In the care of Nurse Ann Droid

Robots may be able to hold your hand but they cannot empathize, warn Noel Sharkey and Amanda Sharkey

Would you like to be left exclusively in the care of robots in your old age? Robots have been working in our factories, painting cars, assembling tiny components and mixing dangerous chemicals for decades. In the new era, service robots have begun working alongside humans in cleaning, medicine, farming and policing. Now robots are being given the intimate jobs of care and companionship for our elderly. Should we welcome such developments? Could a robot empathize and care for us in the way that a human could? Can we trust robots and robot manufacturers with such important and life-defining roles?

In a shrinking economy with a diminishing young workforce, there are concerns about how to care for an increasing elderly population. In Japan, where almost a third of the population is over 65, massive government funding has been ploughed into eldercare robotics. Western nations are looking at the possibilities and starting their own R&D.

The technology can already fulfil some basic needs to enable a life without constant human assistance. Riba, by Riken, can carry you to a bed, a wheelchair or a bath. Resyone, by Panasonic, automatically transforms from a bed into a robot wheelchair on command. It can take you to another Panasonic robot that washes your hair and then massages your scalp with robotic 'fingers'. And if you need feeding, the My Spoon robot from Secom can lift food and put it in your mouth. There is even robotics technology to allow the frail to walk again. Cyberdyne's exoskeleton suit reads neural signals from the thighs and walks without you having to think about it. They are currently being leased to old people's homes in Japan.

If you are old and ill but want to stay at home, don't worry. There are robots that can monitor your heath and let you talk remotely to family and friends or health professionals. The Giraff Plus project is testing 14 robots in three European countries for this purpose. And in the United States and Mexico, the RP-VITA telepresence robot by inTouch Technologies has received US Food and Drug Administration clearance to provide remote consultations with medical experts.

Then there is Robosoft's Kompai interactive robot 'caregiver' that records activity and vital data for healthcare professionals as well as assisting with daily tasks. It accepts speech input, navigates autonomously, plays music and acts as a video-conferencing system.

These are just a few examples of the many robots being developed to care for us in sickness and ill health. It will be a while before they are affordable, but robots are coming in force over the next few decades. If used appropriately, they could empower the frail, elderly and the sick and give them the independence they crave.

Despite the benefits, there is something disconcerting about the possibility of being left in the hands of machines. It is one thing to get spoon-fed or washed by a machine and another to be deprived of the warmth of human company. Grooming and feeding

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sometimes provide the only opportunity for human contact and conversation that old people have. It is here that robot care moves from being a technology issue to one of ethics. Some care professionals believe that robots could assist them in the tasks of care but should never be used for the practice of care.

Roboticists and manufacturers with vested interests are quick to promise robotic alternatives for companionship and the warmth of contact. The question is, will robots really fill the void of loving, caring and empathetic relationships with humans. If you have ever fallen in love with an automated phone answering machine or have late night conversations with Siri on your iPhone, read no further.

Emoting robots

There have been great advances in conversational artificial intelligence but after even a short encounter the interactions seem vacuous. It is like talking to someone disconnected from the real world. Yes we have all met people a bit like that, but hopefully they don't enter the caring professions. One major advantage that most humans have over machines is an ability to understand the subtle emotions of others. We can sympathize with suffering and empathize with the saddest or happiest events.

In recent years computer analysis of our facial expressions has become relatively common in gaming systems. They can work out our primary emotions and project them on to an avatar. Biometric techniques are also being used. Affectiva has used a Q-sensor bracelet to determine emotional arousal.

Calculating that someone is happy or sad is different from understanding why. Emotional understanding requires the ability to put yourself in another's shoes. We humans know what it is like to have suffered or to have experienced joy. Computer systems could not tell whether your sadness resulted from your daughter's cancelled visit or from her unexpected death. It is surely such understanding that makes for genuine care.

Modelling emotion with robots helps us to understand the nature of emotion and how we recognize it. Although scientifically useful, it does not give robots 'feelings'. We have no idea how to do that since we do not fully understand how emotion works: it may be chemical in nature; it may be a property of being alive; it may require sentience and emotional agency. While as

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scientists we cannot say that emotions will never be mechanized, it is safe to say that robots will not be 'feeling' emotions for the foreseeable future.

But even a superficial analysis of our emotions could allow a programmer to trick us into believing that a robot is sympathizing with us. We all have a human tendency to attribute human or animal properties to inanimate objects. This anthropomorphism and zoomorphism has long been exploited by designers. Alessi specialize in making kitchen tools that make us project animal attributes on to them. Even roboticists succumb to anthropomorphic language when discussing their research. This is one of the reasons why the public is confused about what robots can actually do.

People often talk to their computers or cars as if they were alive – particularly when they are not 'behaving' well. When an object like a robot moves in an animal-like way, the illusion is even more powerful.

Affront to dignity

Now there are machines such as SoftBank's Pepper robot and Breazeal's Kismet robot that can display emotional gestures and expressions. Hanson Robotics is well known for their lifelike robot heads that use a material called 'frubber' to create believable facial expressions. One of their robots resembling Albert Einstein has been used to mimic the facial expressions of onlookers.

So a robot could make sympathetic expressions and use body language to convey the impression of understanding. However, the reality is that they are programmed devices running calculations carrying out motor commands. There is no one home.

A robot that made sympathetic noises and expressions would amplify the illusion of understanding. It could say caring phrases such as, 'I feel your pain', or 'I love you'. A robot could hold or stroke the hand

of a suffering person. But make no mistake – this would be deception. The robot would not have the possibility of caring. Does it matter? Would there be any reason to object to the creation of robots that gave the appearance of understanding and sympathizing? This is an open question.

On the plus side, an interactive robot could be useful in a therapeutic setting. The Paro robot, developed as a companion for the elderly, is covered in soft white fur to give it the appearance of a baby harp seal and it responds to touch and stroking. More than a hundred Paro robots are being tested in care homes in Denmark and more are being used in the United States and Britain. Paro doesn't talk but interacts with clients by responding to their touch with realistic movement and calls indicating enjoyment. They are effective in relaxing the severely demented and have been shown to create some health benefits and to encourage social interaction

On the negative side, deceiving the vulnerable in this way could be an affront to their dignity. The health benefits would need to be weighed carefully in any trade-off. There are also implications for care policy. Emotionally deceptive robots could lead care supervisors to believe that their clients' emotional needs are being met. In times of economic austerity, this could justify a reduction in the provision of human care.

Few of us would wish to see an 'eldercare factory' in which all physical needs are met by robots with little human intervention. This may seem extreme but who knows what a future generation will do with the technologies that we create today? It is unlikely to happen for a more than couple of decades. In the meantime robots are being developed to fulfil our physical needs, empower us and gives us greater independence in our old age.

It is important to gain benefits from the advances in robotics while avoiding the dystopian consequence of a misplaced trust in robot capabilities. We as a society need to discuss the issues now rather than sleepwalk into an inhumane nightmare. We may need to establish a new human right to be cared for by human beings.

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