PGEU Position Paper on Artificial Intelligence

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Executive Summary

PGEU acknowledges the valuable role that Artificial Intelligence (AI) can play as a support tool for community pharmacists to meet patient needs. AI has the potential to contribute to the transformation of the pharmacy sector, among others, by automating administrative and logistic tasks, optimizing supply chains, improving communication with patients or enhancing pharmaceutical care. By offering clinical decision support and increasing medication adherence, supporting preventive health campaigns, and predicting potential medicine shortages, AI can also contribute significantly to improving public health outcomes. However, the use of AI in community pharmacy should always complement, rather than replace, pharmacists' professional expertise and oversight.

To promote a responsible use of AI in community pharmacy and realize its full potential, PGEU advocates for:

1. **Establishing clear regulations and guidelines on AI use in community pharmacy,** while addressing organizational challenges and responsibility concerns about the responsibility of the pharmacist in case of errors or adverse patient outcomes.

2. **Clarifying the role of national authorities** in evaluating and supervising AI systems deployed in community pharmacies.

3. **Ensuring compliance with ethical and professional standards and the General Data Protection Regulation**, particularly safeguarding patient confidentiality, informed consent, accountability of the pharmacy staff and transparency, as well as implementing access control mechanisms, and monitoring for unauthorized access.

4. **Educating patients on AI's role in community pharmacy to build trust and ensure informed consent,** emphasizing that AI serves as a support and assisting tool and never as a replacement of the essential professional experience of the community pharmacist.

5. **Promoting AI solutions and tools that enhance pharmacist-patient relationship without replacing in any way their direct interactions**, in order to assist the pharmacist in providing personalized, high-quality patient-centered care.

6. **Supporting system interoperability** between AI applications and existing pharmacy and healthcare IT software.

7. **Equipping community pharmacists with the necessary skills to work effectively with AI technologies**, by updating pharmacy curricula and establishing continuous professional development programs.

1. Background

As one of the most revolutionary technologies of this century, **Artificial Intelligence (AI)** is transforming entirely our world. AI systems, such as virtual personal assistants and large language models, display intelligent behaviour by analysing their environment and taking action with certain autonomy, thus making our daily lives easier[1]. Thanks to its ability to process large amounts of data, recognise patterns and generate outputs almost immediately, AI is impacting nearly every industry and sector, including healthcare. However, AI has drawbacks and challenges, and its regulation is a priority to ensure that all the benefits are harnessed.

In recent years, community pharmacists have been recognising the potential of AI to upgrade European healthcare systems, considering these technologies as valuable tools to assist healthcare providers. In 2019, PGEU released its **Position Paper on 'Big Data and Artificial Intelligence in Healthcare'**[2], highlighting how community pharmacists can be prepared to navigate the challenges and opportunities presented by digital transformation in healthcare. The paper also outlines key policy recommendations to fully leverage the benefits of Big Data and AI while supporting sustainable and resilient health systems in Europe.

In 2021, PGEU welcomed the European Commission's proposal for an EU Regulation on Artificial Intelligence, the so-called AI Act. Supporting the objective of fostering trustworthy AI development and adoption across the Single Market, PGEU provided its **feedback** on the proposal in July 2021[3]. The AI Act[4] was finally adopted in June 2024 consolidating AI as one of the key policy priorities for EU decision-makers. The AI Act is the first legal framework of its kind, which is designed to mitigate AI-related risks and identifies healthcare as one of the key sectors to be prioritised in the context of AI.

The current context of the health sector is ideal for developing the potential of AI. Factors such as an aging population, the rise of chronic diseases, the increasing demand of outpatient care and the healthcare workforce crisis help explain the growing adoption of AI tools to address these emerging needs[5]. Furthermore, the implementation of AI, which needs access to high-quality health data, is likely to be accelerated by the creation of the European Health Data Space (EHDS). The EHDS Regulation[6] entered into force in March 2025 and will facilitate the secondary use of electronic health data for research and innovation, also in the context of AI.

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[1] European Commission (2018), p.1.
[2] Position Paper on Big Data and Artificial Intelligence in Healthcare.
[3] PGEU Feedback on EC Proposal on AI Regulation.
[4] Regulation (EU) 2024/1689 laying down harmonised rules on artificial intelligence.
[5] Ordre National des Pharmaciens (2024), p. 4.
[6] Regulation (EU) 2025/327 on the European Health Data Space.

