Artificial intelligence: The magic 8 ball for vascular surgery

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Vascular surgeons have long searched for their own magic 8 ball to predict clinical outcomes. We have built large databases, like the Vascular Quality Initiaitive and the Vascular Study Group of New England database, to find associative metrics for specific vascular pathology. We even design large prospective studies, like the Best Endovascular vs Best Surgical Therapy in Patients with CLTI study (BEST-CLI), to identify causative variables for an interventional outcome. But now we have artificial intelligence (AI), or a computer brain that is tireless and can compute infinite permutations to find connections between seemingly unrelated variables in big data and may be the key to developing predictive models. As case in point, in this paper, Sawchuk et al[1] used recurrent neural networks to predict stenosis or occlusion of bypass grafts based on surveillance ultrasound examinations. As a proof-of-concept paper, this work has broad implications in minimizing human resources to predict bypass failure and may allow us to predict limb salvage outcomes before surveillance ultrasound examinations demonstrate any hemodynamic abnormalities. How is this for a limb bypass magic 8 ball?

AI aims to develop machine learning systems that demonstrate properties of human intelligence.[2] In the last several years, AI has increased in popularity, even though, interestingly, the concept of AI is not new and has been around since the 1950s. It has been used in banking, industry, and entertainment, but it has only been in the last several years that applications of AI are being explored in clinical medicine. Vascular surgery has gingerly embraced the potential of AI; it seems the perfect technological conduit to marry clinical data with imaging data. Hesitation with bias (especially the black box phenomenon), lack of consensus on regulatory guidelines, and fears about patient privacy are all being explored and investigated as applications of AI are being developed by industry and academic institutions.[3-5]

Despite these worries, AI has brought better understanding and new insights in vascular disease with the development of new techniques such as computer vision enabling advanced imaging analysis and natural language processing.[6] Examples of how AI models have already enhanced understanding of vascular diseases include physician designed computations neural networks that can identify aortic aneurysms without human supervision and machine learning algorithms that can predict ischemia events after carotid interventions.[7,8] Both AI-based and machine learning-based tools have the potential to provide improved prognostic evaluation, guidance of therapeutic decision-making, and contribution to enhanced precision medicine for our vascular surgery patients.[9]

With our current technological advancements and awesome computing power, it's very believable that we can have a magic 8 ball for each vascular disease process. Rigorous testing and validation of these AI models with big data are the critical next steps to ensure the accuracy of these predictive models. Concepts in AI sound techy, but Sawchuk et al[1] proved that an applicable patient facing form of AI is feasible and attainable. Let's harness the power of AI and build the vascular magic 8 ball together.

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DISCLOSURES

None.

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