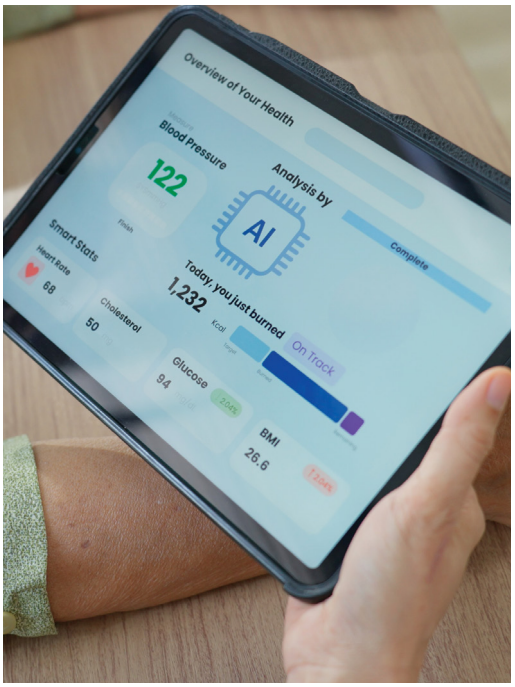
Artificial intelligence–enhanced continuing professional development: Building digital capability in general practice



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Background
Healthcare is on the cusp of major digital transformation through artificial intelligence (AI). This transformation is reshaping general practice, requiring general practitioners to develop new digital competencies. Continuing professional development (CPD) must evolve to support this shift.

Objective
The aim of this article is to outline key aspects of effective CPD and ways in which AI can enhance CPD concerning digital capability in general practice.

Discussion
AI tools exist that are custom built to support adaptive learning, self-assessment and administrative automation, enabling more efficient and reflective CPD. They can personalise content, support diverse learning styles and reduce barriers to engagement. However, ethical implementation is essential to preserve professional autonomy and ensure transparency, data privacy and equity. A pragmatic CPD framework should align AI innovations with digital competency development and practitioner needs, fostering a culture of lifelong learning and adaptability.

WE ARE ENTERING A DIGITAL REVOLUTION

and the age of artificial intelligence (AI). This revolution has major implications for many aspects of healthcare. In general practice, the revolution demands that general practitioners (GPs) engage in ongoing processes to gain and maintain digital competencies. During the past 20 years, we have seen the rapid uptake of such technologies as electronic health records and telehealth platforms.[1,2] The recent boom in AI capability has implications for GPs that supersede those of prior technological advancement. In this context, how are GPs to gain and maintain competencies? The role of continuing professional development (CPD) offers one avenue.

CPD is an established mechanism for maintaining clinical standards and improving patient care. CPD takes many forms and is most valued when it is peer-engaged, flexible, personalised, pragmatic and relevant to practice.[3,4] Constructing such CPD programs is often at odds with feasibility and available resources. Institutions offering CPD now have the added benefit of crafting CPD materials with the help of AI, including CPD for increasing AI capability. Practitioners can also prompt AI tools to assist their learning of specific content by, for example, behaving as a tutor.

In this article, we explore the intersection of CPD and AI in general practice, highlighting ways in which AI can support learners. We explore digital competencies GPs need to thrive in technology-rich healthcare systems. We consider how CPD frameworks can incorporate AI while ensuring ethical and legal rigour as well as clinician autonomy.[5,6] We then propose a model of digital maturity in CPD approaches, using multiple perspectives on AI in CPD, reflecting the diverse ways AI intersects with teaching and learning, administration and digital capability development. We offer theoretical guidance for AI-enhanced CPD, because many of the tools and practices discussed are emerging and not yet widely validated. Existing research, especially in the traditional journals, is catching up to practice.[7] This paper aims to guide future thinking and research by presenting a conceptual framework to support future integration rather than offering a technical guide.