2. Opportunities for community pharmacists

Developments in AI are not unknown to community pharmacy. Over the past few years, the pharmacy sector has increasingly embraced the use of AI. In some cases, this innovation has led to solutions that can ultimately complement and enrich the pharmacist's role in dispensing medications, for example, in the form of automated dispensing technology, such as automated pack dispensing robots, as long as it is appropriate according to the pharmacist's healthcare criteria and meets the requirements set by regulations. However, the integration of AI in community pharmacy represents a transformative shift in the sector that goes beyond automation and logistic support. AI has greater potential to enhance pharmaceutical care by streamlining daily operations, improving patient safety or optimising supply and demand chains.

By leveraging the potential of AI as a support tool for certain administrative tasks, community pharmacists will be able to dedicate more time to providing pharmaceutical care, implementing clinical pharmacy, patient consultations, pharmacy services and public health initiatives. AI can support, facilitate and enhance the work of community pharmacists by:

- ### Reducing logistic and administrative burden

The use of AI-supported systems can facilitate the automation of community pharmacists' administrative tasks, such as documentation, charting or inventory management without compromising their oversight of these activities. By automatising certain administrative activities, the logistic and administrative burden of community pharmacists can be reduced without compromising the required safeguards[7]. AI-powered robots can make the dispensing process more accurate and efficient, reducing human errors by making it easier for the pharmacist to hand medications over to the patient. Likewise, AI systems can help in the back office with the management of close to expiring medicines and serialisation of medicinal products[8]. Thereby, the use of AI-systems can enable community pharmacists to allocate more time to direct patient care rather than routine administrative tasks.

- ### Optimising supply chain and shortages predictability

AI can predict medication demand patterns by analysing historical, epidemiological and real-time data, supporting systems aimed at preventing stock shortages, reducing waste, and improving inventory management for better patient service. Additionally, by using AI- powered data analytics and considering previous shortages, machine learning models can predict shortages for different medicinal products, even if the model cannot precisely determine at what level of the supply chain the shortage will appear. This, in sum, can

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[7] PGEU (2024), pp. 11-12.
[8] Ordre National des Pharmaciens (2024), pp. 20-21.

help community pharmacists to inform their ordering and procurement decisions and to be prepared to find alternative medicinal products[9].

• **Facilitating communication with patients**

Community pharmacists can make use of AI-powered communication tools to engage with patients across multiple channels, including mobile apps, AI audio transcription tools or automated messaging systems, facilitating this communication, but without replacing the direct interaction between professional and patient. For instance, community pharmacists can use trained AI-driven chatbots to complement patient care, by resolving simple patient queries that do not require the intervention of the pharmacist (e.g., queries about pharmacy hours, etc.) and redirecting questions about medication or pharmacy services to community pharmacists themselves. In addition, machine learning models can be useful for community pharmacists to prepare and personalise communication to patients rapidly and accurately[10].
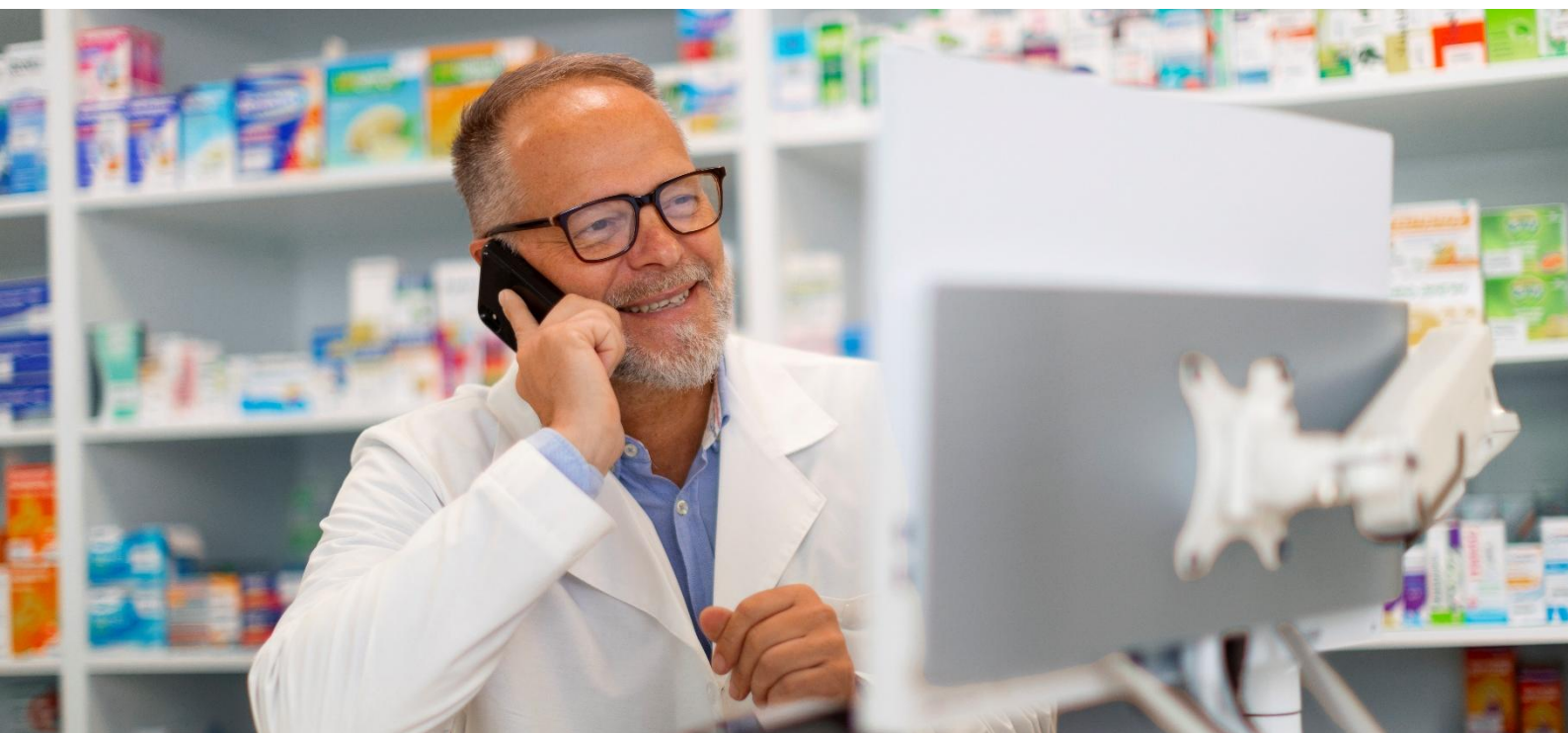
• Enhancing medication therapy management, clinical decision and personalised pharmaceutical care

