replaced, who is responsible for developing and distributing e-label information, the content and format of the e-labels, and how the e-labels relate to existing paper leaflets and containers that provide drug information.

**Results:** South Korea and Japan offer e-labels for a limited range of prescription drugs, particularly those restricted to hospital settings. When an e-label is provided, the marketing authorization holder (MAH) is not required to include a paper leaflet in the drug packaging and is responsible for creating the e-label content. In South Korea, patients can access the e-label by scanning a QR code found on the drug packaging, while in Japan, it can be accessed through a GS1 barcode. Additionally, in Japan, the e-label is available on the PMDA website, whereas in South Korea, it can be accessed via the MAH's own website. Neither South Korea nor Japan mandates readability assessments to develop drug leaflets. Korea has not produced separate patient information leaflets, while Japan offers a leaflet known as Kusuri-no, though the readability for consumers is not guaranteed. There is a need for regulatory enhancement to ensure that the content and format of the information provided in the e-label are both readable and user-friendly.

**Conclusion:** The e-label system provides drug information electronically and goes beyond just delivering basic details. It is essential to present drug information in a standardised format throughout the healthcare system, and this approach can be expanded to integrate with other healthcare systems, such as Electronic Medical Records (EMRs). When implementing e-labels, it is crucial to consider the entire drug information provision system. This ensures the information is readable and usable for patients and other end users, preventing any information blind spots.

## Consolidating a cluster formulary for enhanced patient care and resource accessibility

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**Background:** With diverse drug formularies across institutions, consolidating these resources is essential to align with Healthier SG's objectives of right-siting patients to primary care. A unified cluster formulary ensures consistency, improves access to drug information, and provides educational resources to facilitate better patient understanding and adherence to prescribed treatments.

**Objective:** This project aims to consolidate individual institutional formularies into a single, comprehensive cluster formulary, integrating MOH ACE drug guidance and patient-friendly educational resources. The unified formulary will be made accessible on platforms such as the MOH NDF website, UpToDate, and Lexi-Drug to support clinical decision-making and patient education.

**Method:** Institutional formularies and MOH-provided guidance were retrieved from representatives. Data was consolidated using Excel, ensuring alignment with MOH ACE guidance. The finalised formulary and patient-focused educational materials were submitted to the MOH NDF team and Wolters Kluwer for integration into national and international platforms.

**Results:** The consolidated formulary harmonised prescribing practices across institutions, enhanced accessibility to standardised drug information, and supported Healthier SG's vision. Patients gained access to simplified educational

resources, empowering them to better understand and adhere to their treatments.

**Conclusion:** Consolidating the cluster formulary promotes consistency, supports right-siting of patients, and enhances the accessibility of drug information and patient education resources. Future work will focus on regular updates and integrating additional functionalities to support evolving healthcare needs.

## Farmalibras: Facilitating pharmaceutical care for deaf sign language users in Brazil

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**Background:** The Brazilian Federal Council of Pharmacy (CFF) is a pioneer in the country, having published in 2018 the guidelines for pharmacists who provide care to disabled people. At least 2.4 million Brazilians have hearing impairment or are deaf. Brazilian Sign Language (Libras) is an essential tool for reducing communication barriers faced by deaf people in health care settings. Learning Libras and strategies designed to facilitate communication between pharmacists and deaf patients are essential. With this in mind, CFF, in partnership with the Federal University of Vale do São Francisco, has been developing the FarmaLibras Program since 2019.

**Objective:** This abstract aims to present the FarmaLibras Program over the last seven years. Method - FarmaLibras has an interdisciplinary team in the fields of pharmacy, sign language studies and computer engineering, including a total of 93 deaf and hearing researchers. The program consists of three lines of action: 1. Online Libras Course for pharmacists; 2. Bilingual Pharmaceutical Terminography (Libras – Portuguese); 3. Web application to facilitate communication between pharmacists and deaf people.

**Results:** The Libras Course for Pharmacists was launched in August 2022, on the CFF EduFarma Platform, in distance-learning mode, offering 45 hours of training. In February 2025, it was released to final year Pharmacy students and, by March 2025, it reached 12,000 enrolled students. Compilation of the bilingual pharmaceutical vocabulary started in 2019 with the following stages: 1. Selection of terms; 2. Preparation and validation of entries; 3. Mapping of terms in Libras; 4. Linguistic evaluation and validation of terminological signs; 5. Recording in Libras. A total of 189 terms were selected, organised into eight pharmaceutical categories, with validated entries and mapped terms in sign language. It will be published in two volumes. Linguistic evaluation and recording are ready for Volume I, with four categories (103 terms). The Web Application includes useful common phrases of pharmaceutical care, facilitating communication between deaf and hearing participants. It was conceived in a collaborative activity between hearing and deaf pharmacists, and members of the deaf community. It is divided in six categories, with a total of 418 phrases, in Portuguese and Libras. The content was validated and the application was tested, while still a prototype. After programming, the application underwent functionality testing by 39 professionals (deaf community, pharmacists, computer engineers and interns). Volume I of the Vocabulary and the FarmaLibras Web Application are scheduled to be launched in May, 2025. The three actions of FarmaLibras complement each other, providing deaf people accessible and safer health care.

**Conclusion:** The FarmaLibras Program is innovating the area of health care for deaf people, providing linguistic accessibility to grant safer health care. This program combined forces from the CFF, researchers from various universities, and mainly, the participation of the deaf community, effectively expanding accessibility for the deaf in the field of pharmaceutical care. Deaf people live everywhere; therefore, projects like FarmaLibras need to be multiplied and reach other health care professions in Brazil and other countries.

## Development of educational videos on inhaler device use

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**Background:** The correct use of inhalation devices impacts asthma control. Because they are complex pharmaceutical forms, patients need support for effective and safe use. Given this need, the development of educational materials, such as videos, stands out as a strategy to contribute to patients' understanding of the appropriate use of inhalation devices.

**Objective:** To develop educational videos on inhaler device use for the Brazilian population.

**Methods:** The video production process used the content and structure of eleven brochures crafted by the Federal Council of Pharmacy of Brazil and validated by experts and users: how to use the pressurised metered-dose inhaler; how to use the pressurised metered-dose inhaler with spacer; how to use the Turbuhaler®; how to use the Diskus®; how to use the Ellipta®; how to use the Respimat®; how to use the Breezhaler®; how to use the Aerolizer®; how to use the Aerocaps®; how to use the Nexthaler®; how to use the CDM Haler®. The video prototype was developed by the researchers based on principles of accessibility. After the final review process, the videos will be released as educational material that can be used by pharmacists during the health education process.

**Results:** Currently, thirteen videos are in production. These videos present the structure of the device in 3D, demonstrations of inhalation techniques through self-administration, audio narration in simple language, translation into sign language and subtitles.

**Conclusion:** The videos were developed to be accessible on multiple devices, including smartphones, tablets and computers, targeting a wide audience. In addition, through a dissemination plan, it is expected that these videos will reach a large portion of inhaler device users. In the future, it is expected to adapt the videos for indigenous populations and those with hearing impairments.

## Workplace health literacy in Ohio: A comparison of 2013 and 2021

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**Background:** The Centers for Disease Control and Prevention defines organizational health literacy in their Healthy People 2030 initiative as, “the degree to which organizations equitably enable individuals to find, understand, and use information and services to inform health-related decisions and actions for themselves and others." There is limited research on organizational health literacy and health literacy in the workplace, specifically pharmacy. The Pharmacy Health Literacy Survey was adapted from the Nursing Professional Health Literacy Survey; it is divided into three sections: 1) general knowledge; 2) health literacy in the workplace; and 3) demographics. Herein, we report perceptions related to health literacy in the workplace from this survey.

**Methods:** We conducted a cross-sectional web-based survey of pharmacists. The Pharmacy Health Literacy Survey was administered to a convenience sample of 500 pharmacists in 2013 and 5000 pharmacists in 2021.

**Results:** Response rates were 12.4% in 2013 and 3.5% in 2021. The percentage of institutions with a formal health literacy program was low and remained relatively unchanged, 12.5% (n = 7) in 2013 and 5.8% (n = 10) in 2021 ($p > 0.05$). Roughly a quarter of respondents indicated that their practice site provides patients with health educational materials designed specifically for patients with low health literacy. Institutions with more health literacy materials were ~13 times more likely to have a health literacy program (p = 0.0034). Only 8.9% (n = 5) and 3.5% (n = 6) reported that their practice site has intensive, individualised health education session(s) for patients with low health literacy in 2013 and 2021, respectively. In 2021, two respondents reported having a dedicated specialist for low health literacy, whereas none did in 2013. The three most common barriers to implementing formal health literacy programs for patients at their practice site in 2013 were that health literacy is a low priority (38.5%, n = 20), health literacy is too costly to implement (28.8%, n = 15), and practitioners do not have enough time (26.9%, n = 14). In 2021, the three most common barriers were that health literacy is low priority (46.7%, n=78), practitioners don’t have enough time (43.7%, n = 73), and it is too difficult to implement a culturally competent health literacy program (24.0%, n = 37). The reported barrier that health literacy is a low priority increased significantly from 2013 to 2021 (p = 0.0356).

**Conclusion:** The prevalence of formal health literacy programs in Ohio workplaces remained low and unchanged, with significant barriers such as low prioritization and time constraints persisting from 2013 to 2021.

## Medicine regimens for people with diabetes living in residential aged care: A longitudinal study using routinely collected data in residential aged care facilities

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**Background:** For the 240,000 older people living in Australian residential aged care facilities (RACFs) (residential aged care facilities), 10-20% live with diabetes. Diabetes management in this older frail population can be further complicated by limited life expectancy, comorbidities and changing priorities. The aim of this study was to examine the medication regimens of older adults with diabetes living in RACFs.

**Method:** A longitudinal cohort study was conducted across 11 time points, including the day of admission and subsequent assessments at 3, 6, 12, 18, and 24 months post-admission. The study took place in RACFs in Australia and New Zealand operated by a single provider utilizing electronic medicines charting. Participants included residents aged 65 and older with a documented diabetes diagnosis and recorded medication use at admission. Those admitted for respite care or residing in independent or serviced living arrangements were excluded. The primary focus was to compare medication regimens among residents with and without diabetes.

**Results**: Among 3,802 residents, 590 (16%) had a documented diabetes diagnosis. Residents with diabetes were admitted at a younger age (83.9 ± 7.1 years) than those without diabetes (85.1 ± 7.2 years, p = 0.002). They also had higher medication use and more complex regimens at admission, which increased over time. Despite this, the prevalence of underprescribing and high-risk prescribing remained similar between groups. The use of diabetes medications, particularly insulin and metformin, rose over the first 24 months post-admission.

**Conclusion:** Older adults with diabetes in RACFs tend to have a higher burden of comorbidities, are admitted at a younger age, and require more medications, with polypharmacy and complex regimens increasing over time. Further research is needed to determine whether glycemic control strategies and the use of antiglycemic medications are appropriate for this population.

## Healthcare utilisation for prescription medications: A descriptive study using a 10% random sample of pharmaceutical benefits scheme claims data (2013–2023)

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**Background:** Primary care is the 'cornerstone' of universal health care coverage, yet in Australia there are significant general practice workforce shortages. This study examines patterns of healthcare utilisation for obtaining prescription medicines in Australia from 2013 to 2023, focusing on visits to prescribers and pharmacies.

**Method:** A population-based descriptive study was conducted using routinely-collected administrative dispensing data. We obtained data for a random 10% sample of health consumers eligible for subsidised medicines under the Australian Pharmaceutical Benefits Scheme (PBS) who received at least one PBS-listed medicine from 2013-2023. Key outcomes included the frequency of visits to prescribers and pharmacies per year, patient age, sex, PBS-beneficiary status, number of 'regular' PBS medicines dispensed, and comorbidities. Prescribers were categorised into general practitioners (GPs), non-GP medical specialists, primary and secondary/tertiary other medical practitioners, unclassified non-specialist (medical practitioners), non-medical prescribers, and unknown.

**Results:** Since 2021, there has been a significant decline in GP visits resulting in PBS prescriptions in Australia, from 2,891 visits per 1,000 population in 2021 to fewer than 883 visits per 1,000 population in 2022 and 2023. Conversely, visits to unclassified non-specialist medical practitioners increased from 294 visits per 1,000 population in 2021 to over 2,029 visits per 1,000 population in 2022 and 2023. The number of pharmacy visits rose slightly from 9,340 per 1,000 population in 2013 to 9,768 per 1,000 population in 2023. Similarly, the volume of PBS-subsidised medicines dispensed increased from 16,180 per 1,000 population in 2013 to 17,615 per 1,000 population in 2023.

**Conclusion:** Since 2021, fewer Australians have visited GPs for prescription medicines, potentially leading to increased fragmentation of care. Meanwhile, the overall use of prescription medicines has continued to rise, reflecting a growing demand for pharmacological treatments.

## Development of an online vaccination training course for pharmacy professionals in Finland

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**Background:** The Vaccination Decree lays down provisions on the professionals within the scope of the right to vaccinate. Coronavirus vaccinations during the pandemic caused congestion in health care in Finland. This forced authorities to consider whether we have health care professions that can be added to the scope of the right to vaccinate, and as a result, pharmacists were admitted the right to vaccinate in May 2024. This made it possible to start vaccinations in community pharmacies. However, to be able to vaccinate specific training for pharmacy professionals is needed. In this project, an online training course on vaccination in a pharmacy environment for pharmacy professionals in Finland, starting in June 2024, was designed. The goal was to build a course on immunisation and vaccination targeted at pharmacist working in community pharmacies. The aim was also to promote awareness of immunisation among professionals.

**Method:** The planning of the course was initiated familiarising with the contents of the vaccination training offered to pharmacy professionals in other countries. The baseline vaccination knowledge of professionals was considered, including a review of vaccination-related content in pharmacy university degrees. In addition, the content of available vaccination training programs designed for nurses was analysed and benchmarked against the content of this training to ensure alignment with key topics covered in other courses. Based on these, the learning outcomes of the course were formulated. University lecturers and experienced vaccinators who have served as trainers were involved in the development of the course content. The learning methods chosen were short expert lectures, demonstration videos, self-study materials, tests and final exam. The online course was piloted with four vaccinating nurses. One physician evaluated the contents. After the piloting, the training started on an online platform for community pharmacies. Participants in the training were asked to give feedback on course anonymously.

**Results:** The topics that were mentioned in all international training programmes for the vaccination of pharmacy professionals were selected as the content of the training. In addition, the training focused on topics related to vaccination in accordance with the recommendations of the national health authorities. The content emphasised skills that are not typically included in the job description of a pharmacy professional such as physical contact to clients, intramuscular injection technique, recording in the patient information system and preparing for anaphylactic reactions. Based on the pilot, corrections were made, and the content was supplemented. Recommended study time for the course was defined as 7.5 hours. In participant feedback, training (n = 30) was assessed with an overall grade of 5.3, on a scale of 1-6.

**Conclusion:** Based on preliminary feedback, the online training has provided good theoretical skills for vaccination in pharmacies. After completing the online training, the future vaccinator undergoes practical injection training. The continuous development of educational content is important, as national vaccination recommendations are updated, and vaccines are constantly evolving.

## The hidden side of COVID-19: How much we have contributed to the spread of C. difficile infection through treatment?

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**Background:** The COVID-19 pandemic has significantly impacted healthcare systems worldwide, leading to changes in treatment protocols, prolonged hospital stays, and increased use of broad-spectrum antibiotics. Clostridioides difficile infection (CDI) remains a major healthcare-associated infection, often linked to antibiotic overuse. This study aims to investigate the potential impact of COVID-19 treatment strategies on the incidence of CDI in a tertiary healthcare setting.

**Method:** A retrospective analysis was conducted using laboratory-confirmed CDI cases from three time points: pre-pandemic (2018), peak pandemic (2021), and post-pandemic period (2023). Data were obtained from hospital records from the University Clinical Hospital of Mostar, including the number of CDI-positive patients. The study focused on assessing trends in CDI incidence across these periods to identify potential correlations with COVID-19-related treatment practices.

**Results:** A substantial increase in CDI cases was observed in 2021, coinciding with the peak of the COVID-19 pandemic. The number of positive CDI cases in 2018 was 39, which surged to 355 in 2021, followed by a decrease to 135 cases in 2023. This spike suggests a strong association between pandemic-related healthcare practices and CDI incidence. Factors contributing to this increase likely include the widespread use of antibiotics, immunosuppressants, and prolonged hospitalisations during COVID-19 treatment. The subsequent decrease in 2023 may reflect improved infection control measures, reduced antibiotic use, and a return to standard treatment protocols.