The role and philosophy of CPD in general practice and patterns of engagement

In general practice, CPD serves not only as a regulatory requirement but also as a reflective and developmental process that supports lifelong learning.[3] Although the importance of CPD has been acknowledged for a long time, the philosophy underpinning

CPD has evolved. Early models emphasised compliance and knowledge acquisition, often through passive formats such as lectures and text-heavy courses.[8] More recent frameworks, however, also advocate for learner-centred, work-based and practice-integrated approaches that promote autonomy, relevance, flexibility and transformative learning.[9,10] Interactive learning approaches have emerged, such as simulation-based CPD programs.[11] Tensions logically exist between standardisation and personalisation. GPs vary widely in how they engage with CPD; some pursue it strategically, while others engage incidentally through daily practice or view it as a chore.[12,13]

But GPs value CPD, particularly when it involves peer engagement and external activities such as in-person workshops and conferences.[4] Although there is a risk of AI use further isolating GPs from peers, an equally provoking thought is that this technology will force an evaluation of what value, educational and otherwise, face-to-face activities provide to offset the investment required to attend learning activities in person. Typologies of CPD engagement range from self-directed and autonomous learning to collaborative and transformative approaches.[10] Although these models vary in their emphasis on accountability, professional agency and the potential for practice change, they agree that meaningfulness requires voluntary and self-initiated engagement, promotion of sustained learning that is evaluated and shared, highlighting the important role of intrinsic motivation and contextual factors.[12] This diversity underscores the need for CPD systems to be flexible, inclusive and responsive to different learning approaches and motivations. Preferences for CPD formats are influenced by factors including age, gender and workload, reinforcing that a one-size-fits-all approach is insufficient.[14]

Despite these frameworks, barriers to engagement persist. Time constraints, IT infrastructure issues and competing clinical demands often limit participation, particularly in rural or resource-constrained settings.[15] Online formats have gained popularity for their flexibility, with virtual communities of practice and discussion forums offering new avenues for engagement.[16]

Ethically implemented AI as a catalyst for personalised and effective CPD

AI is increasingly recognised as a transformative force in medical education and CPD. Its potential to personalise learning, enhance engagement and streamline delivery offers new opportunities for GPs to upskill efficiently and meaningfully. AI-powered platforms can adapt content and assessments to individual learning needs, promoting deeper engagement and more effective skill acquisition.[11] It should be noted that although AI can support simulation-based learning for certain practical skills, such as procedural walkthroughs or emergency scenarios, it cannot replace hands-on practice required for competencies such as cardiopulmonary resuscitation or surgical techniques. These require physical engagement and supervised skill acquisition.

AI tools are being used to generate tailored educational videos,[17] provide real-time feedback[18] and support immersive simulation-based training.[5,19] These innovations allow GPs to engage with clinically relevant scenarios at their own pace, reinforcing learning through repetition and contextual application. Importantly, AI can support incidental learners (those who engage with CPD organically through practice) and strategic learners who plan their development around specific goals.[10,12] Figure 1 outlines the proposed framework for AI-enhanced CPD, illustrating how AI supports personalised learning, digital competency development and administrative efficiency. This model anchors the discussion throughout the paper.

Self-assessment tools play a vital part in guiding professional development, helping practitioners reflect on competencies, identify learning needs and track progress. Emerging AI systems may assist in identifying knowledge gaps by analysing clinical documentation or prompting reflective self-assessment. For example, AI could flag underrepresented topics in a GP's learning history or suggest CPD activities on the basis of patient case patterns. However, such applications must be carefully governed to protect data privacy and ensure ethical use. GPs can prompt tools such as Microsoft Copilot, ChatGPT, Google's Gemini and Anthropic's Claude to support learning with a prompt that tells the AI how to behave, what type of support to offer and on which topic. For example, a prompt may be to 'act as my tutor and use Socratic questioning to help me learn about the latest considerations for administering medication X'. AI-enhanced self-assessment platforms use adaptive algorithms to tailor questions, feedback and learning recommendations on the basis of user input and performance, promoting