Due to its ability to analyse large amounts of patient data, AI can support community pharmacists in providing medication therapy management. By incorporating real-time information into existing software, AI tools such as machine learning models can help community pharmacists to provide personalised medication recommendations, to identify patients who require specific attention or even potentially urgent referral to

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[9] Pall R., et al. (2023), p. 409.
[10] Chalasani S. H., et al. (2023), pp. 2-3.

another healthcare professional, to improve risk minimisation measures and management by offering clinical decision support and detecting potential medicine-to-medicine and food-to-medicine interactions, or predicting adverse events, including aspects related to pharmacogenetics and pharmacogenomics, for example, which added to the information collected on the patient's characteristics, can enhance the work of improving patient safety and medication adherence. These tools can also support community pharmacists in keeping track of patients' medication and therapy records, and may even be able to suggest the best medication regimen for a specific patient[11]. Furthermore, AI-based pharmacy practice assisting tools can integrate the latest medicines safety information, increasing pharmacists' interventions' effectiveness and reducing medication-related errors.

Without a doubt, the application of AI to the information processing capabilities available to pharmaceutical professionals can improve the healthcare provided to patients.

3. Challenges and ethical considerations

Despite the potential of AI to improve healthcare and support community pharmacists, certain technical[12], clinical, social and ethical risks of AI in healthcare have been identified[13]. The following key challenges need to be addressed when integrating AI into community pharmacy practice:

• Lack of transparency and patient trust

Patients may be sceptical about the use of AI in healthcare settings such as community pharmacy, in particular when there is a lack of transparency regarding the design, the development or the deployment of AI tools[14], as well as over the data they collect. Pharmacists must educate and reassure patients about AI's role, emphasising that human oversight remains crucial and imperative. AI should always complement and not replace community pharmacists' clinical judgment and interactions with patients. Pharmacists must remain the primary decision-makers when providing pharmaceutical care, only using AI as a supplementary tool to assist.

Moreover, one of the key challenges in adopting AI in community pharmacy practice is managing algorithmic bias. This occurs when AI systems systematically disadvantage certain individuals or groups, often due to biased training data, flawed model design, or inadequate oversight. In healthcare settings, such bias can result in a lack of patient trust and lead to serious consequences, including disparities in treatment and patient outcomes. Community pharmacists must be aware of these risks and engage with strategies such as using diverse and representative data, implementing fairness-aware

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[11] Roosan D., et al. (2024), p. 423.
[12] FIP (2025), p. 24-32.
[13] EPRS (2022), p. 15.
[14] EPRS (2022), p. II.

algorithms, continuously monitoring AI outputs for bias, and ensuring transparency and explainability in AI decision-making[15].