**Conclusion:** The findings highlight a concerning but often overlooked consequence of the COVID-19 pandemic—an increase in CDI cases due to treatment protocols. The sharp rise in 2021 underscores the need for antimicrobial stewardship, rigorous infection control measures, and targeted CDI prevention strategies, particularly during global health crises. Future healthcare policies should integrate lessons learned from the pandemic to mitigate the risk of secondary infections while managing emerging infectious diseases.

## Strategies to improve health literacy among teachers, parents and students: A documentary analysis of 50 school medicine policies in England

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**Background:** Building skills in medicines use in early life is an important component of health literacy, and an investment for the health of future populations. Moreover, data from the 2022 Health Behaviour in School-Aged Children (HBSC) study indicate that 25% of students in England aged 11-15 report a long-term condition, and 35% of those students said it affects their school attendance/participation, which could involve sub-optimal medicines and condition management. Every school in England must have a policy to support students with a medical condition under statutory guidance issued by the Department for Education (issued in 2014, and updated in 2017), which includes a template. School medicine policies have the potential to promote health literacy.

**Objective:** To explore the content of school medicine policies regarding staff training and whole-school awareness about health and medicines, as strategies to build health literacy.

**Method:** This was a group project involving six pharmacy students in 2022. Each student was assigned 1-2 of the nine regions of England; they used search engines to find school websites with publicly accessible medicine policies. Purposive sampling within each region sought diversity of schools (e.g. nursery age to college; urban and suburban; public and private/fee-paying). The group collectively developed an online data collection form for consistent, directed content analysis of the policies. This included 2 questions about the presence of content relating to staff training, and about whole-school awareness, related to health and medicines. The presence of such information was categorised as (1) Yes – a lot of information; (2) Yes – it is mentioned; or (3) None. Data from the online form for each policy were downloaded into a common Excel® spreadsheet and subjected to descriptive statistical analysis. No ethical approval was needed to analyse these public documents.

**Results:** The students analysed 50 school medicine policies across England (3 East Midlands; 1 East of England; 8 London; 7 North East; 8 North West; 10 South East; 4 South West; 4 West Midlands; 5 Yorkshire & Humber). Most policies included information about commitment to staff training (A lot of information = 58%; Mentioned = 32%; None = 10%). Content about whole-school awareness was less extensive, but still present in most cases (A lot of information = 30%; Mentioned = 40%; None = 30%).

**Conclusion:** School medicine policies may contain health literacy-building strategies. Limitations were that this was a relatively small sample of schools, and that stating an intent does not mean that it is actioned. Having the policy, however, is the start of a journey. Pharmacists should engage with local schools to find out more about their medicines policy, and whether they can contribute to staff training and whole-school awareness strategies to build health literacy within the school community, including parents. This can be reinforced in the local community pharmacy when local families visit for help and advice.

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## An exploration of physicians' knowledge and perception about the use of medical cannabis in UAE: A qualitative study

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**Background:** In recent years, the legal status of medical cannabis (MC) has changed significantly, making it accessible to many patients worldwide. However, in many Middle Eastern countries, its use remains prohibited creating the need to explore its potential use in this region targeting the challenges of integration into the healthcare system.

**Objectives:** This study aims to explore physicians' knowledge, perception and willingness to prescribe MC in the United Arab Emirates (UAE) healthcare system.

**Method:** Qualitative semi-structured interviews were conducted with physicians practising in UAE from specialities where there is a potential for prescribing MC. The interview

guide was developed based on a literature search and the integrated – Promoting Action on Research Implementation in Health Services (i-PARIHS) framework. Purposive and snowball sampling were used to recruit participants via LinkedIn professional network. Thematic analysis using i-PARIHS framework as a coding tree was conducted.

**Results:** Nine interviews were conducted with multiple specialities. Participants had positive views about the use of MC in UAE healthcare system despite variable cultural and religious challenges. They also suggested the establishment of robust implementation infrastructure including oversight committees, comprehensive clinical guidelines, strict protocols, and systematic documentation systems. The need for structured training and education for physicians arose given the general lack of knowledge about the employment of MC in clinical practice.

**Conclusion:** This study explored healthcare providers' perspectives on MC use in UAE. The importance of careful planning and infrastructure development was emphasised along with creating strategies that align international guidelines with local needs. These insights offer guidance for policymakers and healthcare administrators to develop evidence-based, culturally appropriate frameworks allowing MC integration in the healthcare system.

## Comparison of epilepsy knowledge, awareness, and attitudes in Lebanon: General population versus pharmacy students

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**Background:** Epilepsy is a prevalent chronic neurological disorder associated with significant social stigma and misconceptions. Two Lebanese studies—one on the general population and another on pharmacy students—were conducted to provide insights into epilepsy knowledge in Lebanon, highlighting the importance of a proper understanding of epilepsy to reduce stigma and discrimination, ultimately improving the quality of life for patients with epilepsy in Lebanon.

**Methods:** Both studies employed cross-sectional designs using structured web-based questionnaires to evaluate epilepsy knowledge, awareness, and attitudes. Statistical analysis included Chi-square tests ($p < 0.05$) in both studies, with the general population study additionally using logistic regression. The pharmacy student study utilised descriptive statistics and frequency analyses to determine correlations between variables.

**Results:** A total of 301 Lebanese adults (66% females) and 146 pharmacy students (80.1% females) completed the surveys. Both populations demonstrated high levels of knowledge and recognised epilepsy as non-contagious (84.4% general population vs. 83.5% pharmacy students). Both groups identified medication as the primary treatment (90.4% general population vs. 97.3% pharmacy students). Awareness levels differed, with 70.1% of the general population demonstrating good awareness compared to 47.3% of pharmacy students recognising different seizure types. Attitudes were positive in both groups regarding marriage (88% general population vs. 87.7% pharmacy students) and having children (87.4% general population vs. 88.3% pharmacy students). Both populations perceived employment limitations (60% general population vs. 60.3% pharmacy students) while supporting sports participation with restrictions (75.1% general population vs. 82.9% pharmacy students). The impact of education was a significant finding in both studies. Lecture attendance was strongly associated with improved knowledge in the general population (OR 5.756, $p < 0.001$), while lectures were cited as the primary source of information (63.7%) for pharmacy students. This educational effect was further demonstrated by professional-year pharmacy students exhibiting significantly better knowledge than pre-professional students ($p < 0.05$), mirroring how higher education levels in the general population correlated with better epilepsy understanding. Despite generally good knowledge, both populations exhibited concerning misconceptions about seizure first aid. Approximately 21.9% of pharmacy students and 36.9% of the general population incorrectly believed they should hold a patient's tongue during a seizure. Additionally, only 69.9% of pharmacy students and 55.8% of the general population knew to protect the head during a seizure, highlighting important knowledge gaps across both groups that could potentially lead to harmful interventions during seizure events.

**Conclusion:** Both studies revealed generally adequate knowledge and positive attitudes towards epilepsy in Lebanon, though important misconceptions persist across both populations, particularly regarding first aid management and certain social limitations. The strong correlation between formal education and improved knowledge in both studies highlights the importance of targeted educational initiatives. Pharmacy education specifically plays a crucial role in developing knowledgeable healthcare professionals who can help dispel epilepsy misconceptions. These findings suggest that expanding educational programmes about epilepsy—both in healthcare curricula and through public awareness campaigns—would be beneficial for improving epilepsy understanding and reducing stigma throughout Lebanese society.

## Enhanced performance in patient comprehension: Evaluation of the effectiveness of icons, text, and combined formats for medication instruction

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**Background:** Good information about use of medicines contributes to the level of understanding and hence improves adherence. Icons that illustrate instructions may enhance comprehension at the start of using medication and during use. The aim of this study was to investigate if patients comprehend icons for medication instructions correctly, and to study the role of health literacy.

**Method:** Prior to the study, a national consortium developed icons to support 50 medication instructions. We studied nine of these: three simple instructions (use in the ear, do not use alcohol, can be kept for one month after opening) and 6 more complex instructions (do not use grapefruit, take with meals, stay out of bright sunlight/ protect skin, this medicine affects other medicines, rinse mouth, then spit out, take before bedtime). In eight community pharmacies, visitors assessed the meaning in the formats: icon, text, or the combination. The researchers assessed correct interpretation and analysed the influence of health literacy (SBS-Q).

**Results:** In total, 93 visitors (43 with limited and 50 with adequate health literacy) participated. Less complicated instructions were interpreted correctly by 93%, irrespective of the format and without differences between limited and adequate health literacy. More complex instructions were interpreted correctly by 74%. The text-only format was interpreted correctly most frequently (93%), the icons only format by 84%, and the combination by 74%. Instructions combined with icons were understood less by visitors with limited compared to adequate health literacy (63% vs 92%, p = 0.000 Chi-square). When asked for the patients' preferences, the combination of text and icons was the preferred (44%).

**Conclusion:** In other settings, combinations of instructions with icons have shown to be beneficial, hence icons might have added value when combined with other interventions. The use of icons in medicine information did not improve correct understanding of medication instructions, also not in patients with limited health literacy.

## Enhancing treatment compliance in dysphagic patients: The role of specialised oral drug formulations across age groups

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**Background:** Dysphagia, or difficulty in swallowing, affects approximately four percent of the general population, with higher prevalence in elderly, children and adults with other primary medical conditions. Overall, 1 in 25 people will experience some form of dysphagia in their lifetime. Dysphagia significantly impacts treatment compliance and adherence as patients with swallowing difficulties often struggle to take their oral medications as prescribed, leading to missed doses, altered dosing schedules, or complete discontinuation of treatment. This non-compliance can result in suboptimal therapeutic outcomes, increased healthcare costs, and a higher risk of complications and hospitalisations. Therefore, despite the general preference for solid oral medications, specialised formulations such as liquids, orally disintegrating tablets (ODTs), and film-coated tablets might bring additional benefits to specific undeserved category of patients.

**Objective:** This literature review aims to evaluate the impact of specialised oral drug formulations, including ODTs, film-coated tablets, and liquid formulations, on improving treatment compliance among dysphagic patients and across different age groups.

**Methods:** A comprehensive narrative review of existing literature was conducted on PubMed, Embase, and MEDLINE databases, focusing on studies that assessed the effectiveness of major specialised oral drug formulations in improving treatment compliance among dysphagic patients. The review included research articles, clinical trials, and case studies involving elderly, children, and adult populations.

**Results:** The literature indicates a marked improvement in compliance rates with the use of specialised oral formulations across all age groups. For children, both ODTs and liquid formulations were highly preferred due to their ease of administration and palatability, making them more acceptable and easier to swallow. In adults, a balanced preference was observed for ODTs and film-coated tablets, which were appreciated for their convenience, taste masking, and reduced swallowing difficulty. Liquid formulations were also beneficial for adults requiring weight-adjusted dosing,

such as those who are chronically malnourished, dehydrated, or affected by severe cardiac, pulmonary, renal, or liver diseases. Elderly patients favoured thick liquid formulations due to their ease in swallowing and minimised risk of aspiration. Additionally, tablet size and shape were crucial for compliance in older adults, as swallowability significantly influenced their willingness to take tablets on a daily base, especially for long-term treatments. Overall, the enhanced swallowability of specialised oral formulations was associated with more favourable patient acceptance and improved medication delivery.

**Conclusion:** Specialised oral drug formulations, tailored to the preferences and swallowing abilities of different age groups may enhance treatment compliance in dysphagic patients. This patient-centred approach, backed by the existing literature, empowers healthcare professionals to select the most convenient and suitable treatment solutions for their patients, potentially leading to better health outcomes and improved quality of life.

## Association between chemotherapy-induced peripheral neuropathy and functional bowel disorders in cancer patients undergoing oxaliplatin-based chemotherapy: Evidence from real world data analysis

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**Background:** Cytotoxic anticancer agents cause a variety of adverse events that decrease the patients' quality of life. Chemotherapy-induced peripheral neuropathy (CIPN) is one of the major concerns in cancer patients undergoing chemotherapy. In particular, oxaliplatin, a platinum-based anticancer drug, frequently causes severe chemotherapy-induced peripheral neuropathy (CIPN) and also severe functional bowel disorders (FBD). The previous basic studies employing laboratory animals have shown that oxaliplatin causes the enteric nerve injury followed by dysfunction of colonic smooth muscle motility, leading to constipation (1).

**Objective:** To analyse the association between CIPN and FBD in oxaliplatin-treated patients, in the present study, we analysed medical records of patients receiving oxaliplatin at a hospital and also nationwide inpatient database.

**Method:** Information about severity scores of CIPN and constipation/diarrhoea, as evaluated routinely by a clinical nurse specialist, was collected from medical records of the patients treated with oxaliplatin between May 2014 and November 2022 at Hyogo Medical University hospital. The scoring from grade 0 (no symptom) to grade 4 was conducted according to the National Cancer Institute Common Terminology Criteria for Adverse Events (CTCAE v4.0). We also analysed the Diagnosis Procedure Combination (DPC) database, a nationwide Japanese inpatient database provided by the JMDC Inc. (Tokyo, Japan). This database comprises medical fee schedules (receipt data) and DPC data for patients who visited medical institutions under a contract with the JMDC, and the information about patients treated with oxaliplatin between April 2015 and May 2023 was extracted for statistical analysis. Diagnoses of peripheral neuropathy, constipation, and diarrhoea were based on the International Classification of Diseases-10 (ICD-10). The protocol of the hospital data analysis was in accordance with the ethical principles of the Declaration of Helsinki and approved by the Ethics Committee of Hyogo Medical University.

**Results:** Analysis of information of patients treated with oxaliplatin at Hyogo Medical University Hospital showed a significant association between severe CIPN and severe constipation, but not between severe CIPN and severe diarrhoea. On the other hand, analysis of the nationwide DPC data showed significant correlations between CIPN and constipation, and between CIPN and diarrhoea.

**Conclusion:** The present findings from two different analyses of the patients' medical records of a single centre and of the nationwide DPC database demonstrated the association between CIPN and FBD in humans, suggesting the involvement of enteric neuropathy in the development of severe constipation and/or diarrhoea in cancer patients undergoing oxaliplatin-based chemotherapy. It is beneficial for pharmacists responsible for pharmaceutical care of cancer patients to understand the relationship between CIPN and FBD.

## Attitudes towards electronic package insert leaflets among medication users in Denmark

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**Background:** In the European Union, all medication packages are legally required to contain a paper package insert leaflet (PIL) with medicine information for the user. However, in recent years discussions about replacing the paper PIL with an electronic version have emerged. This is also part of the European Union Commission proposal to revise the European pharmaceutical legislation. Before introducing an electronic PIL, attitudes towards this need to be uncovered, and therefore this project aimed to explore the attitudes towards electronic patient information among adult Danish medication users.

**Method:** Costumers at 26 community pharmacies and patients at one hospital in Denmark were asked to fill in a questionnaire consisting of questions about demographics, the medication, use of paper PIL, use of the internet for medication information, and attitudes towards electronic PIL. The questionnaire also contained the possibility to write free text. Data was collected by pharmacy students during their internship in community or hospital pharmacy. The quantitative data was analysed descriptively, and the free text was analysed qualitatively with thematic text analysis.

**Results:** In total 545 medication users completed the questionnaire (63% women, 24% more than 70 years of age) in March and April 2024. The users wrote 612 statements as free text. Overall, 24% stated to read the paper PIL always or often, while 29% never read it. Of the medication users, 32% often or always found medication information via the internet. In general, 64% of the medication users thought it would be a good or very good idea to replace the paper PIL with an electronic PIL. The reservation against replacing the paper PIL with an electronic version was greater among older people. The majority (90%) of the users reported having a device for scanning a QR-code. However, 39% would still sometimes or always want to have access to a paper PIL if it was no longer available in the medication package, preferably printed at the pharmacy. As an explanation of why the electronic PIL was a good idea, the medication users described minimising waste of paper and money, that digital access was easy and available at all times, that digital solutions have support options, that everything is digital anyway, and because paper is impractical. Many (73 statements) expressed concern, mostly for older people, by changing to an electronic PIL. Opponents against electronic PIL stated that they wanted to limit digital solutions, and that the paper version of PIL was easy and made them feel safe in their medication use.

