Robots as Healthcare Assistants in Elder Care

Robots as Healthcare Assistants in Elder Care - Policy Memo
Siena M. Guerrero
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Topics to explore: elder care, dementia, social robotics, accessibility, inherent transparency, technology and law, healthcare technology, health data science, HIPAA and technology

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1. Executive Summary

One area of healthcare that desperately needs innovation and solutions for an increase in demand for services in assisted care and living, particularly for elders. In the future, it is possible that assistive technology will develop to the point where there are robots who can act as interactive caregivers/caretakers. Such personal care robots would need to serve as a sort of replacement for the traditional healthcare worker who assists the patient with medications, food, and other living care.

In order to perform these jobs effectively, the personal care robots would need to be able to access health information about the patient, information that may be sensitive that must be secured through the transmission of info to the robot. If the robot is collecting data from the patient (such as health statistics or needs), there needs to be a mechanism for transmitting this data securely and safely to a third party that can filter this data stream for relevant parts.

How can we do all these actions effectively, and with consent, with robots as we understand them now?

This policy memo will explore the specific strictures needed to ensure data privacy, effective communication and treatment as well as other data service needs. Aside from the direct interaction between the robot and the patient, there is another serious social implication of these personal care assistants: the larger question of the human cost of labor force, and the reduction that may be seen if these robots replace traditional human caretakers, as an ethical dilemma arises if there is not sufficient justification for supplanting workers in this model.

2. The Core Issues

In many parts of the world, elders are facing a crisis of care. This crisis arises from several new issues of the modern world in terms of social, financial, and familial changes. Not all elders are treated the same way; some cultures view elder care as the job of the descendants, while other cultures entrust this care to the trust of medical professionals like stay-at-home nurses or assisted living facilities. No matter the practice, however, elders faces the difficult reality that the workforce needed to take care of them is rapidly shrinking. For some countries like Japan, the population of young people is simply too small for the population of elders. There are simply not enough people to care for these people effectively.

But humans are not the only entities that can care for other people; robots can. Several nursing facilities are experiments with ways to employ the use of a socially assistive robot to engage and assist the elders while in hospital. And these robots have been showing a lot of promise. Socially-assistive robots have been shown to be statistically effective in treating social isolation in hospitals, a reality that many elders face. In fact, it is estimated that "patients may spend the day with little or no social interaction" (Sarabia, M., Young, N., Canavan, K. et al., 2018) which likely contributes to depression in "46% of older patients" (Sarabia, M., Young, N., Canavan, K. et al., 2018). Doctors and nurses have little time to visit their patients and give direct on-to-one social contact, and as the shortage of healthcare workers continues, it's likely

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that cases of social isolation will increase. One such socially-assistive robot is NAO, a humanoid robot developed in France described by its manufacturer as:

> "NAO is the world's leading and most widely used humanoid robot for education, healthcare, and research. NAO is 58cm tall, autonomous, and fully programmable robot that can walk, talk, listen to you, and even recognise your face."

In one study, researchers showed that "a majority of patients enjoyed their interaction with NAO," (Sarabia, M., Young, N., Canavan, K. et al., 2018) indicating that patients enjoy socializing with these robots and that they may be useful for combatting social isolation.

Another socially-assistive robot, Zora, offers "companionship in a place where life can be lonely" (Satariano, A., Peltier, E., & Kostyukov, D., 2018) and is already experiencing great success with patients in a nursing facility in France. The robot assists the elders in several ways; it can help with exercise routines, hold conversations, sing, play games, and more. Most importantly, Zora has become an object for others to "[develop] an emotional attachment" (Satariano, A., Peltier, E., & Kostyukov, D., 2018) with as a companion, and many patients have come to treat and take care of Zora like a small child or infant. For social interaction, patients rely on fellow patients, medical staff members, and family, but these interactions can be limited in scope and short on time. Families can only visit every so often, staff are often overworked and limited on time they can dedicate to individual patients, and many patients have mental illness and/or diseases like Alzheimer's that make communication and sustained interactions with people difficult. For many patients, this robot is a source of not only joy and fulfillment, but also acts as a friend and excellent confidant. Patients have told this robot information they are unwilling to tell their nurses or family members, and some have formed an emotional connection so strong that they feel jealous if they feel Zora is spending too much time with another patient (Satariano, A., Peltier, E., & Kostyukov, D., 2018). But with this strong bond, another issue arises: how do medical professionals deal with the information Zora gives them?