• Data privacy breaches

Concerns about data privacy breaches are common when it comes to AI in healthcare, as health data is considered sensitive information and is usually a target for security intrusions[16]. Therefore, patient privacy protection is crucial not only to safeguard patients' rights but also to ensure there is trust in community pharmacists when using AI tools. AI systems that are expected to be used in community pharmacy practice must be designed with robust encryption and secure data-handling protocols to prevent breaches. Likewise, data collection and processing carried out by AI tools for community pharmacy must comply with data protection provisions laid down in the AI Act and the General Data Protection Regulation (GDPR) to ensure patient confidentiality.

• Lack of AI literacy and training

The lack of training regarding AI technologies is considered one of the major barriers to the integration of AI in community pharmacy. Without proper training, community pharmacists may struggle to incorporate AI into their practice and benefit from its full potential. To address this, structured educational initiatives and professional development opportunities on AI literacy should be introduced to ensure that pharmacists are equipped with the necessary digital skills and adequate training in data analytics, AI-driven decision-making, and digital health tools. In this sense, pharmacy curricula should cover AI-related education at university level. In addition, continuous professional development programmes must be established to upskill pharmacists in the effective use of AI tools, alike other digital skills such as real-world data collection, evidence generation and big data.

• Interoperability Issues

The lack of interoperability can also lead to workflow disruptions and data fragmentation, undermining the benefits of AI adoption. AI tools must seamlessly integrate with existing healthcare infrastructures, including pharmacy management systems, medication records, and national electronic health records (EHRs).

• Algorithm bias

Bias in AI occurs when the algorithms produce systematic and unfair discrimination against certain individuals or groups. This can stem from biased training data, flawed model design, data and concept drift, or improper deployment. In the context of healthcare and pharmaceuticals, the consequences of such biases can be particularly severe, affecting patient outcomes and treatment efficacy.

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[15] FIP (2025), p. 24-32.
[16] Chalasani S. H., et al. (2023), pp. 5.
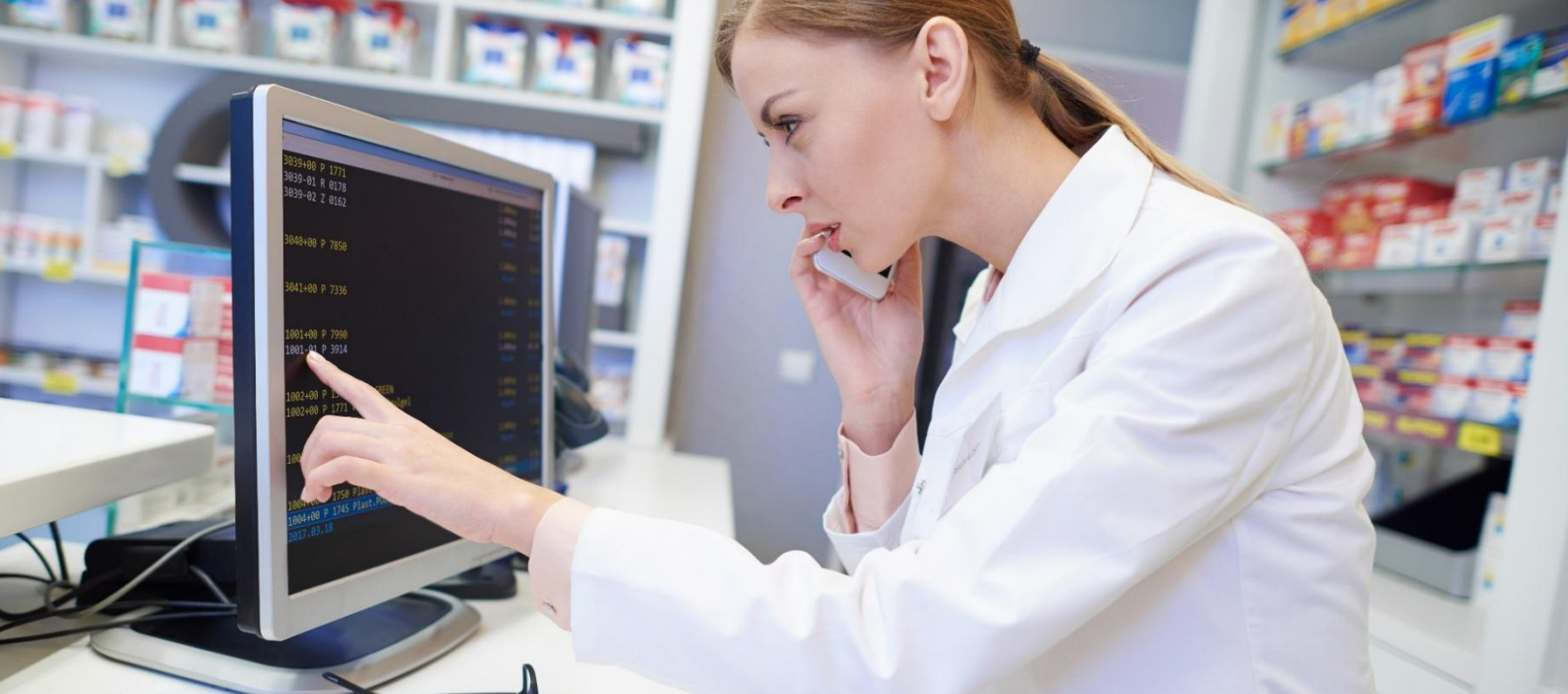
High initial costs