**Conclusion:** Many medication users read the PIL, and six out of ten would be satisfied with an electronic package insert leaflet instead of the paper PIL. The respondents had many and varied arguments for and against an electronic PIL, and focus on easy access, better IT-solutions, and custom-made options were also an issue.

## Media coverage of medicines entering the market in Finland

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**Background:** The media plays an important role in healthcare policymaking, shaping public opinion and perceptions, and influencing the demand and supply for medical treatments, for instance. However, existing research on media coverage of new medicines is scarce.

**Objective:** This study aims to explore what kinds of new medicines receive media coverage in Finnish journalistic media.

**Methods:** Pharmaceutical products introduced to the Finnish market between 2014 and 2023, which were defined as new medicines, were identified using the Finnish Medicines Agency's marketing authorisation register. Tutkain, Yle News, and Media Cloud databases were used to identify media publications on the new medicines, with search terms including brand names, active pharmaceutical ingredients, and indications. Medicines with the most extensive media coverage and being of interest from the research perspective, justified by the research group members from fields of pharmacy and media research, and a patient expert, were chosen as media cases of research interest. On these cases, additional searches covering the years 2003 to 2023 from three databases that provide access to a wide range of published news media in Finland: Tutkain, Yle News, MTV News, and Media Cloud, were conducted. The numbers and publication dates of news media regarding different medicines were compiled from the search results. Number of users and costs per user of the medicine were extracted from the Statistical Database Kelasto of the Social Insurance Institution of Finland.

**Results:** A total of 373 new medicines were introduced to the Finnish market between 2014 and 2023, of which a total of 59 medicines (including 66 active ingredients) for 12 health conditions were selected as media cases of research interest. The tailored media search provided 268 relevant news articles regarding 27 medicines indicated for 10 different health conditions. The largest media coverage was for GLP-1 agonists for weight loss (153 news), of which semaglutide was the most commonly mentioned (118 news). The second most commonly mentioned medicines were prostate cancer medicines (40 news), of which darolutamide was the most commonly mentioned (39 news). Also, medicines for Alzheimer's (19 news), ADHD (17 news), migraine (11 news), depression (11 news), Duchenne muscular dystrophy (five news), MS disease (five news), cystic fibrosis (four news), and anticoagulants (three news) received media coverage. The average annual costs per user of the medicines varied from €260 (vortioxetine for depression) to €442,000 (atalurene for Duchenne muscular dystrophy), while vortioxetine had the highest number of users (57,000) and atalurene the lowest number of users (4) per year in Finland. Semaglutide, the most frequently reported medicine, had 30,800 users per year with an annual cost per user of €1,200. The majority of new medicines in the media cases had the annual cost per user of over €1,000.

**Conclusion:** Among the variety of different medicines entering the market, GLP-1 agonists for weight loss, especially semaglutide, have received significant share of media attention. Further research is needed to explore the news media content and means of media influence regarding the medicines entering the market.

## Measles infection following MMR vaccination: A case report and the national compensation process in Taiwan

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**Background:** Measles, mumps, and rubella (MMR) vaccination is a cornerstone of public health, significantly reducing the global burden of these diseases. However, vaccine-associated adverse events, though rare, can occur. Vaccine-derived measles (VDM) is an uncommon but recognised complication, often presenting similarly to wild-type measles. This case report describes a healthcare worker in Taiwan who developed vaccine strain measles following MMR vaccination and subsequently underwent the national vaccine injury compensation process. The case highlights the clinical course, diagnostic challenges, and the structured approach to vaccine-related adverse event management.

**Method:** A 29-year-old female healthcare worker received an MMR vaccine (Lot: AMJRD853AA) at Shin Kong Hospital's infectious disease clinic on 23 July 2019 as part of routine occupational health screening. Symptoms including fever (38.9°C) and generalised malaise developed on 31 July. She sought medical attention at the same clinic on 1 August, where a rapid influenza test was negative, and C-reactive protein (CRP) was 0.25 mg/dL (normal range: 0–1 mg/dL). On 2 August, facial rash appeared, which persisted until 4 August. She was admitted to the emergency department and isolated due to suspected measles. Laboratory tests, including PCR for measles virus, were performed. CRP had increased to 1.24 mg/dL. Additional differential diagnoses, including drug hypersensitivity and other viral exanthems, were considered before confirming vaccine strain measles.

**Results:** On 6th August, PCR confirmed measles infection. Given the clinical timeline and vaccination history, vaccine-derived measles was suspected. The Taiwan Centres for Disease Control (CDC) National Laboratory subsequently identified the virus as a vaccine strain. The patient was discharged for home isolation until 8 August. Contact tracing revealed no secondary cases, reaffirming the low transmissibility of vaccine strain measles. On 3 September, the patient filed for national vaccine injury compensation. The Ministry of Health and Welfare (MOHW) entrusted the Industrial Development Bureau, a biomedical non-governmental organisation, to collect and review case data. The case was reviewed by the MOHW Vaccine Injury Compensation Committee, which determined vaccine-related causality. The final decision, issued on 8th May 2020, granted compensation of NTD 20,000. The compensation was disbursed on 8 June 2020. The total hospitalisation cost was NTD 1,535, covered by the National Health Insurance (NHI), with the patient paying NTD 500 out-of-pocket.

**Conclusion:** Vaccine-derived measles remains a rare but significant adverse event. This case underscores the importance of timely recognition, appropriate isolation, and thorough case investigation. Taiwan's vaccine injury compensation mechanism provides a structured process for evaluating vaccine-related adverse events and ensuring fair compensation. Future strategies should focus on public awareness of vaccine safety and risk communication.

## Quality and satisfaction: A comprehensive evaluation of drug information services in Jordan

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**Background:** The increasing complexity of drug therapies necessitates readily accessible, accurate drug information. Drug Information Centres (DICs) are crucial in providing this information to healthcare professionals and the public. While DICs are established in Jordan, comprehensive evaluations of their performance and user satisfaction is needed.

**Objective:** This study assesses Jordanian DIC performance through simulated patient interactions and evaluates user satisfaction to identify areas for service improvement.

**Method:** This mixed-methods study assessed Drug Information Centre (DIC) performance and user satisfaction in Jordan from September 2019 to December 2020. DIC performance was evaluated using six simulated patient cases, with responses assessed via a predefined reviewed checklist. User satisfaction was explored through semi-structured interviews with randomly selected healthcare providers and patients who had recently used DIC services. Data were analysed using descriptive statistics, chi-square and Mann-Whitney tests, and thematic content analysis.

**Results:** Of the five centres approached, two agreed to participate in the study. The number of inquiries received by both centres increased significantly, rising from 14,671 in 2016 to 30,581 in 2019. The majority of the inquiries (99%) were from the public, with the most frequent topics being medication availability and cost (41.40%), followed by dosage administration (22.8%). Regarding the simulated patient case inquiries, both centres achieved satisfactory scores for each case (> 60%). However, Criterion 9 “disclosure of relevant references” was the least effectively addressed by both centres. The thematic analysis of the interview transcripts identified several key themes related to client satisfaction and influencing factors, such as high satisfaction, repeat usage, ease of communication, clarity, problem resolution, and the thorough dissemination of information.

**Conclusion:** The study noted a considerable increase in public demand for medication-related information, evidenced by the rise in inquiries throughout the study period. Both centres performed satisfactorily in addressing simulated patient inquiries, demonstrating their competence. Positive feedback on high satisfaction and repeat usage underscores the importance of DIC services to users. Continuous improvements are crucial to uphold quality and ensure sustained user satisfaction within DICs.

## Evolution of Warfarin

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**Background:** Warfarin remains a cornerstone of oral anticoagulation therapy, despite the emergence of direct oral anticoagulants (DOACs). Its efficacy in preventing thromboembolic events is well-established, but its narrow therapeutic index and significant inter-individual variability necessitate careful monitoring. This abstract summarises the key aspects of warfarin use, including its mechanism of action, monitoring, and clinical implications.

**Method:** This abstract is a concise overview based on a review of existing literature, including clinical guidelines, research articles, and pharmacological data, regarding warfarin's use as an anticoagulant. The review encompasses studies on warfarin's mechanism of action, pharmacokinetics, pharmacodynamics, clinical efficacy, and safety profile.

**Results:** Warfarin inhibits vitamin K-dependent clotting factors (II, VII, IX, and X), leading to a reduction in thrombin generation. The international normalised ratio (INR) is the primary measure of warfarin's anticoagulant effect, requiring regular monitoring to maintain the therapeutic range, typically 2.0-3.0. Genetic polymorphisms, dietary vitamin K intake, and drug interactions significantly influence warfarin's pharmacokinetics and pharmacodynamics, contributing to the challenges of dose individualisation. While effective, warfarin carries a risk of bleeding complications, necessitating careful patient selection and management. The advent of DOACs has provided alternative anticoagulation options, but warfarin remains relevant, particularly in patients with mechanical heart valves or severe renal impairment.

**Conclusion:** Warfarin remains a valuable anticoagulant despite its limitations. Effective management requires a thorough understanding of its pharmacology, careful INR monitoring, and patient education. Future research should focus on refining dosing algorithms and exploring strategies to minimise bleeding risks associated with warfarin therapy.

## Pharmacists + AI = True: Enhancing health communication in a Norwegian online pharmacy through the application of artificial intelligence (AI)

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**Background:** In an increasingly digital world, many pharmacists struggle to convey information in a clear and intelligible way. Apotek 1, Norway's leading pharmacy chain, has used artificial intelligence (AI) to enhance readability and clarity of health-related articles on their website, apotek1.no. As one of Norway's top three providers of health information, the objective is to simplify information regarding medication usage and health advice for the customers.

**Objective:** The investigation centers on the utilization of AI to enhance the clarity and accessibility of articles and information regarding prescription medications (Rx) within the digital customer journey on the website. In this context, it elucidates how AI can augment pharmacists' capabilities in delivering information in plain language. Another goal is to ensure consistent language throughout the entire customer journey for both Rx and non-prescription customers.

**Method:** Apotek 1 has established diverse and comprehensive workflows in collaboration with Copy.ai, a secure and closed artificial intelligence platform, to enhance the quality of their information and health articles. The AI model has been trained using existing articles authored by a team of pharmacists, aiming at refining the output and providing the AI model with a clear structure and direction. The developed workflows, comprising 10-20 distinct steps, are then tasked with improving written information across various customer journeys and enhancing existing health information articles. The objective is to generate comprehensible advice and texts, all the while ensuring proper quality control.

**Results:** All information regarding Rx, as well as 200 health information articles, have thus far been optimised using AI. All AI-generated content is reviewed and approved by pharmacists prior to publication on apotek1.no, ensuring strict quality control. Preliminary results demonstrate improved readability (lix score), improved user satisfaction, and better comprehension of complex health topics within a test group. Although not the primary objective, a 30% increase in overall efficiency is also estimated. Increase in output, without compromising quality, further enhances capabilities and possibilities regarding giving correct health information.

**Conclusion:** AI has demonstrated significant utility in enhancing the quality of digital customer journeys on apotek1.no. There are plans to further develop AI models to deliver more personalised and precise information to customers. Even though AI proves to be a valuable tool, it is not infallible. The experience illustrates that generating health information and clear language through AI necessitates a rigorous process and stringent quality control. This is essential to avoid errors, as even precise and conservative prompts cannot wholly eliminate incorrect information, fictitious sources, and non-existent references. Envision AI as an orchestra, generating content within a predefined framework, with the pharmacist acting as the conductor. The pharmacist's role is to define, guide, and oversee the process meticulously, always ensuring accuracy and quality control. AI is here to stay and will be a valuable tool for pharmacists in the future.

## Drug and Substance use. A perspective from Zimbabwe and, a call for action for pharmacists and pharmaceutical scientists in this global health threat.

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**Background:** Drug abuse is the use of harmful psychoactive substances such as illegal drugs; alcohol; the use of prescription or over-the-counter drugs for purposes other than those for which they are meant to be used, or in excessive amounts, resulting in harm of the individual or others. Drug use is associated with addiction, and addiction is a psychological and physical inability to stop consuming a chemical, drug, activity, or substance, even though it is causing psychological and physical harm. Drug use also puts a heavy financial burden on individuals, families and society.

Drug use is on the rise as shown by statistics over the past decade. 292 million people are estimated to have used a drug in 2022 and that constitutes about 5.6% of the population aged between 15 to 64 years. [1] This number is about 20% more than the statistics from the past decade. Cannabis is the most used drug, it was used by about 228 million people in 2022. In that same year, 60 million people used opioids, 30 million people used amphetamine type stimulants, 23 million people used cocaine and 20 million people used ecstasy. The range of substances available on the market for consumers is expanding, as a result the patterns of use is increasingly becoming complex. Vaping devices, also known as e-cigarettes, have become popular among adolescents and young people in some regions.

Drug use is a significant public health, development and national security challenge in Zimbabwe, and a potential threat to the country's development trajectory in terms of the economy and social stability. The use and trafficking of almost all types of drugs and illicit substances have been strongly linked to crime, corruption, violence, unintentional injuries,

road traffic accidents, multiple medical and health complications and mental health disorders. Alcohol and substance use has negatively impacted individuals, families, communities, and burdened health, social and security systems as well as the national economy. It has been associated with public health issues such as HIV, mental health, sexual and gender-based violence, mental health / psychological disorders, morbidities (heart and liver diseases, cancers) and mortality.

The commonly abused substances in Zimbabwe are licensed and unlicensed alcohol, tobacco, cannabis, and non-medicinal use of controlled medicines such as codeine containing cough medicines and benzodiazepines. Among the youth, alcohol, marijuana (cannabis), crystal meth (mutoriro) and Broncleer are among the used drugs / substances. Due to drug and substance abuse, approximately 60% of the patients admitted in mental health institutions in Zimbabwe suffer from drug use disorders. [2] Pharmacists and pharmaceutical scientists are doing tremendous work to curb this drug use problem. For example the FIP policy statement which highlights the role of the pharmacist in establishing a future free from tobacco and nicotine dependence. [3] Is there more that we can do as pharmacists and pharmaceutical scientists? What are pharmacy professionals from your country or region doing to curb drug use?

## Digital health interventions delivered by healthcare professionals and the impact on patient self-care: A systematic review in progress

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**Background:** The World Health Organisation defines self-care as “the ability of individuals, families and communities to promote health, prevent disease, maintain health, and to cope with illness and disability with or without the support of a health worker”. In addition, the WHO describes self-care interventions as “evidence-based, good-quality medicines, devices, diagnostics and/or digital technologies which can be provided fully or partially outside of formal health services and can be used with or without the support of a health worker”. Self-care interventions that use digital technologies provide an opportunity to deliver personalisation, feedback and support to patients without the need for face-to-face visits to their healthcare professional. However, there is a gap in the research indicating the components of each intervention that enable positive outcomes and how healthcare professionals could further enhance these outcomes. Therefore, this systematic review aims to summarise the evidence for digital interventions with involvement from healthcare professionals, describe the digital technologies and report on outcomes that reflect the patient’s ability to manage their condition.

**Methods:** A systematic review was conducted employing the Cochrane handbook methodology. A search strategy was developed in PubMed, Scopus and Web of Science to capture digital Interventions for consumers with a focus on self-care behaviours. Inclusion criteria were: RCT/cRCT studies of digital health intervention that utilised a healthcare professional and compared to a waitlist/usual care control. Exclusion criteria included: non primary articles, pilot studies, protocols, usual care is not the comparator, and/or not targeted at the patient.

**Results:** 6571 articles were retrieved from the databases, with 60 articles included in the review. Depression was the most frequently studied condition, appearing in 18 studies (30%), followed by anxiety disorders in 12 studies (20%) and insomnia in three studies (5%). Cognitive behavioural therapy (CBT) was the dominant framework, used in 32 studies (53%), often integrated into online lessons, modules, or mobile applications. Most interventions (42 studies, 70%) incorporated text-based support, either as direct feedback or interactive messaging, while telephone support was used in 15 studies (25%). Online forums were included in 6 studies (10%), primarily for peer interaction and moderated discussions. The use of mobile applications was limited, appearing in only three studies (5%), suggesting that web-based interventions remain the predominant delivery method.

**Conclusion:** This review highlights the widespread use of web-based digital interventions, with CBT as the dominant framework and text-based support as the primary mode of healthcare professional engagement. These findings will inform the development of an evidence-based intervention for use within community pharmacies that aims to enhance consumer self-care behaviours.