Many elderly patients have memory or other cognitive issues that prevent them from understanding that Zora is actually commandeered by nurses on a computer. When Zora receives information, so does its handler, but this nuance is not always apparent to patients since the Zora operators often stay out of sight of the patients. This distance in location makes interactions feel personal and separate from their human caretakers, but in reality, an exchange of information (some of which could private medical data) arises from human-robot interactions. Like most new technology, grasping the concepts behind socially-assistive robots is difficult, and some elderly patients in need of these care may never be able to truly understand how robots like Zora works. With this reality in mind, it is imperative that medical professionals understand the social implications of using these robots but also the privacy and legal considerations of using this technology. In addition, when designing these robots, engineers must take care to develop these robots to account for the sensitive data they may hold or transmit.

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and many patients have mental illness and/or diseases like Alzheimer's that make communication and sustained interactions with people difficult.

But robots are largely immune to these issues. Robots have all the time in the world, and they could provide a myriad of benefits as a personal caretaker. But not everyone is convinced that robots should play this role as healthcare assistant. As one nurse puts it, "Nothing will ever replace the human touch, the human warmth our patients need" (Satariano, A., Peltier, E., & Kostyukov, D., 2018). The robots we have today are drastically underpowered compared to sci-fi depictions of robots like Rosey from the Jetsons or C-3PO from Star Wars. It is difficult to get robots to properly stack cups, let alone feed food to a living, breathing, and moving human being.

But while progress is slow in the area of robotics, the rapid advancement of technology in the past tells us that the world of Artificial Intelligence is only beginning. In the future, it is possible that assistive technology will develop to the point where there are robots who can act as interactive caregivers/caretakers. Such personal care robots would need to serve as a sort of replacement for the traditional healthcare worker who assists the patient with medications, food, and other living care. In order to perform these jobs effectively, the personal care robots would need to be able to access health information about the patient, information that may be sensitive that must be secured through the transmission of info to the robot. If the robot is collecting data from the patient (such as health statistics or needs), there needs to be a mechanism for transmitting this data securely and safely to a third party that can filter this data stream for relevant parts.

How can we do all these actions effectively, and with consent, with robots as we understand them now? And, if we eventually get to the point where robots *can* completely replace assisted living nurses, should they? At the moment, some of the biggest constraints in adopting these robots into our daily lives are cost and effectiveness. Zora carries a whopping sticker price of $18,000 and still requires an operator to use it (Satariano, A., Peltier, E., & Kostyukov, D., 2018). But as cost goes down and robot autonomy goes up, what will stop corporations and society from adopting them en masse?

3. The Moral Approaches
In combatting the issues of elder care with socially assistive robots, I will focus on two moral approaches: Utilitarianism and Cultural Relativism.

Utilitarianism
From a purely financial, capitalistic perspective, robots could be one potential avenue for hospitals and nursing homes to save costs. Some of the biggest complaints in discourse on healthcare revolves around two variables: availability and cost. And elder care is certainly expensive. In America, according to NPR, the average annual cost for a private room in a nursing home is $87235, the average annual cost for assisted living is $41724, and the average annual cost for homecare aid ranges from $19,760 to $21,840 depending on the type care needed (Geewax, M., 2012). These costs are a huge financial burden for elders, and their family, to carry, often leading to sub-optimum care. And these costs are expected to rise. The need for

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healthcare aids in elder care is growing, so demand for these types of services will likely increase in the future (Aanesen, M., Lotherington, A. T., & Olsen, F., 2011). In order to reduce costs, consumers will either need to forgo professional help or the ratio of professionals to patients will rise. Both of these scenarios raise further issues. Forgoing professional help places more burden on the family members taking care of their elderly relatives, often financially and emotionally. For the good of all, there must be another avenue to fill this gap of care, and robots can help in small and subtle ways.

