without considering the work context into which that student will transition. As leading Australian psychiatrist and National Mental Health Commissioner Professor Ian Hickie warns, focusing on a student’s resilience ignores ‘the deleterious culture of medicine and dangerous working conditions to which junior doctors [are] subjected’.12

We need to know a great deal more on how, and if, medical training and the early, often challenging, experiences of patient care contribute to inhibiting or limiting the expression of medical students’ positive qualities

REFERENCES


Learning from Dorothy Vaughan: artificial intelligence and the health professions

Brian D Hodges

Art, literature and film provide powerful means of understanding the human condition. The remarkable film and book Hidden Figures1 portray three African American woman scientists who, against a backdrop of the 1960s civil rights turbulence, helped to advance the goals of the National Aeronautics and Space Administration (NASA). One of the women prevails against a strong gradient of sexism and racism, using her exceptional mathematical mind. Another pushes against prejudice to become a pioneering advocate for black women engineers. However, it is the third of the trio, a woman named Dorothy Vaughan, who I want to highlight.

In 1961, NASA employed a large group of human computers: a job...
entailing sheer human force to calculate the complex formulae necessary for space travel. Hearing about the arrival of something called the IBM, a curious Dorothy Vaughan surreptitiously read the operating manual and realised that the need for human computers would be short. Although she too had a brilliant mind and a forceful spirit, Vaughan channelled her energies differently. She shared what she learned about the coming computer revolution with her colleagues and offered them night courses. When the wheels of the great new mechanical computer began to turn, and when the jobs of human computers were set for elimination, Vaughan’s colleagues were prepared to assume new roles as computer programmers.

Health professions education is at exactly such a point today. The imminent arrival of artificial intelligence, deep learning and forms of automation such as robotics are about to transform health care and education, just as powerfully as the arrival of machine computing at NASA. Although there is disagreement about the speed of this development, there is no question of its inevitability. At the hospital where I work, we have just installed our first artificial intelligence (AI) system for planning radiation therapy treatment. It can complete in just 4 minutes a treatment plan that only weeks ago took human radiation therapists and physicists over 2 hours. Plans are afoot to integrate departments of radiology and pathology, recognising that AI will support pattern recognition for diagnosis. Robotic drug-dispensing machines are replacing pharmacists just as bank machines replaced tellers. In education, testing organisations are poised to augment human test committees with computers that generate test items and score examinations.

The imminent arrival of artificial intelligence, deep learning and forms of automation such as robotics are about to transform health care and education, just as powerfully as the arrival of machine computing at NASA.

Though it has been said that 47% of jobs will disappear, it is more likely that AI and automation will displace workers to new roles, rather than replacing them outright. Significant displacement will require helping our workforce to develop new specialised skills. As Des Gorman writes in his article in this issue, ‘Matching the supply of health workers to need is necessary if a health system is to be sustainable, affordable and fit for purpose’. Yet sadly I see our professional organisations concerned with clinging to their current scopes of practice, replaying tired historical battles for control of little patches of professional turf, when they should be decoding what human health professionals will be doing in an age of thinking machines.

The Oxford-based authors Daniel and Richard Susskind reveal what is coming in The Future of the Professions. They enumerate functions that are already being assumed by computers: analysing datasets, pattern recognition and scanning data for patterns among them. However, they also warn against the too easy claim that what human professionals do is too complex to be outsourced to machines. What computer could compete with the wise counsel and compassionate presence of an experienced doctor, nurse or pharmacist? Yet in reality, a great many of our professional activities are not very complex for AI. Pattern recognition is one of them, and as AI systems get better and better they will challenge our claim to diagnosis, as a recent study on deep learning and detection of diabetic retinopathy demonstrated. Further, we can scarcely imagine that affective computing might also disrupt domains such as communication and empathy, core competencies of caring professionals.

Nevertheless, as Susskind and Susskind point out, health professionals often claim exclusive license to empathy, but then provide it only during the infrequent, short encounters made possible in our harried, underfunded institutions. People with high emotional needs, such as those with dementia, might be better supported by non-human systems available at all times around the clock than trying to reach a phone that doesn’t get answered at the hospital or clinic. Certainly, however, there are many roles, such as ethical decision making, which should probably remain firmly in human hands and hearts.

An important step is to introduce courses about AI, deep learning and automation into undergraduate curricula. The importance of metacognition, situational awareness and other
higher human cognitive functions should also be enhanced in medical schools and residency programmes to facilitate safe and productive computer–human interactions. I share the concerns expressed by Gorman that today’s health care workers are not easily retrained or redeployed. We must build admissions processes that select students adapted to role flexibility and who can show leadership in changing contexts. However, the dramatic shifts ahead will also unmask one of the great weaknesses in health professions education: underdeveloped continuing education. It is now urgent to create effective, enduring systems for continuing education that link learning and adapting to our work.11 Neglect of this form of learning and adapting education for a radically different future. It will serve us all to spend less time declaring how complex and irreplaceable we health professionals are, and more adapting education for a radically different future.

REFERENCES