## Pharmacist and consumer perspectives on the effectiveness and over-the-counter availability of pseudoephedrine

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**Background:** Pseudoephedrine (PSE) is a widely used oral decongestant indicated for the relief of nasal congestion associated with the common cold, influenza, and allergic rhinitis. It has long been available over the counter (OTC) under pharmacist supervision in many European countries. Following reported cases of possible posterior reversible encephalopathy syndrome (PRES) and reversible cerebral vasoconstriction syndrome (RCVS), the European Medicines

Agency's (EMA) Pharmacovigilance Risk Assessment Committee (PRAC) conducted a review of PSE safety in 2023. This review reaffirmed that the benefit-risk of PSE remains favourable, subject to additional risk minimisation measure including updated product labelling and increased awareness among healthcare professionals. Against this regulatory backdrop, it is important to understand pharmacists' and consumers' perspectives on PSE's role in symptom relief and self-care.

**Objective:** This study aimed to assess pharmacist and consumer perspectives on the effectiveness of PSE-containing medicines, their role in patient self-care, and the potential impact of restricted access.

**Methods:** This study used a mixed methods approach, incorporating a survey of 309 community pharmacists across the UK, Spain, and Germany to assess their views on PSE's effectiveness, safety considerations, and role in patient care. Additionally, a consumer survey was conducted with 1,170 individuals who had purchased PSE-containing medicines since January 2023, exploring their preference for PSE, experience of nasal congestion and treatment decision-making. Seventeen semi-structured interviews with pharmacists provided qualitative insights into clinical decision-making, confidence in recommending or refusing PSE, and anticipated implications of potential regulatory changes.

**Results:** Most pharmacists (68.7%) considered PSE to be more effective at relieving symptoms of nasal and/or sinus congestion than alternative OTC medications. This was supported by 85.5% of consumers who expressed a preference for PSE-containing medicines over alternatives. Nasal congestion was reported as significantly impacting daily life, with 62.3% of consumers experiencing symptoms that affected work, sleep, and well-being. Among these, 41% cited sleep disruption, while 28.7% reported reduced work performance. If PSE were available only by prescription, 58.2% of consumers responded they would visit their GP. During interview, the majority (84.1%) of pharmacists expressed an expectation that loss of PSE as a non-prescription option would place increased burden on primary care and were of the view that PSE should not be further restricted to prescription only. Eighty-seven point seven percent of pharmacists felt confident in their ability to screen and appropriately recommend or refuse PSE based on patient risk factors (strongly agree 49.2%, slightly agree 38.5%), with common reasons for refusal including cardiovascular concerns (65.4%), suspected misuse (31.1%), pregnancy (20.7%), and medication interactions (47.9%).

**Conclusion:** These data confirm favourable opinions from pharmacists and consumers in PSE's effectiveness for nasal congestion relief. Consumers have a preference for OTC PSE for self-care of their nasal congestion. Pharmacists play an active and important role in ensuring appropriate and responsible use of medicines. The results confirm consumer preference for ease of access and pharmacist confidence in their ability to manage appropriate dispensing without prescription

## Bridging the digital health divide: Developing a digital health quotient (DHQ) framework for enhanced adoption and impact

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**Background:** Digital health technologies are transforming healthcare delivery by improving access, enhancing outcomes, and optimising clinical workflows. Despite these advancements, adoption remains inconsistent, particularly in developing regions. A lack of standardised assessment frameworks limits healthcare providers, policymakers, and technology developers in improving adoption. Existing frameworks often focus on individual aspects such as infrastructure readiness but fail to provide a holistic approach. To address this gap, the Digital Health Quotient (DHQ) framework was developed to assess, guide, and improve digital health adoption in healthcare institutions. The framework offers actionable insights to help leaders make informed decisions and address key adoption barriers.

**Method:** A mixed-method research approach was employed to develop and validate the DHQ framework through four key phases:

1. Literature Review: A review of global digital health frameworks identified critical determinants of adoption. Insights from frameworks developed by the World Health Organisation (WHO) and regional authorities informed best practices.
2. Stakeholder Engagement: Focus group discussions and interviews were conducted with over 30 stakeholders, including policymakers, healthcare providers, IT specialists, and digital health innovators. These discussions explored adoption barriers such as infrastructure gaps, workforce resistance, and digital literacy challenges.
3. Framework Development: Insights from the literature review and stakeholder engagement informed the DHQ framework, which assesses five key dimensions:
4. Technological readiness – evaluating hardware, software, and IT infrastructure
5. Digital literacy – assessing staff knowledge and ability to use digital tools
6. Infrastructure support – measuring connectivity, data security, and system integration
7. Regulatory compliance – ensuring alignment with data protection laws

8. Clinical integration – tracking the extent to which digital tools are embedded into clinical workflows

Each dimension was assigned weighted scores to create a comprehensive DHQ index, helping institutions prioritise interventions. Pilot Testing: The DHQ framework was piloted in ten healthcare institutions in India, including public hospitals, private clinics, and specialty centres. Data was collected through surveys, site assessments, and structured interviews with staff.

**Results:** The DHQ framework provided insights into adoption trends. Institutions with dedicated digital health champions achieved higher DHQ scores than those without designated leaders. Infrastructure gaps and low digital literacy emerged as key barriers, particularly in smaller healthcare facilities and rural areas. Institutions that implemented DHQ-driven recommendations, such as targeted staff training, IT infrastructure investments, and improved patient engagement, achieved a 20% improvement in digital adoption within six months. The DHQ's scoring model enabled institutions to prioritise actions effectively, ensuring efficient resource allocation.

**Conclusion:** The Digital Health Quotient (DHQ) framework offers a structured approach to assessing digital readiness and guiding healthcare institutions toward improved adoption strategies. By integrating stakeholder insights and addressing multi-dimensional challenges, the DHQ provides practical recommendations to support sustainable digital transformation. The framework effectively identifies gaps, guides interventions, and enhances digital adoption rates. Future research will expand the DHQ's application globally, refining it for diverse cultural, economic, and regulatory environments. Integrating the DHQ into national health strategies may further empower policymakers to drive digital health initiatives, improving healthcare access and outcomes worldwide.

## Exposure of professional pharmacists to workplace stress factors in Bosnia and Herzegovina

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**Background:** The term 'stress' represents experiences in which the demands of the environment outweigh an individual's perceived psychological and physiological ability to deal with them effectively. Stress occurs when employees must deal with pressures that are not in line with their needs, skills, knowledge and expectations.

**Objective:** The aim of this study is to determine the level of stress to which a pharmacist is exposed to in their workplace, throughout Bosnia and Herzegovina. The main causes of stress in the workplaces of pharmacists were also investigated, as well as reactions to this stress exposure.

**Methods:** The data was collected via an anonymous survey of 191 pharmacists across the country, including private, hospital and city pharmacists over a period of two months. Each survey/ questionnarie was consisted of three topcs. The survey was made using questions created by authors based on a review of data and literature. Previously a modified and validated scale (of the Likert type) measured each of the variables. The results of the analysis are presented tabular and graphical through the number of cases, percentages, arithmetic mean with standard deviation and range depending on the type of data. Comparison between the impact of sociodemographic characteristics and responses to the same stress were evaluated using the Student t test and the one-way analysis of variance (ANOVA). The results of the tests were statistically significant at a 95% confidence level or with a value of $p < 0.05$.

**Results:** 191 respondents filled out the questionnaire. The time required to fill out the questionnaire was one minute and 43 seconds. The response rate was more than 50%. Respondents rated their perception of stress with an average score of 3.15 ± 1.13, which corresponds to a 'very stressful' rating. The biggest source of stress was rated as 'stress associated with unacceptable behaviour in the workplace'. The lowest source of stress was deemed to be 'stress associated with unsafe or poor conditions at work'. All physiological responses to stress were rated by respondents as average (2.61 ± 0.94). The overall rating of emotional responses to stress was prevalent (2.79 ± 0.93). The overall score of behavioural change as a stress response corresponded to a score somewhere between what would be deemed as 'small' and what would be deemed as 'pronounced' (2.58 ± 0.91).

**Conclusion:** The aim of this paper was to determine the level of stress experienced by pharmacists at their workplace throughout Bosnia and Herzegovina. The main causes of stress at the workplace were also investigated, as well as the respondents' response to exposure to stress. The working environment and other variables were examined to see how they affect different dimensions of the quality of working life. (work setting, and other variables were examined for how they influence different dimensions of quality of work life.) This work may prompt further research towards creating a friendly and healthy working environment. This would improve the quality of services provided by pharmacists and raise current practice to an even higher level.

## Artificial intelligence: Transforming healthcare and life sciences in India

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**Background:** Artificial intelligence (AI) is revolutionizing the healthcare and life sciences landscape globally, and its impact is particularly significant in India, where the healthcare system faces the challenge of serving a vast population with limited resources. Traditional methods struggle to keep pace with the growing demand for quality care, making AI a groundbreaking opportunity to improve diagnostics, treatment planning, drug discovery, and overall healthcare delivery.

**Objective:** This research aims to fill the gap in understanding how AI can address these challenges in the Indian context, focusing on its applications in disease diagnosis, personalised medicine, drug development, and clinical trials. The primary objective of this study is to explore the potential of AI in transforming the Indian healthcare and life sciences landscape. Specifically, it aims to analyse the cost-effectiveness of AI implementation, develop recommendations for policymakers and healthcare institutions, and investigate how AI can enhance diagnostic accuracy, streamline clinical trials, and improve disease management. The hypothesis is that AI can significantly improve healthcare outcomes and operational efficiency in India by leveraging vast amounts of medical data for informed decision-making.

**Method:** This study employs a comprehensive analysis of AI applications in various aspects of healthcare and life sciences. It involves reviewing existing literature on AI-powered imaging analysis, electronic health records (EHRs) analysis, drug discovery, and clinical trial optimisation. The study also considers the challenges associated with AI integration, including data privacy, regulatory frameworks, infrastructure development, and workforce training. Data management involves synthesising insights from both primary and secondary sources to provide a holistic view of AI's transformative potential in Indian healthcare.

**Results:** The findings indicate that AI can lead to earlier and more accurate diagnoses through imaging analysis and EHR data analysis, enabling preventive measures and improving patient outcomes. AI facilitates personalised treatment plans by leveraging patient-specific data, which can enhance treatment success rates. In drug discovery, AI significantly reduces the time and cost associated with identifying potential drug targets and designing new medications. Additionally, AI optimises clinical trials by predicting potential roadblocks, leading to faster completion and a more efficient drug development process. The study also highlights the importance of addressing challenges like data privacy and regulatory frameworks to ensure successful AI integration.

**Conclusion:** This research demonstrates that AI has immense potential to transform the Indian healthcare system by improving diagnostic accuracy, enhancing personalised medicine, accelerating drug discovery, and optimising clinical trials. However, successful integration requires addressing critical challenges such as data privacy, regulatory frameworks, infrastructure development, and workforce training. Future work should focus on quantifying the long-term benefits of AI in healthcare and addressing potential limitations. This study contributes to a broader strategy of leveraging AI to create a more sustainable and patient centric healthcare ecosystem in India.

## Public perception survey of Singapore's Know Your Meds series

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**Background**: The National Pharmacy Strategy (NPS) is a 10-year plan developed to transform pharmaceutical care delivery in Singapore, aligning with the Ministry of Health's (MOH) strategic shifts towards value-driven healthcare. The Know Your Meds Series is an initiative created under the NPS, with the vision of empowering the public to manage their medications and achieve their desired health goals. Launched in 2022, the Know Your Meds Series comprises a collection of infographics and videos on basic concepts in medication management, available in Singapore's official languages: English, Chinese, Malay, and Tamil. These resources have seen multichannel adoption across both online and offline platforms, spanning public healthcare institutions, community care networks, and healthcare training institutions. The survey assessed public perception of the Know Your Meds Series' effectiveness in educating the public about medication management and identified areas for future content enhancement.

**Methods:** Public feedback was gathered through an online survey disseminated across multiple channels to healthcare professionals, community care providers, healthcare students, and the public. The survey ran from September to December 2024 and comprised four questions assessing the usefulness, relevance, actionability, and overall sentiment towards the resources. Sentiment analysis was conducted on qualitative feedback using Perplexity Pro, an AI-powered tool, to categorise keywords into positive, neutral, and negative sentiments and generate summaries of the key themes observed.

**Results:** The survey gathered 670 responses. 95% of respondents found the resources helpful for understanding

medication management, and 94 per cent reported being able to apply what they had learned. Analysis of qualitative feedback (n = 198) showed that 77% of respondents expressed positive sentiments towards the series, with feedback centred around four key aspects: informative and educational value (40%), ease of understanding (30%), practical utility (20%), and comprehensive coverage of topics (10%). Key areas of improvement noted included a preference for more concise videos, integration with digital health platforms, and additional content on chronic disease management.

**Conclusion**: The survey reveals a public demand for accessible medication education, suggesting that existing national health resources could benefit from more streamlined delivery formats and enhanced visibility to the public. Future development of the Know Your Meds Series should prioritise optimising content delivery through shorter formats made available through different digital health platforms to meet the preference for point-of-need information access, and a communications strategy to enhance public awareness of existing health resources across national platforms. These insights provide a foundation for enhancing medication literacy in Singapore's evolving healthcare landscape.

## Awareness and knowledge of sexually transmitted diseases among secondary school adolescents in Bayelsa State, South- Southern Nigeria

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**Background:** Over a million sexually transmitted infections (STIs) are acquired every day worldwide. Sexually Transmitted Infections commonly referred to as STIs are infections majorly transmitted through sexual contact, caused by bacteria, viruses or parasites. More than 30 different bacteria, viruses, and parasites are known to be transmitted through sexual contact. This study assessed the awareness and knowledge of sexually transmitted diseases among secondary school students in Yenagoa local government area of Bayelsa State, Nigeria.

**Method:** A descriptive cross-sectional study was conducted using purposive sampling technique for Male and female adolescent secondary school students, in public and private secondary schools in Yenagoa Local Government Area, Bayelsa state, Nigeria. Self-administered questionnaire was used to obtain data. The questionnaire explored themes such as knowledge of different types of STIs, sources of information relating to STIs, mode of transmission of STIs, symptoms of STIs, and access to healthcare. Data was collected and analysis was done using the IBM SPSS version 23 software. Chi-square, and One way Analysis of Variance (ANOVA) were statistical tests conducted. All methods were carried out in accordance with relevant guidelines and regulations. Full ethical approval was granted by The Bayelsa State Health Research Ethics Committee (BSHREC) with approval number, BSHREC/Vol.1/19/14.

**Results:** Over 90% of respondents were aware of HIV/AIDS but less than 20% awareness of other STIs.The major sources of information about STIs were health workers, seminars, textbooks, internet, radio, schoolteachers, television. A high percentage of respondents (90.1%) had knowledge about STIs being transmitted through sexual intercourse. Respondents also recognised the importance of access to healthcare, identifying pharmacies (48%), and hospitals (12.5%) as their key source of information and health care services.

**Conclusion:** Findings showed that the female respondents generally had a greater knowledge about STIs, their mode of transmission and symptoms compared to the males. More awareness is therefore needed especially for STIs other than HIV, inclusion of sex education in the school curriculum is highly recommended. There is also a need for government owned schools to ensure proper sex education for their students.

## Digital Health Literacy investigation among digital consumers and patients

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**Background:** In an era of widespread use of digital media and artificial intelligence (AI), it can be challenging to access clear, reliable and useful health information. Advice on nutrition, skincare, healthy habits and lifestyles, medical advice as disease symptoms, disease prevention and treatment is easily and quickly accessible to everyone. It is not uncommon to receive completely contradictory answers to a single question.

**Objective:** Our main interest in the research was to what extent and in what way do people today apply health advice

taken from digital media and AI. Do they find reliable sources and correct advice for themselves?

**Method:** We created survey, aimed at better understanding how information from digital media, including information generated by AI, influence the health decisions our patients make. The survey was distributed to patients consuming digital media and pharmacy, with a questionnaire concerning how they approach, understand and where they are checking the sources of some health-related issues they are interested in. The survey was done in Montenegro, Croatia, Serbia and Bosnia and Hercegovina. Our interest in this topic was first obtained by many in pharmacy connection with patients already with information from digital media and AI. We wanted to have scope of way patients are approaching this digital and AI "knowledge" and where and how they check if this information is reliable, how they are valuing information, how start to use or try some actions which were not provided by Health professionals, how patients are getting information from digital or AI generated Health professionals.