However, a major downside to adding more robots into elder care stems from the work they are doing, and by proxy, the workers they are displacing. At the moment, socially-assistive robots in nursing homes or hospitals are limited in the actions they can perform; they can't dispense medication or monitor vital signs. But if they could, then surely a moral panic will rise from the idea of machines taking over and "stealing" our human jobs. One text, "Three dialogues concerning robots in elder care" that beautifully imagines the concern many healthcare workers may feel in response to introduction of socially assistive robots in their work is as follows:

> Part of my own concern is that introducing the machines will be only Act One. Act Two could be cuts in the number of human nurses on the staff. After all, I've heard that these humanoid robots can carry on fairly good conversations; they can read temperatures and blood pressures. They're even said to display convincing 'artificial empathy', and some say they could furnish residents with companionship. Robots like this could lead to 'Myloss' – or perhaps '*no* Myloss' – that is, *I could lose my job!* (Metzler, T. A. and Barnes, S. J., 2014)

These fears are natural and understandable. No one likes the idea of being replaced, or having their usefulness run out. But the reality is, we are facing a shortage of healthcare workers worldwide. It is estimated that there will be a "shortfall of 380,000 specialized workers by 2025" (Foster, M., 2018) in Japan alone. From the perspective of utilitarianism, where the goal is maximizing the happiness and good of humanity, the loss of some jobs for a massive increase in care is ethical. But even that statement isn't the full story, since as we see in Japan and beyond, there *is* a shortage of healthcare workers, and it will take a while to replace that shortage with just robots, let alone replacing people already in jobs. In this manner, introducing robots (and particularly socially-assistive robots) into modern healthcare may prove to be the most effective strategy in preventing overall decay and abuse for elders as their number of human caretakers shrinks.

Cultural Relativism
Socially-assistive robots have already shown potential for raising mood and engaging patients in hospitals and nursing homes, but that doesn't mean that introducing them into elder care comes without issues. Different cultures and different families have different ideas of what is "expected" when it comes to taking care of their elders. In many countries around the world, a parent's child is expected to care for them, whether through financial means or by personally acting as their caregiver. And what a shock it can be to have this generational process disrupted by robots. The idea of "handing off" your loved ones to assisted living facilities is not only a scary prospect, but a socially unacceptable one. In America, this decision is often caught between ethnic and class divides. Wealthier Americans are more apt to pay for expensive, elite

care while middle- and lower-class Americans have to choose between caring for relatives themselves or paying for occasional assistive care. For the families who have already out-sourced elder care to individuals outside the family, there may be less resistance to adding a robot into a multidisciplinary team of doctors, nurses, and aids in elder care. But for those who have not made this leap (or are unable to), relying on robots may "risk marginalizing this section of society" (Duggan, G. B., 2016) and prevent them from receiving adequate care as healthcare shifts to adopting more and more technology over human care.

So, how can the benefits of socially-assistive robots aid this marginalized part of society, those who cannot afford robots or are fearful to adapt them? An interesting perspective on this issue again comes from "Three dialogues concerning robots in elder care" when analyzing the difference between Judeo-Christians and Buddhists:

> [one] thing that Linda noted that's relevant here was her observation that 'People in Buddhist cultures may tend to be more willing than Western Judeo- Christians to invite robots into their lives because they are, in effect, inviting the Buddha into their lives' (Pope & Metzler, 2008, p. 26). She was referring to a Zen Buddhist belief in a 'Buddha-nature' that's understood to be present in virtually everything – including dogs *and* the machines that people create. Hence, Western concerns about whether an advanced robot experiences consciousness and should be treated as a person can become much less problematic in the kind of culture one finds, say, in Japan or South Korea. So maybe some of the clash in world- views that we noted for the cultures of nursing and robotics technology mainly apply just to nursing care of older adults in *Western* cultures (Metzler, T. A. and Barnes, S. J., 2014).