For community pharmacies, adopting AI solutions can be particularly challenging due to the substantial investment required in infrastructure, qualified staff, and technological resources. These factors may limit feasibility in smaller or resource-constrained settings.

Resistance to change

Resistance to change among community pharmacy staff can be a major barrier to adopting AI, as successful integration often requires a cultural shift, openness to new technologies, and adaptation of established workflows. Community pharmacists and their teams must also be supported through cultural shifts, with leadership fostering team buy-in, transparent communication, and the development of new workflows that integrate AI seamlessly into everyday practice.

Technical limitations and model reliability

AI systems in community pharmacy practice are subject to significant technical challenges that can undermine their effectiveness and safety if not properly addressed. One such issue is model drift, which refers to the gradual decline in model accuracy due to changes in data patterns over time. If not properly addressed, this can lead to incorrect predictions and reduced reliability in patient care decisions. To mitigate this risk, community pharmacists must engage in regular model retraining with updated data, implement continuous performance monitoring, maintain version control, and use anomaly detection systems to identify unexpected changes in AI behaviour early. Ensuring these safeguards is essential to maintaining trust and safety in AI-assisted community pharmacy practice[17].

Additionally, AI models may perform well on training data but fail to generalize to real-world cases, compromising decision-making in community pharmacy practice. To address this so-called overfitting, strategies like cross-validation, regularization, early stopping, pruning, and ensemble methods should be used.

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[17] FIP (2025), p. 24-32.

4. Policy recommendations

PGEU recognises the potential of AI as a support tool for community pharmacists. Nevertheless, AI tools applied in community pharmacies shall be always guided by pharmacists' professional advice and oversight, and not used as a replacement, in order to improve workflow efficiency, while offering the highest standard of pharmaceutical care to patients.

To ensure the responsible integration of AI in community pharmacy, **PGEU calls for**:

1. **Establishing clear regulations and guidelines on AI use in community pharmacy**

These guidelines should define the scope of AI applications, outline community pharmacists' responsibilities when using AI tools, and establish mechanisms for evaluating AI performance. Policymakers must also address liability concerns to determine the pharmacist accountability in cases where AI-driven decisions lead to errors, adverse patient outcomes or in case of misuse. Guidance and resources are also needed to assist community pharmacies in managing organisational change, ensuring team adhesion and successful integration of AI solutions.

2. **Clarifying the role of national authorities**

National authorities must play an active role in evaluating, certifying, and supervising AI systems deployed in community pharmacies. Clear responsibilities should be assigned for the approval of AI tools, monitoring their performance over time, and managing complaints or adverse events related to AI use.

3. **Ensuring compliance with ethical and professional standards and the General Data Protection Regulation**

AI systems in community pharmacy must adhere to strict ethical principles and comply with data protection laws, particularly the GDPR. Patient confidentiality and informed consent procedures must be safeguarded. In addition, AI algorithms should operate transparently to prevent biased or discriminatory outcomes.

4. **Educating patients on AI's role in community pharmacy to build trust and ensure informed consent**

Community pharmacists should take an active role in explaining AI-driven recommendations and outcomes to patients, emphasising that AI serves as a support tool rather than a replacement for human and professional expertise. Clear communication is crucial to ensure patients feel comfortable and confident. Community pharmacists also have a critical role in guiding patients toward appropriate and reliable

AI tools. By acting as trusted intermediaries, community pharmacists can help patients make informed choices, avoid misinformation, and use AI safely and effectively.

