If any sector has caught the artificial intelligence (AI) bug, it is surely healthcare. The application of machine learning, computer vision and automation can be found everywhere from clinical labs and hospitals to smartphones and wearables: discovering drugs, diagnosing diseases and predicting outcomes, from opioid abuse and depression to bedsores, kidney failure and even ovulation cycles. Accenture, a consultancy, reckons clinical health AI applications could create US$150bn in savings in the US economy alone by 2026.

Yet AI’s penetration into health and life sciences is not without risk. Fancy predictive models have failed when applied to new contexts, and the mass data collection needed to train systems could breach citizens’ privacy. The reverse worry is that AI systems are so good they will replace human workers.

An Economist Intelligence Unit survey, commissioned by Microsoft, reflects this uneasy mix of hope and caution. The vast majority of health industry executives (90%) do believe that AI will play an important role in addressing the sector’s challenges, but 35% of health and life sciences companies have not deployed or piloted AI applications, compared with a survey average of 27%. Execution was a top-ranked risk of AI adoption, selected by 40% of health respondents, while nearly three in ten (29%) say that they have not identified and prepared for all AI risk scenarios. This is in contrast to other sectors surveyed, where cost and financial risk were higher-scoring worries for most.

Decision-makers in hospitals or clinics are understandably cautious about signing off on new-fangled technologies if they go wrong. How is the industry adopting AI, what are the risks, and what is holding decision-makers back?

**Prediction, imaging and workflow automation**

The most popular AI use case by far, adopted by 35% of organizations surveyed, is image analysis. Capable of sifting vast galleries at a speed and detail beyond human ken, AI has been shown to spot tuberculosis from chest X-rays, conduct fine-grained head trauma and stroke risk assessments from computed tomography (CT) scans and identify melanoma, the cause of an estimated 60,000 deaths a year, more accurately than humans.
Predictive analytics is the second most popular use case, used by 23% of respondents. Physicians, nurses and AI developers are optimistic that AI systems can exceed humans in pinpointing at-risk patients. An AI-based predictive tool built by Jvion, a start-up, reduced pressure injuries in one hospital—such as bedsores and skin breakdown—by over 60% within the first month of use. One physician, John Showalter, was so impressed that he later became the company’s chief product officer.

But both applications bring challenges. Prediction models can drift over time or fail in new contexts without a very careful approach to machine learning techniques. One huge risk, says Dr Showalter, is “overfitting”, in which a predictive model is too closely pegged to the dataset it was built on and performs poorly when let loose in other circumstances. “Overfitting means you have tuned and adjusted your AI to the point that it is only effective for the population it was designed on,” explains Dr Showalter. “If you design it in May and over-fit the model, when you run it in June, it won’t work.”

While challenging for all predictive models, this eventuality is more serious in a healthcare setting. “It’s a problem if you use an over-fitted model to drill for oil but, in the end, you really just made an extra hole. When you over-fit in healthcare, and think you understand what’s going on in a patient and try to apply that the next month, the next year or in the next hospital, you end up hurting patients.” Overfitting can be avoided, he says, by using different techniques and focusing on similarities between patient groups rather than trying to apply one algorithm. “If you look at data through multiple lenses, it’s harder to over-fit.”

Samir Manjure, CEO and co-founder of machine learning platform, KenSci, makes a similar observation. “As you go from one geography to another, or one facility to another, the data characteristics could be different and the social determinants of health could be different. You can’t have one algorithm that is universally applicable to everything. We look at the data and let the data advise which of the techniques in our library suit this the best.”

Augmentation and assistance

Discovering new drugs, and surpassing humans in diagnosing diseases or predicting patient risk, are headline-grabbing AI applications. But it has behind-the-scenes uses that could have a huge positive impact on workflows, stress and burnout of physicians. While some fret about AI replacing humans in fields like radiology and dermatology, the survey panel returned a sanguine verdict: 68% expect AI to improve job creation, 66% expect it to increase wages, and 81% expect it to improve talent attraction and retention. Workforce challenges, like reluctance to adopt new technologies or learn new skills, was considered a top AI adoption risk for only 25% of health and life sciences participants, compared with 41% in retail and 43% in finance, again indicating that health executives see AI helping them to do their job.

Indeed, AI developers are adamant that their goal is to assist physicians and caregivers, not to replace them. “Cognitive augmentation is going to be the next wave of AI in healthcare,” says Dr Showalter. “The ability for AI to run in the background, not adding [a] work burden but bringing focus and consistency to decision-making and care, is going to be huge over the next five to ten years.” He adds that having a “human in the loop” is central to Jvion’s model; it is a human who decides whether to act on the predictions or not. “Physicians say ‘I agree with that and I did it, or I disagree and I didn’t’ and we take that information back into the machine.”

Mr Manjure believes AI cannot just inform specific decisions but support physicians and nurses in a far wider sense. “Physicians are going through burnout right now. They are meant to empathize and connect with patients, and that’s what they want to do, but they are spending a lot of time on other tasks, like manual data entry, reporting and compliance. If machine learning and AI can direct efforts to high-risk patients, automate repeatable low-value tasks, you can focus your efforts and have a bigger impact. That would be welcomed by everyone in the health community.” Daniel Ray, director of
data at NHS Digital, which provides information, data and IT systems to England’s National Health Service (NHS) agrees: AI’s advances “will leave the clinical workforce free to focus on and solve more challenging problems,” he says.

The ultimate beneficiary in all of this, the patient, must be borne in mind too. Transparency and accountability are crucial as AI becomes commonplace and patients are affected by its decisions and evaluations. “Maintaining trust with patients will be really important,” says Mr Ray. “The last thing we want is to scare anybody, but if we can make sure that the technology is explained to patients in the right way, then we can build a positive springboard for healthcare.”