Keeping this cultural perspective in mind, we can also learn from these differences in other cultures (like Japan) to better understand how the introduction of robots has gone much more smoothly and with less moral panic than my American peers. One notable difference arises from the cultural differences seen between the US and Japan. Robots have been a "noticeable" part of Japanese culture in a manner that differs strongly from stateside. Robots are much more likely to be depicted as friendly and helpful in Japanese television, leading to positive public perceptions. Advertising robotic care to the public as something that is normal, even moral, to do could vastly impact how widely socially-assistive robots are adopted as well as how effective they prove to be.

4. Current Contexts

Elder care varies across the globe, culture to culture, and various countries have attempted to improve elder care over the years as new technology has become available and new social issues have arisen. In Japan, the government is experimenting with subsidizing robots and funding their development in assistive living facilities to help aid with the shortage of workers in the country. In Tokyo, Shintomi Nursing Home uses 20 different models of robots (Foster, M., 2018). Japanese residents have been particularly receptive to these robots, and workers appreciate the extra time they gain from using these robots (Foster, M., 2018).

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In studies that examine the human reactions to the robots they interact with, researchers have learned that while many people are "aware" that they are interacting with a robot, they still gain many of the same benefits as they would interacting with other humans (Duggan, G. B., 2016). In one study, using a robotic "dog," named AIBO, "complex relationships were formed with the AIBO and that humans readily attributed emotions to the AIBO despite knowing that it could not 'really' feel any emotions" (Duggan, G. B., 2016). From this observation, researchers can infer that "human–human interaction could become less attractive as technology offers simpler relationships without many of the costs inherent in human relationships" (Duggan, G. B., 2016). Similar to the placebo effect, interacting with robots "works" even when humans know they are talking to a machine rather than another human. Some researchers suggest that this effect may arise from a series of "social scripts" that are mindlessly followed by humans at the beginning of a conversation, which continues conversational momentum that allows a "relatively automatic process beyond awareness" (Duggan, G. B., 2016). So, we may not be intending to treat robots like "social actors," but we are so comfortable with following scripted behavior that a connection occurs naturally.

The biggest hurdle faced in this type of human-robot interactions, however, is maintaining the "illusion" of connecting with machines. We are psychologically predisposed to anthropomorphize other beings as long as we are given appropriate "human" responses, but robots are still not perfect at mastering the art of human language. As the field of artificial intelligence expands, however, we may be able to reasonably mimic the human psyche such that robots respond to humans in the manner we would expect of human caretakers. Already, we can see that given sufficiently "sophisticated interactions," people experience similar "cognitive schema and patterns of behaviour" as they would speaking to another human being (Duggan, G. B., 2016).

In the past, computer scientists have experimented with the ideas of rudimentary "psychotherapist" programs like ELIZA, which was developed by Weizenbaum in 1966. Emulating the type of therapy that would be conducted by the likes of Carl Rogers, ELIZA, was surprisingly engaging for many of its users, that is, until "responses became nonsensical within a few minutes and the illusion was broken" (Duggan, G. B., 2016) of interacting with a "real" intelligent being. But this small observation shows that people are willing to engage with these technologies, and by proxy, form relationships with their machines. This connection could prove to be key in tackling the issue of mental illness or disease in elder care.

Among the many complexities that accompany human-to-human care, one of the greatest difficulties faced by mental health care professionals today deals with the rising rates of depression in old people. As noted by a researcher in social isolation in acute hospital settings:

> Previous studies illustrate the magnitude of these problems. Depression is common in hospitals: Shah et al. revealed that up to 46% of older patients are depressed using the Geriatric Depression Scale; yet, as many as 90% of these cases are not identified. Further, studies show that direct patient contact time makes up only 12% of the junior doctors' time. Similarly, only 50% of nurses time is spent in direct contact with patients. These findings suggest patients may spend the day with little or no social interaction. Moreover, with an expected shortage of healthcare workers due to ageing, social isolation will only increase (Sarabia, M., Young, N., Canavan, K. et al., 2018).

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For these patients, robots offer a viable solution to this isolation and a tool for preventing further mental harm given that "Social isolation in hospitals is a well-established risk factor for complications such as cognitive decline and depression" (Sarabia, M., Young, N., Canavan, K. et al., 2018). In these environments, robots act as a companion to patients experiencing a lonely, and oftentimes scary and stressful, trip to the hospital.