5. Promoting AI solutions and tools that enhance pharmacist-patient interactions rather than replacing their direct interaction

AI should be leveraged to support community pharmacists in delivering personalid and high-quality patient care. Policymakers should encourage the development of AI solutions that improve accessibility to pharmacists where it may be lacking, thereby strengthening pharmacist-patient relationships.

6. Supporting system interoperability with existing pharmacy software

Policy frameworks should promote standards for interoperability between AI applications and existing pharmacy and healthcare IT systems to ensure a smooth and cohesive patient care and pharmacy practice.

7. Equipping community pharmacists with the necessary skills to work effectively with AI technologies.

Pharmacy curricula should be updated to include AI literacy and digital health competencies. Additionally, continuous professional development programs should be established to provide community pharmacists with practical training in AI tools. Training on interpreting, analyzing, and applying AI-generated data to support informed decision-making should be incorporated.
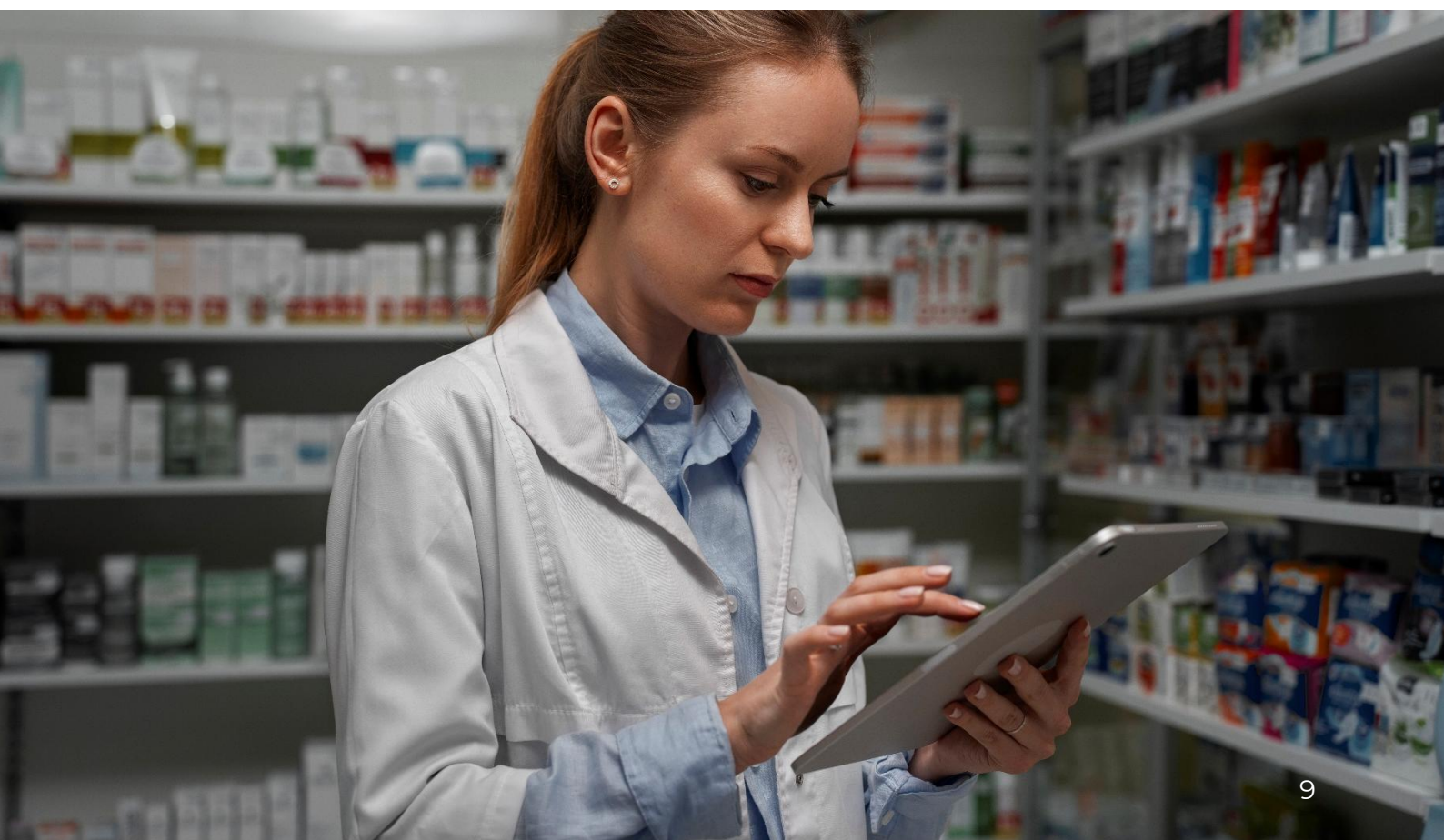
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ANNEX - Use cases at national level