**Results:** The result that we obtained through this survey show us that Digital Health Literacy is not on a satsactoy level and that all kind of information can find their way through Digital media and AI. Patients often do not understand the difference between getting information from a reliable source or an unreliable source, approaching Health information is more like influencing and the checking of information is not always done through reliable medical information sites.

**Conclusion:** Our future actions are planned in many pharmacy and society activities. Actions to provide a rise of Quality Digital Health Literacy, the understanding of a new position and new approach to Health Informations and development of good skills for checking, recognition and position of right Health information. This investigation demonstrates a need of active inclusion of pharmaceutical professionals in raising social awareness for good Digital Health Literacy and collaboration with both patients, other health professionals and legislative authorities, making better structures for accepting new powerful tools without harm for our patients and patient groups.

## Assessing the efficacy of traditional Chinese medicine in treating uremic pruritus: A systematic review and meta-analysis

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**Background:** Uremic pruritus (UP) is a common condition in patients undergoing dialysis or suffering from end-stage renal disease (ESRD). It can lead to sleep disturbances, anxiety, depression, reduced quality of life, and even increased mortality. Since the pathogenesis of UP remains unclear, current research suggests it may be related to systemic inflammation and opioid system imbalances. Factors such as the degeneration of sweat glands and sebaceous glands leading to skin dryness, hyperparathyroidism, and uncontrolled calcium-phosphorus levels have been implicated. Clinical treatments mainly focus on symptom relief, including the application of moisturisers, antihistamines, opioid receptor antagonists, and narrowband ultraviolet B (NB-UVB) therapy to regulate IL-2 immune responses. In Taiwan, many people seek traditional Chinese medicine (TCM) as an adjunct treatment to improve patients' quality of life.

**Objective:** Through this study, we aim to determine whether TCM intervention has a clear therapeutic effect on UP with fewer side effects, providing patients with more treatment options.

**Method:** A comprehensive search of six databases was conducted for studies published up to January 31, 2025. A total of 13 randomised controlled trials (RCTs) involving 1,313 patients were included in this meta-analysis. The studies selected used validated pruritus intensity measurement tools such as the visual analogue scale (VAS), verbal rating scale, and numerical rating scale. Additionally, laboratory markers such as calcium (Ca), phosphorus (P), and parathyroid hormone (PTH) levels were analysed to support the efficacy.

**Results:** TCM intervention significantly improved pruritus symptoms in dialysis patients without severe side effects. The meta-analysis results showed an improvement in pruritus severity. A total of 469 cases were included in VAS (SMD = 1.38; 95% CI [0.63–2.13]; p = .000), and the total effective rate was analysed for 730 cases (RR = 1.21; 95% CI [1.13–1.30]; p = .000), demonstrating a statistically significant difference. Additionally, laboratory indicators showed significant differences in calcium (SMD = 0.35; 95% CI [-0.01–0.69]; p = .045), phosphorus (SMD = 1.03; 95% CI [0.42-1.64]; p = .001), and parathyroid hormone (i-PTH) levels (SMD = 0.95; 95% CI [0.33-1.57]; p = .003) compared to pre-treatment values. The observed balance in calcium-phosphorus ion levels and the reduction in i-PTH levels further support the alleviation and improvement of pruritus symptoms.

**Conclusion:** According to TCM theory, the pathogenesis of pruritus is attributed to blood deficiency, wind-dryness, and toxin stagnation. Treatment primarily focuses on nourishing the blood, dispelling wind, detoxifying the body, and promoting blood circulation. Using oral herbal medicine with heat-clearing and detoxifying properties, combined with acupuncture, to modulate central nervous system activity, alleviate inflammation, and effectively reduce itching responses. Additionally, topical treatments such as herbal ointments and medicinal baths facilitate absorption through the skin, helping to inhibit the production of inflammatory substances. The findings of this study demonstrate that TCM effectively alleviates pruritus in uremic patients, offering them additional treatment options. Future research will further analyse specific herbal formulations to enhance the treatment model with stronger scientific validation. Given its efficacy and potential benefits, TCM intervention presents a promising and worthwhile therapeutic approach.

## How can we do pharmacovigilance better? Indonesians' voices on the pharmacist's role in managing side-effect experience: A qualitative study

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**Background:** The Indonesian Pharmacovigilance system was established in 2004, followed by the initiation of Adverse Drug Reactions (ADRs or medication's side-effects) reporting activity in 2012. Like other countries, details of ADRs are captured using a Spontaneous Reporting System (SRS). This form relies on voluntary reports, alongside mandatory reporting for drug manufacturers and health care providers in hospital settings. However, research into the side-effect reporting system in Indonesia has shown very small report numbers. Patient direct reporting in other countries has shown numerous advantages that potentially could lead to increasing the number of reports. Therefore, the patient's perspective as the first-hand source is important to explore in order to expand understanding and identify ways to optimise reporting rates, particularly in Indonesia.

**Objective:** The study aimed to explore Indonesians' views and experiences of pharmacists' role in managing medication's side-effect.

**Method:** Following Ethics committee approval, eligible participants were selected purposively by the pre-determined inclusion criteria (Indonesian residents aged 18 or over who had experienced a side-effect) and recruited online through social media including Facebook, Instagram, and WhatsApp. Online semi-structured interviews were conducted using Zoom® from April to July 2024. Participants were able to select Focus Group Discussion (FGD) or One-to-One interview as the interview method. The interview schedule was applied to address questions related to their experiences, views, and how they should deal with side-effects. Data collection ended once theme saturation was achieved. The original transcripts in Indonesian were translated into English and thematic analysis was performed. Dual coding was administered for verification and accuracy of analysis purposes.

**Results:** Sixteen members of the public from the Western part of Indonesia (Sumatera and Java Province) participated and were organised into two focus group discussions and 12 one-to-one interviews. Female participants outnumbered the male (13 vs 3) with most aged 41-50 years. Most participants presented their self-experience whereas others talked about their children or parents' experience. Three themes emerged: pharmacists as a source of side-effect information sources, the current and expected role of pharmacists in reporting side-effects. In this study, none of the participants obtained side-effect information from pharmacists. Side-effect information came mainly from doctors, others with the same experience, and the internet. Participants identified that pharmacists currently provide no information about side-effect and focussing primarily on the transaction of medicines. Improvements to pharmacy service and communication regarding side-effects were identified. Participants expect pharmacists to explain and provide information to promote the safe use of medicines, including details of the benefits of treatment and medication side-effects whilst also demonstrating sympathy.

**Conclusion:** Acknowledging the small scale of this study, based on life-experience, Indonesian members of the public outlined perceived shortcomings in the pharmacists' role, including non-existent or substandard services regarding medication side-effect events. However, this study shows several potential works that can be implemented to improve pharmacists' services in order to reverse this unfavourable situation. Further work is underway to determine whether the idea of pharmacists' role improvement may provide an opportunity to contribute to increasing ADR reporting rates in Indonesia.

## Longitudinal linkage of paracetamol poisoning hospital admissions in NSW, Australia

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**Background:** Paracetamol is one of the most accessible medications worldwide and its use in poisonings, particularly those that are intentional, are common and increasing. It is considered one of the top causes of acute liver failure in many high-income countries and the Australian government has recently reduced paracetamol pack sizes to limit the harm from intentional poisonings. The Poisoning And enVenomation Linkage to evaluate Outcomes and clinical Variation in Australia (PAVLOVA) cohort is a large data linkage project within New South Wales (NSW) established to evaluate risk factors and outcomes of toxicological events. This cohort is a useful way to examine the recent burden of paracetamol poisoning in Australia and identify outcomes and at-risk groups.

**Objective:** To describe characteristics and outcomes of hospitalised paracetamol poisonings recorded in PAVLOVA's hospital admissions data including the type of poisoning, demographics, coingestants, length of stay, drug induced liver injury, liver transplants, deaths, self-poisoning repetition and long-term post-discharge survival.

**Methods:** We performed a retrospective observational study of patients admitted to NSW hospitals using the PAVLOVA cohort. We analysed data on people with any event coded as T39.1 (poisoning by or adverse effect of 4-Aminophenol derivatives) in the NSW Admitted Patient Data Collection (APDC) dataset in PAVLOVA. We extracted all their APDC and death data held in the dataset between January 2011-September 2020 and analysed it using R statistical software. We examined features associated with paracetamol poisoning and short-term outcomes. We also examined those determining long-term survival and self-poisoning repetition (by any agent) using time-to event analysis with competing risks and censoring.

**Results:** There were 24,092 paracetamol poisoning events admitted to NSW hospitals between January 2011 and September 2020 involving 19,895 unique individuals. The median age was 28.5 years (IQR 18.7-44.9) and 71.0% (n = 17,095) were female. Most events (78.8%, n=18,987) were intentional poisonings with a high frequency in young women. These individuals had high rates of psychiatric and substance use comorbidities such as anxiety (56.5%), mood disorders (54.8%) and disorders due to psychoactive substance use (37.5%). Approximately 4% each of the accidental and undetermined/other groups developed drug induced liver injury compared to 1% for the intentional group. Over 20% of the individuals with an intentional poisoning had at least one further repeat intentional poisoning. The proportion of females increased with increasing number of repeat intentional poisonings. Overall survival at the end of the 10-year study period was 93% (n=18,512) however long-term survival was lowest amongst accidental poisonings and individuals with multiple repeat intentional poisonings.

**Conclusions:** Paracetamol is a common cause of poisoning admitted to NSW hospitals. Intentional poisonings constitute most events which supports government decisions to reduce paracetamol pack sizes. Datasets like the PAVLOVA dataset will be valuable for evaluation of this intervention. However, with a high frequency of poisonings in young adults and higher rates of drug induced liver injury and poor long-term survival with accidental poisonings, further actions are necessary.

## Personalised drug dosing and pharmacotherapeutic recommendations for obese and post-bariatric surgery patients

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**Background:** With the rising prevalence of patients with obesity and those undergoing bariatric surgery, the need for clear, evidence-based recommendations has become more important than ever. Since 2018, the KNMP has been developing evidence-based recommendations for drug dosing and pharmacotherapy in patients with obesity with a body mass index of 40 kg/m² or greater (BMI ≥ 40 kg/m²), and those who have undergone bariatric surgery. Over the past seven years, dosing and pharmacotherapeutic recommendations have been established for a wide range of drugs. These recommendations are implemented as clinical rules into the Dutch drug database G-Standaard, which are used by hospital and outpatient pharmacies, and also by prescribers in primary and secondary care settings.

**Objective:** Evaluation of the development and implementation of evidence-based dosing and pharmacotherapeutic recommendations for patients with obesity (BMI ≥ 40 kg/m²) and post-bariatric surgery.

**Method:** KNMP pharmacists develop dosing and pharmacotherapeutic recommendations based on comprehensive literature research. These recommendations are then reviewed by a multidisciplinary team of experts, including internists, hospital pharmacists, community pharmacists, and general practitioners. When needed,

bariatric surgeons or other specialists are consulted. The team assesses potential changes in pharmacokinetics and pharmacodynamics and evaluates their clinical relevance. Additionally, they ensure that the recommendations are practical and applicable in both primary and secondary care settings.

**Results:** To date, a total of 278 recommendations were developed, with 132 focused on obese patients (BMI ≥ 40 kg/m²) and 146 on post-bariatric surgery patients. For obese patients, 46 of the recommendations led to an intervention (33%), mostly involving dosage adjustments (74%), followed by pharmacotherapy modifications (22%) and drug monitoring (4%). For post-bariatric surgery patients, 69 (47%) recommendations required an intervention with 56% focused on drug monitoring, 41% on therapy modifications, and 3% on dosage adjustments. In some cases, predicted pharmacokinetic changes did not match literature findings, underscoring the importance of relying on existing research. For certain drugs, scientific evidence was limited. In these cases, recommendations were primarily based on expert opinion.

**Conclusion:** Adjustment of drug dosing, pharmacotherapy, or drug monitoring is often warranted in obese (BMI ≥ 40 kg/m²) and post-bariatric surgery patients. The implementation of these recommendations supports healthcare professionals in providing optimal and personalised care for obese and post-bariatric surgery patients. For some drugs, the impact of obesity or bariatric surgery on pharmacokinetics and pharmacodynamics remains uncertain, highlighting the need for further evidence-based recommendations in the future.

## Impact of cephalosporins on outcomes of warfarin therapy: A multicentre retrospective cohort study

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**Background:** Cephalosporins are antibiotics commonly prescribed for a wide range of bacterial infections. Haemolysis can occur as a rare adverse effect of certain medications including cephalosporins. Warfarin is one of the most widely used oral anticoagulants. Although interactions between cephalosporins and warfarin have been reported, the extent of international normalised ratio (INR) change, bleeding risk, and warfarin dose reduction or discontinuation remains unclear. We evaluated the effect of the combination on various outcomes.

**Methods:** A retrospective, multi-centre, case-control study was conducted on adults (≥ 18 years old) receiving regular warfarin therapy who were hospitalised between October 2010 and September 2024. Those who only received warfarin were labelled “warfarin-only” group, whereas those who also received any cephalosporin during their hospitalisation course were labelled “warfarin/cephalosporin” group. We excluded patients who had insufficient INR readings at baseline and during the hospital course, as well as patients with active bleeding prior to or at the time of antibiotic initiation. The primary outcome was the change in INR, while the secondary outcomes included bleeding, changes in warfarin therapy, receipt of vitamin K, length of stay (LOS), and in-hospital mortality. Multivariable logistic regression to generate odds ratio (OR) and 95% confidence interval (CI) was done to evaluate the factors associated with INR elevation by ≥ 20%.

**Results:** Of 261 included patients, 136 were in the warfarin-only group and 125 in the warfarin/cephalosporin group. Baseline characteristics were balanced, except for hospital location, warfarin indication, and baseline haemoglobin and haematocrit levels. The most frequently used cephalosporins were ceftriaxone (49%), cefuroxime (33%), and cefazolin (26%) with a median duration of therapy of seven days. The mean change in INR was significantly higher in the warfarin/cephalosporin group compared to the warfarin-only group (44.1% vs. 23.52%; P = 0.009), resulting in a higher rate of warfarin dose reduction or discontinuation (12% vs. 3.7%; P=0.012 or 26.4% vs. 5.1%; *P < 0.0001*) and a longer median LOS (14 vs. 9 days; *P < 0.0001*). However, no difference was observed in bleeding, vitamin K receit, and in-hospital mortality. Univariate analysis showed that none of the baseline characteristics was significantly associated with ≥20% elevation in INR, except for four factors: the study group, baseline INR, whether the patient was within therapeutic INR range at baseline, and concomitant medications that may impact coagulation. In the multivariable regression model, only receiving cephalosporin maintained a significant association with INR elevation (OR, 1.95; 95% CI, 1.12-3.42; P = 0.020), whereas low baseline INR was negatively associated with INR elevation (OR, 0.35; 95% CI, 0.20-0.60; *P < 0.0001*).

**Conclusion:** This study provides evidence that cephalosporin administration may significantly impact concomitant warfarin therapy, potentially leading to increased INR. Such an outcome may trigger clinicians to change warfarin therapy by dose reduction or treatment discontinuation. The increase in INR may have also been associated with prolonged hospital stays until patients’ INR return to baseline prior to discharge. To avoid this drug-drug interaction, alternative antibiotics should be considered whenever possible. It's also important to emphasise the importance of close monitoring and potential dose adjustments of warfarin if cephalosporins are deemed necessary.

## Adherence patterns and influencing factors in inhaler use among COPD and asthma patients in Albania

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**Background**: Medication non-adherence is a major challenge in managing COPD and asthma, leading to worsened health outcomes and increased healthcare costs.

**Objective:** This study aims to assess adherence patterns among Albanian patients using the Test of Adherence to Inhalers (TAI) and explore key influencing factors.

**Methods:** A 12-month cross-sectional study was conducted at a tertiary pulmonary hospital in Tirana, Albania, targeting 235 patients, with 148 analysed. The TAI-12 questionnaire, translated and adapted in Albanian, was used to assess adherence. Chi-square tests and logistic regression evaluated demographic, clinical, and healthcare provider-related influences.

**Results:** Non-adherence was found in 92.6% of patients, 4.7% had intermediate adherence, and 2.7% were adherent but unconscious non-compliant. The mean TAI Q1-10 score was 35.30 (SD=5.29), while Q11-12 averaged 2.86 (SD=0.78), indicating patients overestimated their adherence. Higher education correlated with better adherence ($p < 0.05$), while urban (54.1%) and rural (45.9%) residency showed no significant differences. COPD patients, particularly those in Stage C (56.8%), adhered less than asthma patients (p = 0.03). Disease duration for over ten years (21.0%) showed no improvement on adherence over newly diagnosed patients (23.6%). Patients receiving inhaler instructions from multiple healthcare providers (59.5%) had significantly better adherence than those receiving guidance from a single provider (37.2%) ($p < 0.05$).