Continuing the mental health status-quo for these patients is an achievement in of itself, but robots can act as more than companions. ELIZA may not have proven to be an effective replacement for a human therapist, but machines are getting better at emulating human responses. And, it's important to note, that human mental health workers are not immune to imperfection; therapy can be draining for not only the patient but the professional giving treatment. Treatment can be a long process, and for many elders, cost, time, and effort make pursuit of such treatment difficult. Once again, robots can lower these constraints and even avoid some of them entirely; an unemotional machine could prove to be a more effective resource for a patient whose suffering stems simply from a lack of being heard and feeling invisible. However, the idea of "computer-mediated therapy" that is "free from some of the constraints of human interaction" causes some alarm from professionals who worry that "[g]iven the cost-effectiveness of technology…healthcare service users [could miss] out on human contact" (Sarabia, M., Young, N., Canavan, K. et al., 2018) at times when it would be most necessary.

In addition, this issue relates to one of the biggest issues facing the larger societal impact of introducing socially-assistive robots: the loss of human jobs. Plenty of Hollywood films, like "I Robot" explore the societal impact of robots who "are seen as a threat to workers' employment prospects," but few films explore an alternative reality where, say, robot doctors work with human doctors. Even more crucially, few of these depictions have noticeable cultural impact in terms of encouraging or fostering positive reactions to this sort of interaction. Greater exposure to the benefits of robotic assistance and, particularly, robot caretakers, is necessary for this type of work to be truly accepted and integrated into society, changing the status quo.

5. Current Policy Analysis & Proposals

In engaging the current policies surround socially-assistive robots in elder care, three broad policy topics to analyze arise: training people to properly engage with new technology, monitoring technology/the data it collects, and preventing the overstepping bounds of human privacy and independence.

1. *Training people to properly engage with new technology:* A large portion of the general population around the world do not understand the underlying mechanics behind robots and, in particular, how artificial intelligence works. As such, it is imperative that greater education/understanding of basic models be given both to healthcare workers as well as patients in their family.

   One area of robotics that must be tackled in public perception, and in particular, public fear. A good way to increase positive reception and adoption of these new technologies, researchers, engineers, and other professionals engaging in the world of robotics must

take special care to emphasize the benefits and careful research that has been done on these products. An example of what a difference cultural impact has on this issue can be seen in Japan, where robots are viewed as a more socially acceptable component of society. Part of this wide acceptance may stem from the massive impact that Japan's technological manufacturing sector has on everyday life in Japan. It is much more common to see depictions of useful technology integrated into society in Japanese media, from video games to manga, than in countries like the US. Unfortunately, this policy issue is much harder to tackle than the remaining two, as it directly involves changing human perceptions and reactions, which has proven to be no easy task.

Governments can aid in changing this perception by providing incentives for adopting new technology through the use of subsidies and grants. Of course, such actions would have the literal costs that could range in the millions in order to be effective, given how expensive robotic technology is currently (Aanesen, M., Lotherington, A. T., & Olsen, F., 2011). However, like technological advancements in the past that were sponsored by governments, the return on investment for this type of aggressive marketing, promotion, and integration of new tech would reach far into the future, stimulating new areas of business and new workers to maintain and develop this new industry. From the perspective of utilitarianism, integrating socially-assistive robots has the potential to positively affect vastly more people than it would negatively harm, lending credence to the idea that robots are a sector of technology that our government should actively support for the good of society despite the cost.

There are few other tangible solutions that governments or society at large can implement in order to combat the shortage of workers in elder care. One such alternative includes subsidizing elder care cost and implementing other programs or policies that stimulate an increase of individuals working in healthcare, but such measures would also prove to be costly without addressing the real issues of low pay and undesirable work in healthcare.

With new research and new integration in society, there are bound to be a few bumps along the road. We do not know how long it will take for socially-assistive robots to properly and convincingly emulate the work of human caretakers, and this uncertainty makes pouring millions of dollars into such an endeavor seem risky and possibly financially irresponsible. However, the alternative is arguably waiting for the inevitable shortage of workers and harm to society (elders particularly) resulting from inadequate care.