Across Europe, ongoing and foreseen national initiatives with AI in community pharmacy offer practical insights that help illustrate both the potential of AI integration on the ground:

DENMARK

In Denmark, community pharmacists are actively exploring potential areas where AI can support pharmacies in their work. Based on their initial work, they have found it relevant to start by applying AI as a support tool for employees in their interactions with patients. The focus will be on providing alerts and recommendations to employees based on patients' data. The first initiatives are expected to be launched in 2026.

FINLAND

In Finland, the medicine and product information database managed by the Association of Finnish pharmacies uses a language model integrated into the system to translate product information of non-medicinal products. Furthermore, a customer traffic analysis tool powered by AI is currently under development and is meant to use a classification tree model. In some pharmacies, classification tree AI technology is also being already used in medication reviews, but always with pharmacist oversight and verification.

FRANCE

In France, there are several ongoing AI initiatives for different uses that can be of value to community pharmacies, such as:

- o Automated prescription entry (e.g. id. Genius) and prescription safeguarding with real-time anomaly detection (e.g. Phealing);
- o Automated prescription analysis and therapeutic decision support (e.g. Posos AI, which is integrated into Pharmagest's id. software, and can detect interactions, suggest alternatives in the event of shortages, etc.);
- o AI-enabled tools for pharmaceutical interviews (e.g. BPM with Lémur Innovation, id Vocal + from Pharmagest for automatic interview reports);
- o Intelligent assistants and chatbots available to pharmacists and their teams to facilitate information research (e.g. Pharmagest's id Assistant).

LUXEMBOURG

Community pharmacies are currently exploring the potential use and integration of AI-driven chatbots to enhance patient support by addressing their health-related inquiries.

THE NETHERLANDS

In the Netherlands, the following AI initiatives are in place:

o   The Royal Dutch Pharmacists Association (department medicine information centre) is using an AI tool to screen literature. These literature is used to develop clinical decision support advices for risk management of medicine use (clinical decision support)[18].

o   Community pharmacists are using Evidence hunt [19] to find the latest evidence based advices and publications. They send their questions to this website instead of looking for publication on *Pubmed*. See attachment for a publication about the use of evidence hunt by a Dutch Pharmacist.

o   With the Pharmi chatbot[20], patients and community pharmacists are connected: through spoken word, dialogue with this virtual pharmacist can be initiated 24 hours a day. Pharmi is under development and research at the Sint Maartenskliniek (hospital for rheumatism). It aims to virtually address therapy non-compliance, inability to read package inserts, or issues with packaging and dosing. Pharmi is also available in the community pharmacies.

o   Clinical decision support and AI and diabetes patients

In the Netherlands, automated medicines dispensing packages are increasingly used for home situations. Patients find this convenient because of the clear information about intake times. The automated medicines dispensing packages improves adherence to therapy.

Many automated medicines dispensing packaging companies deliver automated medicines dispensing packages to selected patients at home upon request from community pharmacies.

For final inspection AI systems are developed and used. This system recognizes pills using multiple cameras, like: RGB camera, IR camera, text control camera, and hyperspectral camera. All produced images are transmitted to the AI system. The RGB camera takes a colour photo, the IR camera takes a contour photo in black and white, the text camera

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[18] More information: https://asreview.nl/project/simulation-study-risk-analysis-documents/.

[19] More information: https://evidencehunt.com/.

[20] More information: https://pharmi.info/en.

takes a black and white photo and can also check barcodes, the patient's name, and the administration time.

PORTUGAL

The Portuguese National Association of Pharmacies developed a chatbot (RCM Guide) used by a central helpdesk which is available to assist community pharmacists in providing further value to the customer. This generative language model aggregates information from relevant knowledge sources, such as summaries of product characteristics (SMPCs) and databases of medicines and is able to respond quickly, objectively and robustly to questions posed in real-time.

Furthermore, an AI based tool for merging and standardizing information from different healthcare databases is under development.

SPAIN

CisMED (Medicine Supply Information Center) is an information system that allows voluntarily participating pharmacies to report medication supply incidences [21] immediately upon their occurrence. Since its creation, various initiatives have been promoted and implemented, consolidating and strengthening the system. It is characterized, among other things, by being an evolving information system. CisMED applies a series of criteria that employ statistical and machine learning techniques to identify supply issues early and, by analyzing the behavior of medication supply issues, makes predictions, anticipating potential shortages. CisMED processes 350,000 data points daily using an advanced analysis system, generating reports that provide highly useful information for the proper management of medication supply.

