

# The Disruptive Impacts of Next Generation Generative Artificial Intelligence

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The growing influence of generative artificial intelligence (GAI) on our personal and professional lives continues to give it the appearance of a truly disruptive innovation. Kivimaa et al<sup>1</sup> noted the characteristics of disruptive innovations to include high-intensity disruption or deletion of entire job markets, resetting of process or business models, and a “technological substitution process.”<sup>1(p111)</sup> Artificial intelligence (AI) applications have already been shown to be quite capable of acting as technological substitutions for human processes. Generative AI, though, moves beyond just the automation facets of AI into something more complex and curious that has captured the public's imagination. The impacts of GAI are continuing to unfold within healthcare delivery and education, with both value and cautions yet to be fully realized. Active engagement on the part of all nurses, particularly nurse informaticists, is required in order to shape the technology moving forward and to alleviate potential negative impacts and misuse.

## LARGE LANGUAGE MODELS AND GENERATIVE ARTIFICIAL INTELLIGENCE

Artificial intelligence had previously been operating more in the backgrounds of our work and home lives, serving up streaming video recommendations or as a research blurb in a tech blog. The computing and star power of Chat Generative Pre-Training Transformer (ChatGPT), thanks in part to generous public relations and financial support from Microsoft (Microsoft Inc., Redmond, WA, USA),<sup>2</sup> has changed the role of and conversation related to AI. The public access to ChatGPT and the integration of its subsequent generations into the Bing search engine have helped demonstrate both its potential promise and risks. Reports of integration options and expansion of use cases are now a daily occurrence and are showing up on strategic plans and technical team backlogs globally.

Generative AI, like ChatGPT and Google's Bard, are applications of large language models (LLMs). Large language models are deep learning algorithms that are trained to perform using massive amounts of data (think trillions of data points). Generative AI applications ultimately operate by predicting the next word in a string, note in a song, or pixel in an image. Output is heavily driven by user prompts and of course the data the LLM was trained on. Generative AI outputs

include images, software code, conversational text, audio, presentations, lists, video, and more and are limited only by the imagination of users and programmers. The impressively human responses, rapidity of updates, and ease of use have further helped to capture the imagination of the public, researchers, and the technical community. Generative AIs also appear to be getting close to or have passed the Turing test, a test of a machine or application to intelligently respond in a way that is indistinguishable from those of a human.<sup>3</sup>

It can be easy to anthropomorphize these applications and mistakenly see their outputs as thinking or relevance-making when they are actually just high-quality prediction algorithms. Their abilities are also only as good as the quality and quantity of the data they were fed, their training protocols, and of course user prompts, which can include multiple sequences of questions and responses. In practical terms, the incredible curiosity and explosive growth in variety and integrations of GAI already speak to its power to captive our imagination and sometimes fool our senses. Despite how human-like, dazzling, accurate, or mystical their responses may seem, GAIs do not think and in fact are easily misled and can suffer from “hallucinations,”<sup>4</sup> which are outputs that reflect misinterpretations and falsehoods. These “hallucinations” present the greatest risks for healthcare and for the public.

## GENERATIVE ARTIFICIAL INTELLIGENCE IN HEALTHCARE

Hallucinatory outputs present an unacceptable quality and safety risk for many clinical contexts at this point in time. Clinicians, technologists, and nurse informaticists in healthcare are rightfully skeptical and risk-averse, but there is not a lack of curiosity and exploration efforts for applied use cases for both practice and education. For example, Seney et al<sup>5</sup> explored GAI as a means of teaching enhanced clinical judgment in nursing students, and Patel and Lam<sup>6</sup> theorized its potential ability to create discharge summaries. A comprehensive scoping review<sup>7</sup> found extensive application opportunities in nursing practice with several caveats about the lack of evidence and compounding risk factors.