**Conclusion:** Management of COPD and asthma remains a major challenge among Albanian patients, mostly due to lack of adherence. Higher education and multi-provider instruction improve compliance, emphasizing the need for structured adherence programs.

## Exploring the influence of social media on eating behaviours in childhood and adolescence: A cross-sectional survey of young adult and parent perspectives

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**Background:** Dietary shifts have been pivotal in human evolution, and in today's digital era, social media may be driving another change. Prevalence of obesity and diet-related disease is rising, whilst social media facilitates promotion of unhealthy foods and nutrition misinformation to youth. Perceptions on specific labelling systems for diet-related content, identifying users with healthcare licenses, have not been explored as media literacy interventions. The aims of this study are to investigate social media's influences on children's and adolescent's eating behaviours, as perceived by parents and young adults. Additionally, to explore perceptions on promoting healthy eating by increasing healthcare professional's online presence and contextual labelling on diet-related posts.

**Methods:** A cross-sectional quantitative survey explored social media use, eating behaviours, nutritional knowledge, media literacy skills and interventions. Participants: health club members in Southwest England and parents, primary carers, or guardians to a primary school aged child (4-11 years); University of Birmingham students (18-22 years) who use social media. Statistical analysis was applied to quantitative questions, and thematic analysis to open-ended questions.

**Results:** Forty parents and 85 young adults were recruited. Many 4-11-year-olds own, or have access to, a device (n = 16; 67.5%; n = 10, 25%). YouTube is the second most popular purpose of device use, after gaming, (n = 16, 40%) with 45% (n = 18) of children reportedly following or enjoying an online personality's content. Around 33% (n =13) of children have requested an unhealthy food or drink because of an online influence. Identified nutrition literacy gaps and lack of school nurses in many children's schools (n = 19) may contribute to health disparities. Most parents felt unconfident in their child's media literacy skills (n = 15, 37.5%). Reportedly, children are likely to follow pharmacist's diet advice (n = 22). Many young adults (n = 64) encounter food-related content multiple times daily; most common posts included clean eating, fast food, and weight loss products. From those who had purchased a food or drink due to an online influence (n = 51), 54% (n = 31) deemed the product unhealthy. Young adults generally overestimated protein's significance in the diet and protein-labelled products as healthier. Half (n = 42) credited online influences for motivating diet alterations, only 6% (n = 3) cited a licensed healthcare professional. Participants generally supported promotion of healthy eating through increasing healthcare professional's social media

presence (n = 125, 68 %, 95% CI: 59.8%-76.2%), and contextual labelling of diet-related posts (n = 125, 84%, 95% CI: 77.6–90.4%).

**Conclusion:** Findings support the emerging evidence that children's device use predates essential media literacy education, and that promotion of unhealthy food and nutrition misinformation may harm youth's eating behaviours. Therefore, timing and extent of school media literacy curricula in the United Kingdom may require revaluation. Pharmacists could help address health disparities by contributing to children's nutritional education. Online campaigns could leverage healthcare professional expertise and online personality influence to promote healthy eating to youth. Future research could trial content labelling implementation on diet-related posts.

## Pharmacoeconomics of stem cell therapies for diabetes and neurodegenerative diseases: The role of clinical pharmacists in cost optimization

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**Background:** Diabetes and neurodegenerative diseases, such as Parkinson's disease (PD), impose significant economic burdens on healthcare systems globally. For type 1 diabetes (T1D), the lifetime medical costs in the U.S. alone are estimated at 133.7 billion, with additional income losses of 289.2 billion. Traditional treatments, including insulin therapy and islet transplantation, are costly and often fail to provide long-term solutions. Similarly, neurodegenerative diseases like PD and stroke require expensive, lifelong management. Stem cell therapies (SCT) offer promising alternatives, with potential for improved patient outcomes and cost savings. However, high manufacturing costs and scalability challenges limit their widespread adoption. This study explores the pharmacoeconomic potential of SCT and highlights the critical role of clinical pharmacists in optimizing cost-effectiveness.

**Objective:** The objectives of this study are to:

- Compare the costs of traditional treatments versus Stem cell therapies for T1D and neurodegenerative diseases.
- Evaluate the cost-effectiveness of SCT using pharmacoeconomic models, such as incremental cost-effectiveness ratios (ICERs) and quality-adjusted life years (QALYs).
- Explore the role of clinical pharmacists in optimising the cost-benefit potential of Stem cell therapies through process management, reagent optimisation, and multidisciplinary collaboration.

**Method:** This study employs a mixed-methods approach, combining literature reviews and data analysis. Key pharmacoeconomic models, including cost-effectiveness analysis and QALYs, were used to evaluate the economic impact of SCT. Data were extracted from peer-reviewed studies on Stem cell therapies for T1D and neurodegenerative diseases, focusing on cost drivers such as differentiation media, downstream processing (DSP), and batch scalability. The role of clinical pharmacists was analysed through case studies and expert recommendations, emphasizing their contributions to process optimization, cost data collection, and pharmacoeconomic modeling.

**Results:**

1. Cost Comparisons: Stem cell therapies for T1D showed a 20-year cost of 1,241,957 compared to 310,425 for insulin therapy, but with a significant QALY gain (13.32 vs. 9.59). For PD, SCT demonstrated cost savings of $3,224.62 and a QALY gain of 1.133 in advanced stages.
2. Cost Drivers: Key cost-saving opportunities in Stem cell therapies include reducing differentiation media costs (37–65% savings) and improving DSP yield (42–61% savings). Scaling production to 50 patients per year reduced costs to $650,000 per patient.
3. Pharmacist Contributions: Clinical pharmacists optimise SCT costs through process management, reagent optimization, and pharmacoeconomic analysis. Their involvement in multidisciplinary teams ensures cost savings without compromising therapeutic efficacy.

**Conclusion:** Stem cell therapies offer significant clinical benefits for T1D and neurodegenerative diseases but remain costly compared to traditional treatments. Pharmacoeconomic models highlight the importance of scaling production and optimizing key cost drivers. Clinical pharmacists play a pivotal role in enhancing the cost-effectiveness of SCT through process optimization, cost data analysis, and multidisciplinary collaboration. Future research should focus on reducing manufacturing costs and expanding pharmacist-led interventions to improve accessibility and affordability of SCT.

## Multiple disciplinary engagement on artificial intelligence in healthcare

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**Background:** Technological advancements are transforming pharmaceutical and medicinal sciences, reinforcing the potential of innovative technologies, such as Artificial

Intelligence (AI), to become a steady member of the healthcare team. Whilst being widely considered as a promising approach, the integration of AI in public health practices is often linked to substantial challenges which may not be addressed by any one discipline in isolation. Multiple stakeholders reached out to the Malta Medicines Authority (MMA) through the MMA Academy for Patient Centred Excellence and Innovation in Regulatory Sciences, expressing interest in the field and urging initiatives to further explore the developing landscape. In response, an educational webinar was organised to provide a platform for professionals to exchange insights, discuss concerns and gauge the way forward.

**Method:** The content of the webinar was designed by experts with different backgrounds, including data science, immersive technologies, information management, as well as policy, regulatory, legal and clinical specialists. The disseminated invitation attracted registration by 133 individuals from public (46) and private (67) entities. Registrants were encouraged to submit questions which they wish to have addressed in the panel discussion scheduled towards the end of the one-hour webinar. The panel was intended to complement the keynote sessions on the current state-of-play, AI applications in healthcare, prompt engineering, causes of apprehension, risks, key models of data protection, ethical considerations, regulations, national strategies and future outlooks. The webinar, entitled Stakeholder Engagement on AI in Healthcare, was delivered in December 2024 and feedback collected thereafter via an evaluation tool using a five-point Likert scale.

**Results:** Eighty-nine (89) local and international participants attended the webinar, with their areas of practice ranging across pharmacy, clinical, public health, industry, academia, regulatory sciences and information technology. By bringing together representatives from different spheres, the webinar offered multiple disciplinary engagement on diverse elements of an ever-evolving field. The exchange of views touched upon the underutilization of healthcare data, which might be fragmented, incomplete or trapped, hindering its possible use to improve patient outcomes. The need for collaboration, also beyond healthcare settings, was emphasised, highlighting that at this stage, innovative tools may be implementable in some scenarios, such as pharmacovigilance, while further developments are necessitated for other contexts such as rare diseases. Questions raised and points discussed with the panellists included the upfront effort required to collate data, facilitators that could enable healthcare professionals to leverage AI in their daily practice, regulatory flexibility to support the unlocking of AI's full potential while protecting the public, and harmonisation across jurisdictions. Feedback gathered from participants was largely positive, with 86% of respondents indicating that they would recommend such webinar to colleagues and consider attending a similar educational initiative in the future.

**Conclusion:** The positive response and collective engagement on this initiative augur well for further outreach endeavours, sustaining the commitment of the MMA Academy to continue serving as catalyst for innovation, collaboration and dissemination. Consolidated efforts are due for embracing the shift from promise to practice, translating artificial intelligence into true health value for our patients.

## Estrogen suppressant prescription negatively associated with topical steroid use and itch in females: Evidence from analyses of pharmacy claims data and adverse drug reaction database

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**Background**: There is evidence from basic and clinical studies that estrogen functions to reduce nociceptive and neuropathic pain (1, 2). On the other hand, a fundamental study has reported that estrogen rather promotes itch responses in rats (3). However, the relationship between endogenous estrogen and itch sensitivity in humans is still open to question. To address this question, we analysed pharmacy claims data and adverse drug reaction database in Japan.

**Method:** We used pharmacy claims data of female patients who visited nationwide 886 community-based pharmacy branches of Sugi Pharmacy Co., Ltd. for one month (November 2020), after anonymization by an outsider. Estrogen suppressants included anti-estrogens, aromatase inhibitors, and Gn-RH receptor desensitisers. The patients were classified into two groups, users and non-users of estrogen suppressants, or patients younger than 55 years and ones at 55 years and older. The rates of prescription of topical steroids that are commonly used for treatment of itch were statistically compared between the two groups. Further, the pharmacy claims data in the users and non-users of estrogen suppressants were balanced by propensity score matching (PSM), and the association of the rates of prescription of different categories of drugs, including topical steroids and moisturisers, and opioid analgesics, with the use of estrogen suppressants was analysed using a multivariate logistic regression model. We also analysed the Japanese Adverse Drug Event Report database (JADER), in which the description of adverse events conforms to the Medical Dictionary for Regulatory Activities (MedDRA version 27.1) developed by the International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use. Itch-related adverse events were extracted using descriptions containing "itch" in the MedDRA Preferred Term (PT). In our study, the data from the first quarter of 2004 to the third quarter of 2023 were subjected to logistic regression

analysis. The study protocol was in accordance with the ethical principles of the Declaration of Helsinki, and approved by the institutional ethics committee.

**Results:** The analyses of pharmacy claims data showed significant decreases in the rate of topical steroid prescription in the user of estrogen suppressants and in the patients at 55 years and over, compared to the control groups. The multivariate logistic regression analysis after PSM detected significant association of estrogen suppressant prescription with decreased topical steroid use and increased opioid use. The analysis of JADAR detected significant association of estrogen suppressant use with the decreased incidence of itch that was reported as a side effect of drugs, but not as a background symptom.

**Conclusion:** The analyses of pharmacy claims data and JADAR demonstrated significant association of the use of estrogen suppressants with decreases in the topical steroid prescription possibly for itch treatment and in the incidence of a complaint of pruritus, which is consistent with the basic research evidence that estrogen promotes itch sensation in rats (3).

## Applying information and communication technologies to tackle public health threats: Creation of a mobile application for mapping venomous animal species

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**Background:** Venomous animals, such as scorpions and vipers, pose significant health risks in Algeria, particularly in the High Lands and Southern regions. Indeed, approximately 50,000 scorpion stings occur each year, resulting in around 60 deaths. Scorpion mapping data in Algeria, dating back to Vachon's work in 1952, are outdated which emphasises the crucial need for an updated mapping of these animals.

**Objective:** This study aimed to develop an innovative solution to fulfill this need by applying modern information and communication technologies, through creating a mobile application to map venomous species.

**Method:** This work analysed two application development tools, WinDev Mobile 25 and Flutter, with a focus on creating a hybrid application compatible with Android and iOS. Firebase was chosen as the data hosting tool for its scalable and real-time data management capabilities. Scrum methodology was applied for project management, ensuring iterative development and regular updates through weekly meetings. The developed application offered two interfaces: Public access and herpetologist access. The public can take and upload photos of venomous species along with their location, which are then reviewed and classified by herpetologists. The application includes an analytics module to visualise species distribution, compare data and generate reports. The application was successfully tested and validated following the mapping process.

**Conclusion:** This application represents a significant advancement in venomous species mapping by providing a cost-effective and modern solution for data collection without the need for physical relocation. It is a valuable tool for studying venomous species and their respective venoms in Algeria, improving the understanding of species distribution and supporting informed decision-making, particularly in urbanization and antivenom production. Future prospects include enhanced data storage solutions, multilingual solutions, and launching the application and the mapping process.

## Mobile App in improvement of medication adherence in patient with chronic diseases: an updated systematic review and meta-analysis

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**Background:** Adherence to long-term medication regimens in chronic diseases is typically low. Traditional strategies to improve adherence are often complex and have limited success. Mobile applications present a scalable alternative for enhancing medication adherence.

**Objective:** This study aimed to conduct a meta-analysis of randomised controlled trials (RCTs) to assess the effectiveness of mobile applications in improving medication adherence among patients with chronic diseases.

**Methods:** We systematically searched eight databases up to October 31, 2024, for RCTs examining the impact of mobile apps on medication adherence in chronic disease patients compared to usual care. A random-effects model was used to calculate and pool the standardised mean difference (SMD) for medication adherence outcomes.

**Results:** The analysis revealed that mobile applications significantly enhance medication adherence in patients with chronic diseases compared to usual care. The pooled standardised mean difference (SMD) was 0.639 (95% confidence interval [CI]: 0.363 to 0.915; $p < 0.001$), indicating a moderate effect size in favor of mobile app interventions. However, substantial heterogeneity was observed across the

studies ($I^2$ = 91%, $p < 0.001$). Subgroup analyses revealed that heterogeneity could be due to variations in chronic diseases and adherence measurement tools. Sensitivity analysis confirmed the robustness of the findings, with no evidence of publication bias.

**Conclusion:** The use of mobile applications to enhance medication adherence in patients with chronic diseases shows promising feasibility and acceptability, with evidence suggesting positive effects on adherence outcomes.

## For the development of international interoperability of pharmaceutical information- In the Case of Japan -

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**Objective:** In order to ensure the proper use of pharmaceutical products, it is essential to share accurate drug information both domestically and internationally in order to strengthen and promote safety surveillance activities. However, each country currently uses its own names, codes, etc., for drug information. This makes smooth international exchange of drug information difficult. Therefore, this study focuses on the codes of pharmaceutical products in Japan, with the aim of learning about the standard specifications of pharmaceutical product codes in Japan.

**Methods:** A master database of drug codes will be constructed for individual drug codes (YJ codes), which are drug codes used universally by medical institutions in Japan, computerised receipt codes, and GTIN codes used in distribution.

**Results:** Since the drug codes implemented in Japan's medical information systems are operated using local codes for each medical institution, a code master database was established to ensure interoperability for codes that link lists of Japan's major drug codes: individual drug codes (YJ codes), receipt computer processing codes, and distribution codes (GTINs). The code master database has been constructed for the purpose of interoperability. ATC codes and other codes were added to this code master database. The following are considerations to take into account. In Europe, data utilization is being developed through primary and secondary use of data in the health and medical fields. However, there are differences in the legal definition of data utilization and the concept of primary and secondary use in the utilization infrastructure. The next step in the development of domestic standardised and approved codes is to link them with ISOIDMP ,ATC and other standards, which will allow them to be linked with foreign drug codes. In parallel with this, it is necessary to consider exchange rules (HL7/FHIR) for the content of information.

## Does the risk of myocardial infarction, stroke and thrombosis change in people with menstrual and uterine disorders treated with analgesics, hormonal contraceptives and tranexamic acid?