The creation of a new website dedicated to CisMED, the optimization of reporting supply shortages and their storage, and the European CisMED (MedSRI) are some of the new features that have been incorporated into CisMED and that constitute "CisMED 2.0."

SWITZERLAND

Generative AI is starting to be used in Switzerland to support both the general public and healthcare professionals, particularly in areas related to medicines:

o A university hospital has developed conflAnce, a multilingual public chatbot available 24/7 without login or data storage. It provides medically validated

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[21] CisMED defines an incidence of supply when the order of a medicines by a pharmacy cannot be met by any of its suppliers.

information on more than 30 chronic diseases. For example, a patient with hypertension can ask about potential side effects of their treatment and receive trustworthy, evidence-based information. The tool is designed to support—but not replace—medical consultation.

o The same hospital center is currently developing Cybermedoc, a conversational chatbot for post-discharge follow-up. It sends daily medication intake reminders to patients. If no response is received, a healthcare professional is automatically notified, enabling early intervention and improving continuity of care.

o For healthcare professionals, a digital health provider has also developed SwissGPT, a generative language model compliant with Swiss and EU data protection standards. Hosted on Swiss servers, it can assist, for instance, a community pharmacist in checking complex medicine interactions and provide precise, evidence-based answers with source references. It is also designed to integrate into existing clinical information systems.

While these tools are not specifically designed for community pharmacies, they are relevant to pharmaceutical practice and highlight the emerging applications of generative AI in the Swiss healthcare system.

Pharmacy curricula should be updated to include AI literacy and digital health competencies. Additionally, continuous professional development programs should be established to provide community pharmacists with practical training in AI tools. Training on interpreting, analysing, and applying AI-generated data to support informed decision-making should be incorporated.
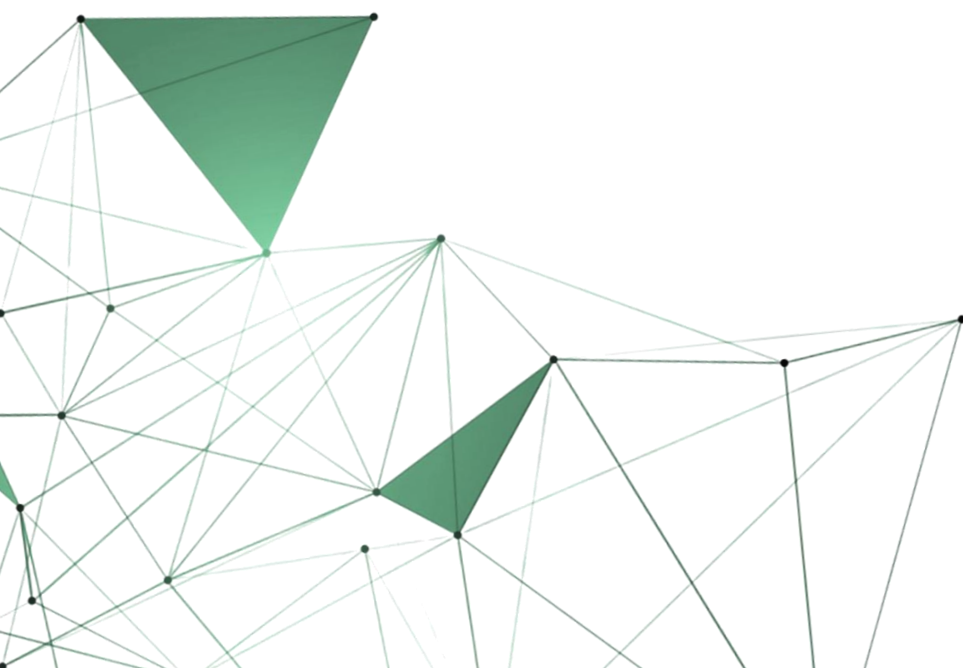
About Us

The Pharmaceutical Group of the European Union (PGEU) is the association representing community pharmacists in 33 European countries. In Europe over 400.000 community pharmacists provide services throughout a network of more than 160.000 pharmacies, to an estimated 46 million European citizens daily.

PGEU
European Community Pharmacists

Rue du Luxembourg 19, 1000 Brussels, Belgium
T: +32 (0)2 238 08 18
Email: pharmacy@pgeu.eu
www.pgeu.eu