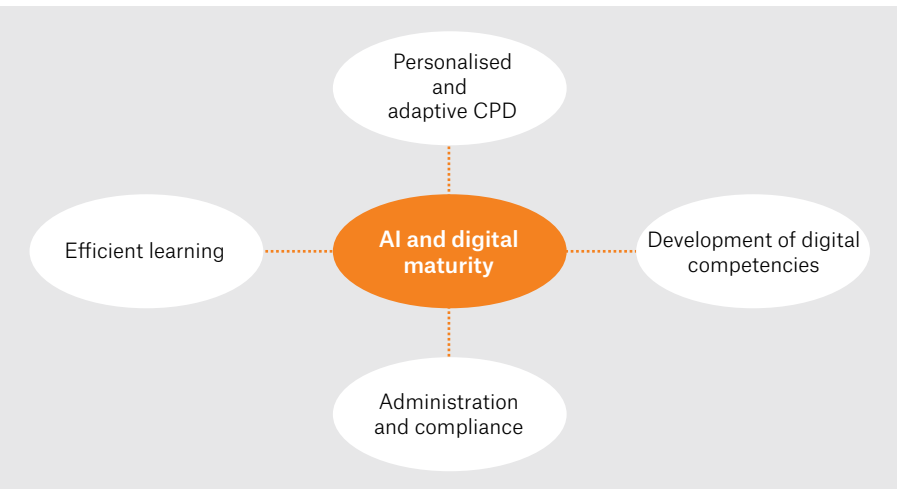

Figure 1. Artificial intelligence (AI) and digital maturity represented as a central component of the continuing professional development (CPD) framework that enables efficient, personalised learning; leads to the development of a suite of digital competencies; and assists with CPD administration and compliance.

metacognitive awareness and supporting independent learning[20–22] that is personalised, dynamic and responsive to individual learning trajectories. These personalised insights help practitioners better understand their strengths and areas for improvement.[23] Adaptive learning systems can curate content on the basis of a GP's interests, clinical profile or knowledge gaps, helping to diversify learning and reduce the burden of navigating fragmented resources.[6,24] While AI-enhanced CPD offers flexibility and personalisation, it must be integrated thoughtfully to avoid diminishing opportunities for peer engagement. In-person workshops and collaborative learning environments remain essential for fostering professional connection, reducing isolation and mitigating burnout (Table 1).

AI must be implemented in ways that preserve professional autonomy. Studies show that when AI functions as a guide, offering recommendations rather than mandates, it is more likely to enhance self-directed learning and empower professionals to make informed choices.[25,26] Conversely, research also shows that AI can lead to deskilling, so optimal learning relies on learners having effective AI skills and intrinsic motivation and curiosity towards learning.[27] Ethical and transparent use of AI is also imperative. For formal CPD, AI systems may need to include sensitive personal and professional data, necessitating robust governance frameworks to ensure confidentiality and trust. Ethical use of AI ensures that it supports, rather than supplants, the reflective and relational dimensions of CPD. The use of AI introduces challenges around data privacy, algorithmic bias, transparency and professional accountability.

For open (public domain) AI tools, such as OpenAI's ChatGPT, ensuring robust data governance and user compliance with healthcare privacy regulations is essential to maintain user trust and protect practitioner autonomy.[28,29] AI tools that are designed to search and synthesise research, such as OpenEvidence, can be used to support clinical decision making, whereby the ethical issues raised concern decision making and accountability when using novel user-generated information from frontier model large language models.[30] Furthermore, generative AI tools may produce inaccurate or misleading outputs ('hallucinations'), posing risks in high-stakes learning contexts.[31] CPD systems must incorporate human oversight and critical engagement to ensure safe and effective use.

Transparency is an important element of effective learning with AI support. Presently, many generative AI tools, such as OpenAI's ChatGPT and Google's Gemini, are not transparent, a consequence of the non-linear and high-dimensional interactions of billions of parameters constituting the 'black box problem' in AI.[32] When CPD incorporates AI for learning, it requires an understanding of the capabilities and limitations of AI tools, and how users maintain accountability by questioning or overriding automated outputs where needed.[28,33] The Royal Australian College of General Practitioners' position statement on AI in general practice[34] provides a foundational framework for ethical and safe AI use. This paper aligns with those principles, particularly in advocating for transparency, professional autonomy and data governance in AI-supported CPD.

