

EDITORIAL

The impact of artificial intelligence in revolutionizing all aspects of urological care: a glimpse in the future

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There has been a technological revolution in the field of urology over the last 2 decades. A part of this advancement is the advent of artificial intelligence (AI), which is growing exponentially and has the potential to perform complex tasks, analyse data by emulating human cognitive function and revolutionise patient care [1, 2].

AI has a myriad of applications and is leading to a paradigm shift in healthcare industry. Its primary aim in healthcare is to understand and analyse the association between prevention and/or treatment, and related clinical outcomes [3, 4]. The 4 subsets of AI in healthcare are machine learning, natural language processing, deep learning and artificial neural networks, and computer vision. AI methodologies seem to be more precise in prediction and for studying big data than traditional statistics and is therefore widely used in urology. It has led to evidence-based and personalised treatment by having patient data available to urologists.

The role of AI expands to various benign and malignant conditions such as urolithiasis, benign pros-

tate enlargement (BPH), paediatric urology, renal transplant, urogynaecology, robotic surgery, and uro-oncology pertaining to prostate, kidney, bladder and prostate [5–8]. Our editorial reviews the broad role of AI in urology for diagnosis and risk assessment, treatment planning and precision medicine, robotic surgery and AI-assisted procedures, improved patient care and outcomes, challenges and ethical considerations, and its future role within urology [9, 10, 11].

Diagnosis and risk assessment

Early diagnosis and risk assessment with AI-driven algorithms seem to be able to analyse medical imaging of data from USS, CT or MRI with speed and accuracy. This can be seen in prostate cancer detection which can detect subtle imaging abnormalities which can potentially be missed by radiologists. Similarly, by analysing electronic health records and patient data, AI related algorithms can notice patterns which may not be readily recognised by urologists,

and help in correlation with personalised and proactive treatment, improving outcomes [12].

Treatment planning and precision medicine

After the initial diagnosis, AI can help with implementation of precision medicine by tailored and individualised treatment [13]. This can be done by analysing urological history, any genetic information and previous treatments. Herein, AI algorithms can potentially come with best urological plan. For example, in bladder cancer it can help with selection of surgery vs chemotherapy or immunotherapy taking into account drug interactions and potential side effects. This approach can maximise treatment efficacy, reduce complications, and ultimately lead to better outcomes and patient experience.

Robotic surgery and artificial intelligence-assisted procedures

While robotic surgery has been used in urology for over 2 decades, AI has been instrumental in enabling the safety and precision with robotic surgeries. AI allows for image processing and real time feedback which in turn allows for increased accuracy with complex procedures and also translating to better patient outcomes. In addition, it can help with tele training, tele mentoring and tele surgery helping with remote guidance to less experienced trainees and urologists. It therefore allows for distant learning and knowledge sharing with mentoring of urologists.

Improved patient care and outcomes

AI has the ability to transform patient care with the chatbots and virtual assistants that can provide evidence-based information, answer queries and offer advice on urological conditions. This enhances patient participation and involves them in the decision-making process thereby also minimising burden on healthcare providers.

This ability of AI can really help with chronic conditions such as BPH, urinary incontinence and kidney

stone disease [14]. This aspect of AI can be helped with wearable devices and can allow for early intervention and individualised treatment. This might even have improved outcomes for such patients [15, 16].

Challenges and ethical considerations and future of artificial intelligence

As AI gets integrated into mainstream urology, care must be taken to address the ethical and legal challenges [17]. Data security and privacy along with AI algorithms adhering to strict guidelines and regulations are a must for responsible AI and in protecting patient confidentiality [18]. Similarly, steps must be taken to avoid AI hallucinations and data bias and ensuring that the technological innovations are available to all irrespective of their socio-economic status. The cost of data storing and processing, legal aspects, decision making in difficult scenarios, risk management, potential job losses especially for the newer generation of medical students are other challenges which can affect its future potential and usage. But its use as an alternate to the google search engine can also be a good alternate source of information for patients and clinicians alike.

The future of urology and AI are inter-linked and with continued evolution, we will see more potential avenues of its use and clinical applications and perhaps it is time for guidelines to also adopt this [19].

CONCLUSIONS

AI has already transformed the journey of urological patients and healthcare providers and is shaping the present and future of urological landscape. Urology needs to embrace AI for to harness its capability and improve patient care, yet care must be taken to ensure that the ethical, legal and social challenges are addressed for a better patient experience and improved quality of life.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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