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**Background**: Menstrual and uterine disorders are often accompanied by symptoms of excessively heavy bleeding and pain. These symptoms are typically managed with analgesics, hormonal contraceptive agents, and tranexamic acid. However, the potential risks associated with these medications, particularly the increased risk of myocardial infarction (MI), stroke, and thrombosis, remain uncertain. To address this gap in knowledge, a systematic review and meta-analysis was conducted to evaluate the safety profile of these medications and determine any change in the risk of these adverse effects when individuals with menstrual and uterine disorders take these medications individually and/or in combination.

**Methods**: A literature search was conducted across Ovid Medline, Ovid Embase, CINAHL Plus, and Web of Science electronic databases up to December 2024. The search focused on the prevalence of MI, stroke, and thrombosis in individuals of female sex with menstrual and uterine disorders taking analgesics, hormonal contraceptive agents, and tranexamic acid, either alone or in combination. The inclusion criteria were randomised controlled trials and observational studies published in English. Search terms applied included MeSH terms such as "menstrual disorder," "uterine disorder," "tranexamic acid," "analgesics," "hormonal contraceptives," "thrombosis," "heart attack," and "stroke,". Random effects model was used to calculate pooled odds and risk ratios and 95% confidence intervals (CI) using inverse variance model. A narrative synthesis was conducted where meta-analysis was not feasible. $I^2$ statistic was used to assess heterogeneity where applicable. Risk of bias was assessed using validated tools.

**Results**: Two thousand seven hundred and thirteen studies were found and after duplicates were removed and screening was done; seven studies (three randomised controlled trials, three cohort studies and one case-control study) were identified and included in data analysis. The studies investigated three interventions: analgesics (non-steroidal anti-inflammatory drugs (NSAIDs)), hormonal contraceptive agents and tranexamic acid and reported on adverse effects of thrombosis and stroke. Preliminary results from data analysis of similar outcomes showed a statistically significant

increased risk of thrombosis ($p < 0.001$) and stroke ($p < 0.0001$) with tranexamic acid use however studies show the number needed to harm is high. The pooled risk of thrombosis with hormonal contraceptive agents favoured no risk of thrombosis with hormonal contraceptive agents (p = 0.9449). Preliminary results also suggested an increase in stroke risk with NSAID use ($p < 0.0001$) whereas no significant increase in thrombosis risk was found with NSAIDs (p = 0.7.282). However, the sample size and power for these studies are insufficient for definitive conclusions.

**Conclusion:** Preliminary results from pooled summary treatment effect measures show an increased risk of adverse events with NSAID and tranexamic acid used for management of menstrual and uterine disorders, however this risk was not significant with use of hormonal contraceptive agents. Sample size and power of some studies were too small to provide a conclusive conclusion and in some studies outcome data were incomplete and adverse events were not pre-specified as an outcome by study authors. Further research is needed to investigate and compare adverse events in pharmacological interventions used for management of menstrual and uterine disorders, to better inform clinicians and guide patient decision on management of these conditions.

## Digital tool in primary health care; QR code for suspected adverse drug reaction reporting

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**Background:** The implementation of digital tools in healthcare is transforming the way healthcare professionals manage patient safety. In this context, the use of QR codes as a method for reporting suspected adverse drug reactions (ADRs) emerges as an innovative and efficient solution. This system allows physicians and primary care staff to report drug-related problems quickly and directly, facilitating real-time data collection and improving responsiveness. The ease of access and immediacy provided by the QR code, together with its integration into mobile devices, simplifies the reporting process and promotes a culture of safety in the healthcare environment, aiming to:

- Streamline and facilitate the AMR reporting process.
- Optimise data collection
- Promote the active participation of health professionals.
- Strengthen systems for monitoring and preventing pharmacological risks.

**Method:** Access to QR code in each clinical care box and internal wall diaries of primary health care teams for reporting via mobile phones of the health care team. Information that enters via QR code is centralised in the standard spreadsheet of the pharmaceutical services directorate (community pharmacovigilance manager), who carries out the first evaluation and confirmation of data to send information to the referent of each pharmacovigilance health establishment, which corresponds to the Pharmaceutical Chemists, depending on where the patient is registered. Pharmaceutical Chemists of each health establishment carries out the process of evaluation, review, analysis of clinical history together with the face-to-face or telematic interview with the patient. Notification is made via the Integrated Surveillance System of the Institute of Public Health.

**Results:**

1. Before QR code will be implemented.
   - o 2019: RAM 42 notifications
   - o 2020: RAM Notifications 15
   - o 2021: RAM Notifications 20
   - o 2022: RAM Notifications 25

   -Since starting with QR code.
   - o 2023: RAM 141 Notifications
   - o 2024: Notifications RAM 285
   - o 2025: Notifications as of 28/02/25 there have been 75.

2. The drugs mainly associated are:
   Metformin CM 850mg
   Amlodipine CM 10mg
   Amlodipine CM 5mg
   Fluticasone/Salmeterol Inhaler.
   Atorvastatin CM 20mg
   Sertraline CM 50mg
   Metformin CM 1000mg

**Conclusions:**

1. Optimisation of AMR reporting
2. Increased participation in pharmacovigilance.
3. Improved quality of safety data
4. Strengthening patient safety
5. Fostering a proactive safety culture
6. Reducing technological and administrative barriers
7. Significantly improving the efficiency, coverage and quality of pharmacovigilance.

This approach not only optimises reporting processes, but also contributes to improved patient safety and the strengthening of the healthcare system as a whole. Challenge: increase reporting, encourage and educate health care teams and community, improve data collection process.

## Safer doesn't mean safe – the scale of risk for alternatives to smoking

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**Background:** Alternative nicotine product usage is now endemic amongst youth and young adult populations, adding to risks from the ongoing smoking endemic. Nicotine users are no longer "only smokers". Alternative nicotine products such as heated tobacco products (HTPs), e-cigarettes and nicotine pouches are often used in addition to or as a substitute for cigarettes, as well as to quit cigarettes.

**Objective:** There is a gap in comparing the health impact of nicotine products other than traditional cigarettes. This leads to the lack of knowledge in healthcare professionals (HCPs), meaning they are not always able to adequately support patients seeking information and support in switching and quitting these products. The aim is to produce a scale of risk for these products, co-created with pharmacists, to empower HCPs with the critical knowledge needed to educate themselves and support patients considering or already using alternative nicotine products. As accessible HCPs, pharmacists are pivotal in supporting patients make informed decisions that can significantly impact their health and wellbeing.

**Method:** Literature searches were conducted to obtain the latest data in both humans and animals for the health impacts of alternative tobacco and nicotine products. Consumer insight research was used to determine how many users wish to reduce or quit their habit and what the barriers to quitting are.

**Results:**

High risk:

1. Cigarettes:
- Long established high risk to health

Medium risk:

- HTPs: Carcinogenic
- Impacts pulmonary system
- Affects cardiovascular function

2. Tobacco pouches
- Cardiovascular disease – increased risk
- Oesophageal, oral, rectal cancer - increased risks
- Obesity, diabetes, heart failure – increased risks
- Significant increase in all-cause mortality and cardiovascular mortality compared to never users

3. E-cigarettes
- Asthma exacerbations, especially in youth
- Chronic bronchitis, dry cough
- Myocardial infarction – increased risk
- Second-hand exposure linked to asthma, bronchitis

4. Nicotine pouches:
- Periodontal disease link

- Low risk:
- Nicotine replacement therapy
- Long established good safety profile

This scale shows HCPs the risks of each product, in comparison to other forms of nicotine as alternatives to smoking. It will enable pharmacists to proactively warn patients of the potential dangers and long-term health risks of these alternative products, giving tools to evaluate health impacts of quit attempts with patients.

**Conclusions:** Among nicotine sources, cigarettes pose highest threat to health, however there are data to show that whilst alternative forms of nicotine are "safer" than cigarettes, they are still not "safe" and can cause harms themselves. Pharmacists are uniquely positioned to guide patients towards safer options and effective quitting strategies. It is essential pharmacists are thoroughly informed about specific health risks associated with each type of alternative nicotine product. By delivering clear, accurate, impactful information, pharmacists can help their patients make better-informed decisions about their nicotine use, ultimately leading to improved overall health and well-being. More research is needed into health risks of these alternative products to provide further information to those wishing to quit and those wishing to help them quit, as more people become addicted to their use.

## Harnessing generative AI for global medical insights

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Novo Nordisk receives vast volumes of global medical insights containing critical professional opinions and patient experiences. The MedAI Q&A application, powered by Generative AI and a Retrieval-Augmented Generation (RAG) approach, revolutionises the analysis of these insights. MedAI processes data swiftly and accurately across over 35 countries, allowing users to ask specific questions (e.g., "What are the concerns for doctors in Italy related to semaglutide?") and receive concise answers. Over 90% of users find MedAI highly relevant, significantly reducing manual data handling and analysis time for Medical Affairs, CMRs, and CMMs. MedAI exemplifies the strategic value of

AI-driven solutions in enhancing decision-making and maximizing the impact of medical data.

## A smartphone-based decision support app for total parenteral nutrition prescription via WeChat mini-program

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**Background:** Total parenteral nutrition (TPN) is essential for patients unable to meet nutritional needs orally/enterally. Complex calculations, numerous formulations, and individual patient factors such as disease states, laboratory results, and organ function complicate TPN prescribing and increase medication error risks. Smartphone-based decision support applications may facilitate safer, faster, and individualised TPN prescriptions. Therefore, the authors developed and evaluated a smartphone-based decision support application ("PNtailor") via the WeChat Mini-Program to assist clinicians in prescribing accurate, patient-tailored TPN.

**Method:** The authors systematically reviewed pharmaceutical guidelines, consensus documents, and prescribing standards related to TPN. A rational medication knowledge base and logic flowchart were established and integrated into the "PNtailor" smartphone application, accessible via WeChat Mini-Program platform.

The application's prescription recommendation includes five sequential steps:

1. Formulation Selection: Lists commercially available TPN formulations in China, including amino acids, fat emulsions, glucose injection, electrolytes, vitamins, and trace elements.
2. Daily Energy Estimation: Calculates daily energy requirements using the Harris–Benedict equation, adjusted for gender, age, height, weight, clinical condition (e.g., postoperative status, malignancy, infection), and activity level.
3. Enteral Nutrition Status: Assesses existing enteral nutritional intake.
4. Laboratory Indicators: Considers patient-specific data, including liver and kidney function, electrolytes, triglyceride levels, international normalised ratio (INR), and platelet count.
5. Custom Parameters: Allows clinicians to input specific parameters, including desired total TPN energy, total fluid volume, glucose-to-lipid ratio, and amino acid requirement calculation methods.

Based on these inputs, "PNtailor" outputs three recommendation modules:

1. Prescription Parameters Module: includes total fluid volume, parenteral energy, non-protein calories, total nitrogen content, final calorie-to-nitrogen ratio, amino acids per body weight, glucose-to-lipid ratio, alanyl-glutamine (Ala-Gln), Ala-Gln to total amino acids ratio (mass ratio), osmolarity, and minimum infusion duration.
2. Customised Bag Recommendations Module: Generates detailed prescriptions with specific dosages for amino acid solutions, glucose (10%, 50%), fat emulsions, electrolytes (Na, K, Ca, Mg, P), vitamins, trace elements, and insulin if indicated, alongside clinical precautions on compatibility, stability, and monitoring.
3. Three-Chamber/Two-Chamber Bag Recommendations Module: Identifies suitable commercially available three-chamber or two-chamber TPN bags matching the patient's clinical profile, recommending additional electrolyte supplementation (particularly Na and K), along with associated administration precautions.

**Results:** "PNtailor" generated individualised TPN prescriptions based on commercially available formulations, nutritional status, clinical conditions, laboratory results and custom parameters. Clinical validation was conducted with 44 patients receiving TPN in thoracic surgery and intensive care unit (ICU) wards. Independent review by three senior pharmacists confirmed 100% rationality of prescription recommendations. Clinical physicians rated the application highly, averaging 4.70 ± 0.17 (maximum 5), appreciating convenience, calculation accuracy, and tailored recommendations for patients with impaired hepatic or renal function. The primary suggested improvement was seamless integration with hospital information systems (HIS) for direct prescription transcription.

**Conclusion:** The smartphone-based "PNtailor" decision support application effectively provided clinicians with accurate, patient-specific TPN prescription recommendations. Clinical validation demonstrated excellent rationality, high user satisfaction, and substantial convenience. Future integration with HIS platforms could further improve clinical workflow efficiency. Innovative digital tools such as "PNtailor" hold strong potential for optimising patient care, reducing prescribing errors, and streamlining nutritional management workflows.

## Interactions between low-grade chronic inflammation with medication intake, health status, and socio-economic factors on the aging populations on the developing country

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**Background:** Low-grade chronic inflammation is one of the characteristic features of aging organisms, whereas elevated high-sensitivity C-reactive protein (hs-CRP) is amongst the biomarkers to indicate this inflammation. The influence of inflammation on body functioning, together with other socio-demographic factors' impact on inflammation itself is a topic of great importance that might shed light on important mechanistic functioning of the ageing organism. Therefore this study examines the interactions between inflammation and medication usage, comorbidities, self-perceived health status, nutritional status, and other socio-demographic parameters of a developing society.

**Methods:** A cross-sectional study of 283 aging Kosovo adults (mean age 65.17 ± 10.30 years) was conducted, with participants classified into low, moderate, or high inflammation groups based on the hs-CRP levels. Hs-CRP was assessed from the blood serum samples collected in the morning after an overnight fast, followed by a pre-designed data collection process including information regarding the self-perceived health status, presence of chronic diseases, number of medications consumed, nutritional status, and other sociodemographic parameters.

**Results:** Amongst 283 total participants (153 females), no differences could be detected between inflammation groups in any of the analysed parameters. However, significant differences emerged when separating participants based on biological gender, with more females reporting "not good" health amongst the high inflammation (79.1%) and moderate inflammation (65.0%) groups in comparison to the low inflammation group (46.9%) ($p < 0.01$). Similarly, more females with chronic diseases (83.7% and 83.3% in high and moderate inflammation groups, respectively) in comparison to the low inflammation group (61.2%) were observed. Medication intake was the other factor where significant differences ($p < 0.05$) were observed between the three female groups with more medication consumers in moderate and high inflammation groups (88.0% and 60.9% respectively). This was also seen in the number of medications consumed by participants of the three groups. When investigating the differences in medicine intake between the nutritional groups, significantly higher intake was observed in those with normal nutritional status (p = 0.038). A similar situation was encountered between the groups deriving from the education level, with subjects with higher educational levels consuming significantly fewer medications ($p < 0.001$) than the others. Finally, poverty was the last factor detected for an association with higher medication intake (p = 0.003).

**Conclusion:** Our findings show that elevated hs-CRP levels in middle-aged and older adults from Kosovo were associated with poorer health and a higher prevalence of chronic diseases and medication use in female participants. On the other hand, medication intake amongst our study participants was associated with nutrition, education level, and poverty. These findings highlight the role of low-grade chronic inflammation in overall health status and disease burden, emphasizing the need for targeted pharmacy intervention to reduce inflammation and chronic disease burden, as well as address the inflammation-related health risks in aging populations. Our findings related to nutritional status highlight the importance of monitoring medication use in relation to nutritional health, especially in those at risk of malnutrition.

## Prevalence and risk factors of use of potentially inappropriate medications in older outpatients using Japanese health insurance claims database

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**Background:** Potentially inappropriate medications (PIMs) are known to cause adverse drug events in older patients. In a super-aging society, understanding the prescription status of PIMs to consider proper medical intervention and promote appropriate drug use for older patients is important. Most patients first visit the hospital and receive drug treatment in an outpatient setting. However, the use of PIMs in outpatient care has not attracted much attention. The objective of this study was to investigate the prevalence of use of PIMs and to identify its risk factors in older outpatients using large-scale Japanese health insurance claims database.

**Method:** A cross-sectional study was conducted using data from the Japanese health insurance claims database. This is commercially anonymised patient database, which included details of patient medical expenses (prescription drugs, disease, etc.) managed by JMDC Inc. Eligible patients were older patients aged ≥ 65 years who had outpatient prescription between January 2019 and December 2020. Use of the PIMs was identified using Beers criteria 2019. Patients with at least one outpatient prescription of PIMs were defined as PIMs users and patients with no outpatient prescription of PIMs were defined as non-PIMs users. The index month was assigned as the first month that outpatient PIMs was prescribed for the PIMs users, or as the first month of any outpatient drug was first prescribed for non-PIMs users. For analysis of risk factors for PIMs use in outpatient,

patient information at the index month or 6 months prior to the index month between the two groups were examined. After the univariate analysis, multivariate logistic regression analysis was performed and adjusted odds ratios and 95% confidence intervals were estimated.