Early versions of ChatGPT raised alarms for healthcare in particular given a lack of explainability or the ability to understand how an output or mistake was made, privacy and

intellectual property issues, a lack of contemporary data sources, a lack of source attribution, and the authoritative tone of responses despite warnings and recommendations to talk to a care provider.<sup>8–10</sup> Unfortunately, along with these concerns and the potential hallucinations noted earlier, there are also the ongoing realities of bias in healthcare data and applications. Even before the rise of more sophisticated GAI, patterns of bias were being identified in healthcare AI. As a result, algorithms and efforts were being explored to better detect and mitigate the negative impacts of bias embedded in technology.<sup>11,12</sup>

The healthcare industry will most likely only adopt generative AI and LLMs on the patient care side with great caution and testing while perhaps being more eager to invite it into the administrative side. Care providers in almost every practice setting desperately need the kind of solution that appears poised to help tame portal messages and inboxes and to finally reduce burnout inducing documentation burden.<sup>13</sup> Administrators see opportunities to leverage AI and GAI for improving workflows and greater productivity and efficiencies with activities such as documentation and care notes as examples.<sup>14</sup> Despite ChatGPT's ability to pass all three examinations on the US Medical Licensing Exam Accuracy and perhaps ironically the legal Bar Examination,<sup>15</sup> there is little appetite yet to replace nurses and doctors with GAI chatbots and robotic assistants (yet). The ethical implications of bringing more technology, particularly GAI, into healthcare settings are equally critical for nursing practice, particularly given the professional responsibilities of vigilance and advocacy. Furthermore, nurses are often the humanizing factor with their clinical judgment, touch, and presence as they interact with patients in a sea of technology.<sup>16,17</sup>

## GENERATIVE ARTIFICIAL INTELLIGENCE IN SCHOLARLY AND ACADEMIC CIRCLES

The vitriol and hand-wringing toward GAI in academia are palpable. Even the technology vendors serving academia are already adjusting to the new realities that GAI is bringing. For example, the widely used plagiarism detection software, TurnItIn, has already deployed an AI writing detection solution. Several Web-based AI-generated content detectors sprung up almost immediately after the release of ChatGPT including GPTZero, which even specifically notes, "...these results should not be used to punish students. While we build more robust models for GPTZero, we recommend that educators take these results as one of many pieces in a holistic assessment of student work." The trust tug-of-war between students and faculty may unfortunately now tip towards more of an academic surveillance culture resulting in an unpleasant and uncivil relationship.<sup>18</sup> Even scholarly journals are rapidly adjusting publication policies, with even the *Journal of the American Medical Association*<sup>19</sup> clearly noting that AI does not qualify for authorship and

that authors must be responsible for the integrity of any content created with applications such as GAI. Whole Reddit forums and Facebook groups have been devoted to decrying the end of any creative academic or scholarly work along with to text-based discussion forums, online testing, and student paper writing. Some faculty have even reverted to written quizzes and tests or have adopted video-based discussion forums to reduce the risk of AI serving as an academic shortcut.

Fear of negative impacts of GAI on nursing education and academia in general has also been met with optimism and creative ideas for how to leverage the various formulations of LLMs. The ability to draft an idea or to have an exploratory digital conversation about esoteric topics can be a great catalyst for scholarly works and ideas for teaching that could be used by faculty and students alike. Generative AI is already proving to be a powerful homework helper that can give students a second or third option for understanding how to solve complex problems.<sup>20</sup> The utilization options for simulation, virtual or in-person, where conversational applications could promote learning and creative experiences for promoting clinical judgment seem limitless. Future uses to teach about and with technology will only be tempered by the curiosity of academic technology vendors and faculty. Many of the same privacy, accuracy, and acceptance concerns identified in healthcare settings will continue to be explored and resolved within academia, where many faculty are unfortunately still reeling from the rapid and emergent integration to remote learning during the COVID-19 pandemic.<sup>21</sup>

## CONCLUSION

Technological innovation and disruption in healthcare settings and in healthcare academic circles must be met with creative and proactive approaches to GAI. A nursing consensus group<sup>22</sup> outlining nursing's professional roles and responsibilities for AI called for better understanding of nursing data as related to AI, meaningful and early involvement in development and deployment, and the recognition of the profession's ability to do global-scale good using these applications. Leveraging these fast-evolving LLM applications such as GAI requires all nurses to be paradoxically cautious and creative. We will need to continue the expansion of our leadership footprint and to maximize the positive benefits this disruptive innovation can have in education and practice.

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