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In this issue of *Angiology*, Guo et al¹ summarize studies exploring Artificial Intelligence (AI) and machine learning (ML) models to evaluate the risk of abdominal aortic aneurysm (AAA) growth and rupture. Such models would be particularly useful as they would be able to distinguish patients with fast-growing versus slower-growing AAAs, thus targeting elective AAA repair according to each individual's AAA rupture risk.

It has now become clear that the maximum AAA diameter is not the sole criterion determining AAA rupture risk. This is why some AAAs rupture below the recommended threshold for repair, while others grow to for example, >8.0 cm without rupturing.² It was argued that the established thresholds for intervention (5.5 cm for men and 5.0 cm for women) may not accurately reflect rupture risk.³ It was supported that the UK Small Aneurysm Trial (UKSAT)⁴ and the Aneurysm Detection and Management (ADAM)⁵ study, which are often cited as the origin of the 5.5 cm threshold, never actually demonstrated a benefit for repairing AAAs at 5.5 cm.³ Rather, these landmark trials were designed to test whether repairing AAAs <5.5 cm offered a mortality benefit over surveillance.^{4,5}

A recent study created a Markov chain analysis for patients who present with an AAA and enter surveillance.³ It was demonstrated that the optimal size threshold to minimize AAA-related mortality for a 60-year old average-health woman presenting with a 5.0 cm AAA was 6.1 cm. Similarly, it was demonstrated that the optimal size threshold to minimize AAA-related mortality for a 60-year-old average-health man presenting with a 5.5-cm AAA was 6.9 cm.³ These thresholds increased even more if the male or female patients were in poor health and reached above 8.5 cm in 70- and 80-year old men in poor health.³

Although these results are interesting, they are markedly different from an earlier study using real world data and comparing outcomes between England and the U.S.A.⁶ This study examined differences between England and the United States in the frequency of AAA repair, the mean AAA diameter at the time of the procedure and rates of AAA rupture and AAA-related death during the period from 2005 through 2012.⁶ A total of 29 300 patients in England and 278 921 patients in the U.S. underwent repair of intact AAAs. The mean AAA

diameter at the time of repair was larger in England compared with the United States (63.7 vs 58.3 mm, respectively; $P < .001$).⁶ At the same time AAA-related death was more common in England than the U.S. (odds ratio [OR]: 3.60; 95% confidence interval [CI]: 3.55-3.64; $P < .001$) and hospitalization due to an AAA rupture occurred more frequently in England than in the United States (OR: 2.23; 95% CI: 2.19-2.27; $P < .001$).⁶ These real-world results suggest that intervening earlier and at a smaller AAA diameter is associated with lower perioperative mortality rates and argue against delaying an intervention.

A large ($n = 61\,598$ patients) cohort study including all patients ≥ 67 years undergoing elective open AAA repair ($n = 32\,056$) or endovascular AAA repair (EVAR; $n = 29\,542$) similarly demonstrated that the perioperative mortality increased from 0.4% to 0.8%, 1.3%, 1.6%, and 2.7% for patients undergoing EVAR at ages 67 to 69, 70 to 74, 75 to 79, 80 to 84, and ≥ 85 years, respectively.⁷ Based on these results, a delay in the performance of EVAR may be associated with as much as a 7-fold higher periprocedural mortality rate.⁷

A disadvantage of EVAR is the increased late mortality compared with open AAA repair. A study using the Medicare-matched Vascular Quality Initiative Vascular Implant Surveillance and Interventional Outcomes Network database demonstrated that although open AAA repair was associated with significantly higher odds of 30-day mortality (OR: 3.56; 95% CI: 2.41-5.26, $P < .001$), it was associated with lower

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6-year mortality compared with EVAR (35.6% vs 41.2%, respectively; hazard ratio: 0.83; 95% CI: 0.74-0.94; $P=.002$).⁸ Although open AAA repair was associated with an increased in mortality at 1 year compared with EVAR (9.0% vs 8.2%, respectively; $P=.02$), this difference was reversed from 1 to 2 years (4.1% vs 7.5%, respectively; $P<.001$) and 2 to 6 years (17.8% vs 24.5%, respectively; $P<.001$).⁸ These results emphasize the importance of careful patient selection and long-term follow-up surveillance for patients who undergo EVAR.⁸

The use of AI and ML models for risk prediction of AAA growth and rupture is still in its infancy. However, there is already evidence that Chat Generative Pre-trained Transformer (ChatGPT) provides accurate responses to a variety of patient-level questions which were well-aligned with the current Society for Vascular Surgery clinical practice guidelines for AAA care.⁹ Future improvements in technology and AI/ML models are expected to provide even better patient care and guidance regarding the management of individuals with AAAs.

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Declaration of Conflicting Interests

The authors declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Marc L. Schermerhorn is the PI for Roadster 3 (Boston Scientific), ADVANCE (Medtronic), and SHAPE (Shape Memory Medical), but gets no financial support from these projects. Mahmoud Malas is a Consultant for Bard and Cordis. Kosmas I. Paraskevas has no conflicts of interest.

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