**Results:** Eligible patients were 159,778 outpatients, with a mean age of 67.9 years and 53% male. The average number of prescribed medications was 4.1 ± 3.3. PIMs users were 24,146 patients and the non-PIMs users were 135,632 patients. The proportion of patients who received at least one outpatient PIM prescription was 15%. This is consistent with a previous study (Tian F et al, JAMA Netw Open. 2023) that found outpatient PIMs use worldwide to be around 14 - 56%. The most commonly used outpatient PIMs in therapeutic category and medication were antispasmodics (31.5%), which included scopolamine butylbromide used as digestive medicine, followed by proton pump inhibitors (12.7%) and metoclopramide (12.2%). One PIMs drug was the most common (90.1%), followed by two drugs (9.4%). Multivariate logistic regression analysis revealed that risk factors significantly associated with increased outpatient PIMs use were age, number of concomitant medications, women, cerebrovascular disease, cancer, dementia, and depression.

**Conclusion:** The prevalence of PIMs use in older outpatients was revealed from health insurance claims data in Japan. Based on the analysis of risk factors for outpatient PIMs drugs in this study, it was suggested that reassess the number of concomitant medications and considering patient's medical conditions may lead to a decrease of outpatient PIMs drugs.

## The use of AI-supported translation to develop comprehensible patient information about medication in other languages

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**Background:** Comprehensible patient information is provided by pharmacies to patients to support optimal use of medicines. However, this information is written in Dutch and with the increasingly multicultural society, there is a need for written multilingual information. Many patients struggle to read written medicines information in Dutch, and this may cause problems in taking medication correctly. If comprehensible patient information is available in other languages, this will improve safer and effective use of medication. The use of AI-supported translation can help healthcare transition.

**Purpose:** The aim is to study the success rate of AI-tools in generating a correct and comprehensible translation of patient information about medication from Dutch to English, and to study which textual elements in medicine information are problematic for AI-tools.

**Method:** First, we selected different Large Language Model (LLM) tools for translation from Dutch to English. We checked the quality of AI-tools by (1) quality of the translation according to native speakers and comparison with translations by a translation agency, (2) capability of the LLMs to replace words or sentences in the context of medicine information.
Second, we translated the comprehensible patient information into English with the best performing LLM. 10 representative leaflets were checked by two native speakers. Words that were not translated optimally were flagged for improvement. The improvements were added to the glossary functionality that allowed words to be replaced with preferred terms by default. Next, the same set was translated again and checked by the native speakers. Subsequently, 30 leaflets and glossary were reviewed by pharmacy staff at Radboud University Medical Centre in Nijmegen. The improvements were added to the glossary.

**Results:** ChatGPT, DeepL, Google Translate and Microsoft Translator were selected as potential LLMs for translation. DeepL scored best by choosing the right words and making the best sentences according to the native speakers. In addition, DeepL contains a glossary function, where certain words can be replaced with improved words by default. A total of 181 words and 621 sentences were flagged for improvement by native speakers. For each leaflet (mean number of words in English=1105), a median of 12 words and 21 sentences per leaflet needed to be translated by native speakers. This applied particularly to Dutch words that have another meaning outside of the medical context. In total 16.000 leaflets are translated in English according to this method.

**Conclusion:** We developed an automated translation of comprehensible patient information supported by the LLM DeepL. Correction of the translated text by native speakers were necessary. The use of AI-tools can save time. This allows caregivers to devote this time to other tasks within the delivery of care.

The process is also performed for the other languages Turkish and Arabic. Multilingual comprehensible patient information is implemented in hospitals and in the patient portals in the Netherlands. More than 75% of patients have access to digital comprehensible patient information, and more languages will be added in the future.

## Automatic substitution of insulins begins in Finland: Do people with diabetes know what biological medicines and automatic substitution of long-acting insulins mean?

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**Introduction:** The increasing use of biological medicines has improved treatment outcomes in many diseases but also increased medicine costs. To enhance price competition and reduce the costs of biological medicines, several European countries have implemented a range of policies, such as price link policies, tendering, reference price systems, and in some countries, also automatic substitution. In Finland, the automatic substitution of biological medicines began in 2024, including long-acting insulins from 2025. Few studies exist on the views of people with diabetes on biosimilars and substitution in pharmacies. The aim of the study was to investigate the knowledge and information needs of people with insulin-treated diabetes regarding biological medicines, biosimilars, and their automatic substitution, the factors associated with this knowledge, and the issues concerning them regarding the automatic substitution of insulins.

**Method:** The data were collected in May 2024 through an electronic survey conducted via University Pharmacy, 10 private pharmacies, and Finnish Diabetes Association's communication channels. Participants were asked whether they had heard of biologics, biosimilars, or the upcoming automatic substitution. One question assessed knowledge of the definition of biosimilars. Additionally, structured questions were used to determine the information needs and concerns of people with diabetes regarding the automatic substitution of insulins. Binary logistic regression was used to examine the association between participant characteristics and knowledge.

**Results:** A total of 459 people with insulin-treated diabetes (T1D n=262, T2D and others n=197) responded to the survey. Of the participants, 67% had heard of biological medicines, 38% of biosimilars, and 45% of the automatic substitution of biological medicines. The definition of biosimilar was correctly identified by 63% of the participants. HbA1c level 64-70 mmol/mol and fewer than 4 comorbidities were statistically significantly associated with inferior knowledge of biosimilars and the automatic substitution compared to HbA1c level below 53 mmol/mol and more than 4 comorbidities. Additionally, use of the current long-acting insulin for less than 1 year compared to over 10 years was associated with poorer knowledge. Of the participants, 55% desired more information about biological medicines and their substitution. The equivalence and differences between biosimilars and original biological medicines were the most common information needs. The participants were most concerned about whether the insulin substituted at the pharmacy was as good as the insulin they had previously used (62%) and the competence of pharmacists (47%) and physicians (46%) in the substitution of insulins at the pharmacy.

**Conclusion:** Less than half of people with insulin-treated diabetes had heard of biosimilars and the automatic substitution of biological medicines. Participants with higher HbA1c levels, fewer comorbidities, and shorter time of use of the current long-acting insulin needed information the most. It is important that pharmacies systematically inform patients using long-acting insulin about the automatic substitution, in particular about the equivalence and differences between the substituted insulin and the previously used product.

## Did COVID-19 trigger a surge in hypertension and high cholesterol? A nationwide study on Scotland's post-pandemic prescribing trends and healthcare system recovery

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**Introduction:** The COVID-19 pandemic caused significant disruptions in healthcare services, with previous studies estimated that the early months of the pandemic led to a substantial decline in new prescriptions for hypercholesterolemia and hypertension. The long-term recovery of healthcare systems in addressing these gaps remains uncertain. We aimed to assess the recovery of the healthcare system in Scotland regarding the initiation of treatments for hypercholesterolemia and hypertension post-COVID-19 pandemic.

**Method:** This retrospective cohort study analysed prescription data from January 2020 to December 2022 in Scotland, as well as In-hours encounters with general practitioners. Incident prescribing patterns for drugs used in the treatment of hypercholesterolemia and hypertension were compared against pre-pandemic averages from 2018-2019. Data were stratified by health regions and socioeconomic status.

**Results:** New treatment initiations for drugs used in the treatment of hypercholesterolemia and hypertension significantly increased from mid-2021 onwards, surpassing pre-pandemic levels. By December 2022, there were approximately 40,000 and 60,000 additional new treatments

for drugs used to treat hypercholesterolemia and hypertension, respectively, compared to the expected numbers based on 2018-2019 averages. The stratified analysis showed a relatively higher increase in less deprived quintiles. GP encounter activities mirrored trends in new antihypertensive and lipid-lowering initiations, with a significant reduction starting in March 2020 due to the first COVID-19 lockdown. Encounter rates gradually recovered from May 2020, reaching near pre-pandemic levels by March 2021. Notably, the encounter rate slopes during the reference period (2018–2019) and post-recovery phase (May 2021–December 2022) showed no significant difference [-0.7 (95% CI: -4.0, 2.5) vs. 0.9 (95% CI: -3.1, 4.9)].

**Conclusions:** The observed increase in new treatments for drugs to treat hypercholesterolemia and hypertension suggests recovery of the healthcare system in Scotland following the COVID-19 pandemic. These higher prescribing rates post-pandemic hypothesise potential long-term sequelae associated with COVID-19. The findings demonstrate the potential for improved pharmacotherapy strategies that address both the backlog of untreated cases and new-onset conditions linked to COVID-19. This underscores the need for ongoing surveillance and flexible healthcare responses to manage emerging health challenges effectively. Additionally, our findings suggest novel research areas that could offer a more comprehensive understanding of the COVID-19 pandemic's influence on the prescribing patterns of these widely used medications.

## Revealing reality: Knowledge, attitudes, and practices regarding performance-enhancing drugs among gym-goers in Lebanon

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**Introduction:** Performance-enhancing drugs (PEDs) use in fitness settings represents a significant public health concern due to associated health risks and ethical implications. Despite increasing prevalence, there remains limited research on knowledge, attitudes, and practices regarding PEDs among gym-goers, particularly in Middle Eastern contexts. This study aimed to assess awareness, perceptions, usage patterns, and possible correlations between demographic factors and PED-related behaviors among gym members.

**Method:** A cross-sectional study was conducted among gym-goers in Lebanon during September 2024. The comprehensive questionnaire assessed demographics, gym experience, knowledge about PEDs and associated health risks, awareness of PED prevalence, attitudes toward users, personal usage patterns, and preferred intervention strategies. Descriptive statistics were calculated for all variables, and correlation analyses using Pearson's correlation coefficient (r) were performed to examine relationships between demographic factors, knowledge levels, and PED usage. Statistical significance was set at $p<0.05$, and data were analyzed using SPSS version 26.

**Results:** A total of 729 gym-goers responded to the questionnaire, of which 55.3% were males with a mean age of 26.2 years. The majority of respondents (64.1%) were aware of PEDs in fitness contexts, with 36.3% reporting having observed frequent PED use in their gyms. Knowledge about health risks varied, with greater awareness of cardiovascular risks (78.3%) and hormonal imbalances (76.5%) than respiratory complications (52.7%). Social media (78.5%) and gym trainers (68.4%) were primary information sources. Regarding usage, 19.5% reported having used PEDs, while 24.4% had considered usage without acting on it.

Correlation analysis revealed significant relationships between demographic factors and PED behaviors. Longer gym experience was positively correlated with PED usage ($r=0.31$, $p<0.01$), while higher education levels showed a negative correlation ($r=-0.24$, $p<0.01$). Males were more likely to report PED use than females ($r=0.28$, $p<0.01$). Interestingly, greater awareness of health risks showed only a weak negative correlation with usage patterns ($r=-0.17$, $p<0.05$), suggesting knowledge alone may be insufficient to discourage use.

Most respondents (51.3%) viewed PED use as a serious issue in fitness communities, with varied attitudes toward users: 13.9% admired users' dedication, 35.4% maintained a neutral stance, 24.8% disapproved, and 9.2% considered users to be cheaters. A majority (49.4%) supported implementing more proactive gym measures against PED use.

**Conclusion:** This study highlights significant gaps in knowledge about PEDs among gym-goers despite widespread awareness of their existence. The findings suggest that demographic factors, particularly gender and education level, significantly influence PED-related behaviors. The weak correlation between health risk awareness and usage patterns indicates that educational interventions alone may be insufficient. Comprehensive approaches combining education, gym policies, and targeted interventions for high-risk groups are recommended. Future research should explore the effectiveness of various intervention strategies and the influence of social media as both an information source and potential driver of PED use.

## Prenatal exposure to maternal asthma and asthma medication and neurodevelopmental outcomes: A population cohort study

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**Background:** Asthma exacerbations during pregnancy can adversely affect maternal and fetal health. While, prenatal exposure to asthma medication has been linked to autism spectrum disorder (ASD) and attention deficit hyperactivity disorder (ADHD), the specific contributions of different medications classes remain unclear, particularly given the need for multiple treatments based on symptom severity.

**Purpose:** To investigate the associations between treated and untreated asthma during pregnancy and neurodevelopmental outcomes in the offspring, including ASD, ADHD and learning difficulties, and to determine whether these associations are specific to one or more class of asthma medication.

**Methods:** A population-based retrospective birth cohort was constructed using linked health and education records of children liveborn in Wales between 2009 and 2016, with up to 13 years follow-up, to mothers registered with a Secure Anonymised Information Linkage (SAIL)-contributing general practice for at least two years before delivery. Generalized estimating equations with a binomial distribution and logit link function were employed to evaluate associations between treated and untreated maternal asthma and special education needs (SEN) in the offspring. Survival analyses were used to investigate associations with ADHD.

**Results:** Among 179,024 children (49.4% female, mean age 5.68 years (SD 1.11)), 11,991 (6.7%) had mothers with treated asthma, 4,927 (2.8%) mothers with untreated asthma, and 5,265 (2.9%) mothers who took asthma medication without a recorded asthma diagnosis. SEN was recorded in 50,955 (28.5%) children. Prenatal exposure to short-acting beta agonists (SABA) was associated with increased risk of SEN (aOR 1.23, 95% CI 1.18-1.28) and ADHD (aHR 1.39, 95% CI 1.23-1.56), with similar risks for inhaled corticosteroids (ICS). Untreated maternal asthma was also associated with SEN (aOR 1.14, 95% CI 1.07-1.23) and ADHD (aHR 1.70, 95% CI 1.42-2.05), suggesting that asthma itself contributes to risk. In contrast, ASD was associated with SABA with or without other asthma medication (aOR 1.20, 95% CI 1.05-1.37) and not with untreated maternal asthma.

**Conclusion:** Prenatal exposure to SABA was associated with a higher risk of ASD. Asthma treatment is required during pregnancy, but treatment choices need to carefully balance potential maternal and offspring risks.

## The silent struggle: Identifying barriers to mental health help-seeking among Lebanese University students

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**Introduction:** Despite the increasing prevalence of mental health issues among university students globally, many do not seek professional help due to various barriers. In Lebanon, where societal stigma towards mental health concerns remains high and resources are limited, understanding these barriers is crucial for developing targeted interventions. This study aimed to identify and analyse the primary barriers to seeking mental health counselling among undergraduate university students in Lebanon and to determine associations between these barriers and demographic factors.

**Methods:** A cross-sectional survey was conducted among undergraduate students across various universities in Lebanon. The survey incorporated validated measures, including the Mental Health Literacy Scale (MHLS) and the Revised Fit Stigma & Value (RFSV) Scale. Participants provided demographic information and responded to questions assessing their reluctance to seek counselling. Pearson correlation coefficients were calculated to assess relationships between continuous variables, while Spearman's rank correlation was used for ordinal data. Chi-square tests were performed to examine associations between categorical variables, and independent t-tests and ANOVA were conducted to compare means between groups.

**Results:** A total of 572 university students filled the survey, with the majority being females (65.0%, n=372) and mean age (± standard deviation) of 21.1 ± 3.7 years. The primary barriers to seeking mental health counselling included social stigma (concerns about friends' negative perceptions, 68.3%), self-stigma (feelings of embarrassment, 72.1%, and concerns

about appearing unstable, 64.7%), and practical barriers (financial costs, 57.9%, and perceived lack of benefit, 45.3%). Significant correlations were found between help-seeking barriers and demographic factors: gender ($\chi^2 = 8.74$, $p < 0.01$), with males reporting higher stigma concerns; university type ($\chi^2 = 6.32$, $p < 0.05$); field of study ($F = 4.18$, $p < 0.01$); and prior exposure to mental health information ($t = 3.56$, $p < 0.001$). Students from lower socio-economic backgrounds reported more significant financial barriers ($r = -0.42$, $p < 0.001$), while those without prior mental health educational experiences demonstrated higher stigma-related barriers ($r = -0.38$, $p < 0.001$).

**Conclusion:** Barriers to seeking mental health counselling among Lebanese undergraduate students are mixed, encompassing social stigma, self-stigma, and practical constraints. Educational interventions targeting stigma reduction, increased mental health literacy, and improved accessibility to affordable counselling services are needed. University-based initiatives should focus on creating supportive environments that normalise help-seeking behaviours while addressing the specific concerns identified in this population.