Table 1. Appropriate versus inappropriate uses of artificial intelligence in continuing professional development

Use case	Appropriate	Inappropriate
Content curation	Yes	If biased or irrelevant
Self-assessment	Yes	If used without human oversight
Clinical skills training	Only if used with supervised simulation	Cannot replace hands-on, supervised skills acquisition and collaborative learning
Compliance documentation	Yes	If used to fabricate records

AI for CPD administration and compliance

AI can offer practical solutions for managing the administrative demands of CPD by automating the processes of tracking CPD activities, maintaining portfolios and ensuring compliance with regulatory requirements and competency frameworks. With AI tools including repurposed AI scribing software, healthcare analytic and engagement tools such as Health Catalyst's Lumeon, and knowledge management tools such as Obsidian and Notion AI, efficiency is improved through real-time monitoring of CPD progress through personalised reminders, and curating of documentation for audits and portfolio submissions.[35] This improvement in efficiency allows GPs to focus on more meaningful learning. AI systems can match individual learning profiles with required competencies, flag gaps, and support reflective narratives and learning summary development, helping GPs articulate insights and integrate learning into practice.[29] This creates a more dynamic and responsive CPD ecosystem for time-poor clinicians. The use of AI in CPD documentation must be governed by ethical safeguards to prevent misuse, such as fabricating evidence of participation. Verification mechanisms and audit trails should be embedded in AI-supported systems to uphold professional integrity.

Defining digital competencies for the modern GP

As general practice becomes increasingly digitised, the competencies required of GPs are expanding beyond traditional clinical skills to include digital literacy, data governance and effective technology engagement. Recent frameworks identify a broad set of digital competencies for GPs, including basic computer literacy, effective use of electronic health records, digital communication and the ability to critically evaluate and integrate digital tools into practice.[1,2] These competencies also encompass ethical and legal dimensions, such as data privacy, informed consent in digital contexts and the responsible use of AI in patient care.[36,37] These competencies can be conceptualised as 'digital maturity',[38] a multidimensional construct that

describes how GPs demonstrate technical proficiency, integration into workflows and the ability to adapt to new tools (Figure 1). CPD systems must evolve to support this emerging paradigm, and a pragmatic competency framework for the digital-ready GP should reflect these multidimensional professional needs.

Despite growing recognition of these competencies, gaps remain in how CPD pathways support digital upskilling. Surveys across healthcare systems reveal limited access to high-quality digital training, insufficient integration of digital skills into medical education, and a lack of financial and institutional support for ongoing learning,[39,40] potentially highlighting inequitable access to digital capability-building. AI-enhanced CPD must be designed with equity in mind, which does not only pertain to GPs in rural and remote areas with less reliable internet access, but also to already-existing gaps in experience with AI, both of which risk exacerbating the digital divide. Infrastructure investment and offline-compatible tools are essential to ensure inclusive access.

Conclusion

As general practice continues to evolve within a digitally enabled healthcare system, CPD must also transform. AI offers a powerful toolkit to support this shift, enhancing personalisation, streamlining administration and enabling more reflective and strategic engagement with learning. From adaptive content delivery to AI-enhanced self-assessment, these innovations can help GPs build digital competencies required for modern clinical practice.

AI integration into CPD must be guided by thoughtful co-design, ethical oversight and professional governance. Issues of data privacy, bias and transparency are not peripheral, and clear frameworks and inclusive strategies will be essential to ensure that technology supports, rather than supplants, practitioner autonomy and agency.

Ultimately, building digital capability and maturity in general practice goes beyond acquiring technical skills and involves fostering a mindset of adaptability, critical engagement and lifelong learning. By aligning AI innovations with educational theory and practitioner needs, CPD can become a more responsive, equitable and empowering process.

Key points

- AI can enhance CPD by personalising learning, supporting self-assessment and streamlining administrative tasks, making CPD more efficient, engaging and accessible for GPs.
- Ethical implementation is essential to preserve professional autonomy, ensure data privacy and maintain transparency and trust in AI-supported learning environments.
- Digital competencies for GPs now include not just technical skills but also ethical, legal and critical engagement with digital tools, requiring CPD systems to evolve accordingly.
- A pragmatic CPD framework is proposed that aligns AI innovations with practitioner needs, fostering digital maturity and lifelong learning in general practice.

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