Editorial

Artificial Intelligence. How Artificial is Urology Practice Becoming?

Inteligencia artificial. ¿Qué tan artificial se está volviendo la práctica urológica?

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The evolution of medical practice has changed from the most basic tool of patient interrogation to current technologies of artificial intelligence and machine-learning driven practice.[1] Traditionally at the forefront of technology, once again urology has an opportunity to embrace and lead in these rapid changes in medical practice.

Since the introduction of natural orifice surgery due to optical technologies and instrument size reductions later enabled the growth of intracorporeal surgery. Subsequently, implementation of minimally invasive surgery has always been led by urologists worldwide, mentoring to other specialties. The most recent breakthrough technology has been laparoscopic robot-assisted surgery which is currently being utilized by urologists in their daily practice. Urologists have long realized the benefits of technological implementation to improve our medical practice. Today, the explosion in artificial intelligence is likely to transform our present relationship between knowledge, data, and clinical care.

Artificial intelligence (AI) as it relates to medicine can be broadly defined as any device, computer, or machine that perceives its environment or the data provided and takes or recommends action that maximizes the chance of reaching a successful outcome or clinical goal. Presently much of AI in medicine has been focused on exploiting medical images, either radiological (eg., x-rays, ultrasounds, nuclear studies) or photographic (eg., anatomical or histopathologic images).

One urological condition with persisting uncertainty and great subjectivity in its description is hypospadias. In 2020, there is still no objective means to phenotype hypospadias accurately and reproducibly. Most attempts at hypospadias classification systems have relied on numerically grading discrete anatomical features but inter-user agreement remains variable and classification preoperatively does not meaningfully predict surgical outcomes.[2] Indeed, outcome descriptions themselves often remain a matter of opinion. With no systematic description mechanism, the current practice remains gross labels of distal vs proximal hypospadias states, let alone the inability to accurately or meaningfully correlate future biological, cellular, or genetic data with hypospadias status.

Our emerging experience with AI has been focused on developing machine and deep learning algorithms to accurately phenotype (ie., describe) an individual patient's hypospadias. A deep learning AI algorithm trained to recognize multicultural normal circumcisions' images (as a normal circumcised state is the surgical goal of hypospadias surgery) that objectively rates hypospadias images pre and postoperatively against these unbiased circumcision standards would be a major advance in hypospadias clinical management. Rapid increases in computational capability may even allow use of more complex algorithms that are trained with multiple clinical variables in addition to anatomical images to predict outcomes. For example, the use of novel imaging technologies such as ultra-high frequency ultrasonography, thermal imaging and histology slides may be able to predict tissue quality and healing behaviour.[3] Furthermore, data such as genes involved in wound healing and hypospadias pathophysiology may also be included as analyzable AI training variables to improve surgical outcome predictions and even provide long range function predictions in the care of hypospadias.

Medical practice will clearly change and refusing to adapt is futile. There may be specialties that may disappear or radically change altogether, and new ones will arise. Current patient-physician interactions will also change but in a way that provides for greater personal reflection as the objective heavy data lifting will be provided by AI assisted technology.

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Conflict of Interests

The authors have no conflict of interests to declare.

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