EDITORIAL

Artificial Intelligence Applications in Obstetrics and Gynaecology

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The idea of artificial intelligence (AI) initially stemmed from philosophical ideas based on 'thinking machines that mimic human intelligence.' The term was first coined in 1956, and Warren McCulloch, a neurophysiologist and cybernetician, is credited as the founder of AI. He was the first to propose artificial neural networks in 1944, which is a model based on the structure and function of the human brain.

Essentially AI emulates human intelligence via computer programs, i.e. machine learning creates algorithms that analyzes information to identify patterns and make predictions. This technology is used in AI applications such as image and speech recognition (e.g. meeting recordings) and natural language processing which is the ability to process natural human created text, e.g. virtual call agents and chatbots, e.g., such as Amazon Alexa, Google Assistant, and WeChat. Deep learning is a subset of machine learning and utilises the neural networks to process complex data and tasks, i.e., equips machines to make intelligent decisions by learning and modelling relationships between data.

AI is currently used in all major industries such as healthcare, finance, manufacturing, entertainment, education etc. In the healthcare sector, AI is revolutionizing care via applications in diagnostics, imaging, drug innovation, personalized treatment, and medical education.

AI IN MEDICAL EDUCATION (AIMED)

AI technologies have been gradually adopted in medical education. Its integration into medical curricula must be balanced by the best available scholarly evidence. Most studies highlight the inevitable diagnostic and predictive impact of AI on healthcare decision making process and thus the need for medical education to adapt and integrate AI teaching platforms. Some medical schools have currently integrated teaching skills to medical students (our future doctors) on how to manage and interpret AI, promote academic interest, as well as communicate ethical and legal implications of their use. Examples of AIMED include computer aided diagnosis, intelligent tutoring systems, checkbots and virtual 3D anatomy learning. Currently the majority of AI applications are based in training labs and have demonstrated improved practical and theoretical knowledge amongst medical students.

AI IN OBSTETRICS & GYNAECOLOGY PRACTICE

Ultrasound heavily depends on the skill and experience of the operator of the device, and AI has the potential to support sonographers. AI in obstetric ultrasound still faces significant obstacles as it must overcome challenges such as the mobility of the foetus, the complexity of developing fetal anatomy, maternal body habitus and the need for obtaining accurate foetal anatomy planes. A recent systematic review and meta-analysis concluded that preliminary experience shows good accuracy of AI in determining gestational age, holding potential benefits for resource poor settings with limited access to trained ultrasonographers.[1]

AI algorithms combined with 3D/4D ultrasound images can enhance image quality and resolution, allowing clearer and more accurate visualisation of foetal facial features.[2] Future expectations are that AI will play an important role in assisting with the foetal anomaly scan, identifying normal anatomy as well as congenital conditions, including congenital heart disease.[3-4]

There is also evidence suggesting AI might significantly improve the sensitivity and specificity of electronic foetal monitoring, and when combining the necessary maternal and foetal information into these algorithms, can result in improved intrapartum care.

In reproductive medicine AI can assist with improved understanding of factors influencing oocyte quality, improved sperm selection, embryo selection and pregnancy outcomes.[5-6]

AI and machine learning have great potential in gynaecological cancer screening, risk stratification, accurate diagnosis, and treatment planning.[7-8]

The prevalence of pelvic floor disorders is expected to rise in view of increased life expectancy. Practical urogynaecological AI applications include improved drug selection, predicting drug-target or drug-drug interactions and optimizing treatment protocols in patients with urinary incontinence. Integration of AI in the robotic platform in surgical procedures such as robot assisted sacrocolpopexy could track correct mesh placement and highlight important structures such as the ureters to avoid surgical complications.

AI tools in physiotherapy can deliver personalised and adaptive options in pelvic floor interventions, facilitate remote monitoring and feedback via virtual programs. As regards urodynamics, AI applications are currently evolving and is focusing on improving urodynamic interpretation and diagnostic paradigms of voiding dysfunction.

ETHICAL CONSIDERATIONS

Although AI is still in its infancy and not yet widely implemented in clinical practice, it will soon find wide clinical application as clinical research results become available. The data sets that will be used in machine learning will mostly originate from high-income countries or from specific racial, ethnic, or other population groups, creating certain biases that might make its use in diverse populations or low- and middle-income settings challenging. AI tools may be developed for high-resource settings that are not validated in low- and middle-income countries.

AI generated clinical decisions that might result in harmful or sub-optimal outcomes raise the issue of accountability and liability. The responsible party must be clearly identifiable when for example AI assisted continuous electronic foetal monitoring fails to identify a hypoxic foetus or a foetus at risk for cerebral palsy. Decisions made on the foetal condition might result in AI clinical decisions

that can potentially result in undesired maternal morbidity.

Clinicians are currently relying increasingly on technology such as MRI or CT scans and less on clinical judgement. If AI is added to the mix, clinical judgement may well be eroded further, and even result in less interaction between patients and healthcare providers.

The ethical issues referred to above are just a few of many other potential ethical challenges that will complicate incorporation of AI into clinical practice

CONCLUDING THOUGHTS

The human brain remains the inspiration behind neural network architecture and thus AI. Computing power will progress at a phenomenal pace and will inevitably impact healthcare. While we embrace AI, we must not forget the importance of human touch and empathy, the provision of empathy and the impact of direct communication.

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