2. *Monitoring technology/the data it collects:* One of the biggest concerns in adding computers to a field traditionally run by humans involves the incorporation and storage of data collection. Different countries hold different standards for protection of medical info, which makes it difficult to come up with one "standardized" process for interacting with such sensitive data. In countries like the US, laws must ensure that a robotic caretaker abides by the same standards of care that are expected from human caretakers, including but not limited to HIPAA compliance.

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In addition to ensure secure storage of sensitive medical information, care must also be taken to ensure secure analysis of this collected data. For the foreseeable future, robots will need handlers/operators which means that these handler/operators must also be held to the same standards as if they were conducting the interactions with patients themselves, including the sort of medical and legal duties that come with such responsibility. If handlers witness abuse, they should be required to report it. Unfortunately, the legality of technological practices always lags behind legislatively, which means that it could be harder to monitor and correct abuses in the system with the degree of separation that robot and handler share. To combat this possible pitfall, robot manufacturers and the companies that adopt them in their practices should keep the ethical framework that human workers face in mind as they complete their duties.

Keeping handlers/operators accountable does not mean that they should be the point of contact to blame if issues arise from the use of socially-assistive robots. They should not be blamed for technical glitches or mishaps outside of their control. However, if such glitches or mishaps persist, it is an ethical imperative for the manufacturers of these robots to correct these issues and prevent further damage.

3. *Preventing the overstepping bounds of human privacy and independence*: Arguably one of the largest concerns in adding socially-assistive robots revolves around the fear of how adding in a machine could change the very human and vulnerable experience of the end of life. Elder care is a very sensitive field precisely because there are so many individuals and relationships involved in the process. One such relationship stems between the patient and their family and friends, who seek the best possible care for them. But there is perpetual imbalance between the patients' cognitive abilities and their legal rights. Like any other patient, they deserve to dictate their own care and be in control of how it is conducted. Many of the elders who have interacted with socially-assistive robots were able to develop deep, intimate attachment to these objects, and these attachments must be treated with dignity and respect. Otherwise, these robots will simply become another way to "deal" with the problems of aging populations without taking care to actually care of them.

5. Action Items
• *Training people to properly engage with new technology*
   1. **Increase engagement with socially-assistive robots** – Reaching out to entities with significant social and cultural capital can ease the transition of implement this new technology and reduce concerns and questions regarding its use. A big hang-up to adopting robots into regular life, for many people, is fear of the unknown. Proper education can help alleviate this fear.
   2. **Establish programs centered around integrating socially-assistive robots into society** – Similar to above, the key to societal acceptance comes through readily available and understandable information.

• *Monitoring technology/the data it collects*

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1. **Implement laws that protect data collected by socially-assistive robots** – In the modern age of Facebook, Google, and other technological giants co-opting personal data for corporate use, it is especially important to enact regulations that deal with technology before that technology is employed to the masses. Before socially-assistive robots become commonplace in society, the data these machines produce and use in treatment must be sufficiently handled with modern encryption and safety regulations in order to better respond to the needs of the people who use them.

2. **Clearly outline the responsibilities of robotic handlers/operators that deal with sensitive medical data** – Along with handlers/operators, manufacturers should allocate room for a third party that can filter the data stream of information that is collected by socially-assistive robots including video/audio of sessions. Consumers should know what individuals or entities have access to the data that is collected by the socially-assistive robots that they interact with. In order to ensure there is transparency between the patient and its robot (including the team of operators/handlers), this information should be easily accessible, and the rights to this data should remain with the patient, not the company that "collects" it in pursuit of better treatment. Otherwise, we face the same privacy concerns and breaches of information that we have seen from tech giants in the past.

• P*reventing the overstepping bounds of human privacy and independence.*

1. **Establish consumer watchdog organizations to ensure adequate elder care** – Like any other technology, socially-assistive robots are being produced by manufacturers who, among other, more righteous, look to gain a profit from the sale of their technology. Given that these robots are not individuals looking out for their own needs, it is easy to imagine a scenario in which socially-assistive robots are misused, and in the process of this misuse, actively harm consumers. Given that deploying this type of technology is particularly groundbreaking (with possibly disrupting emotional and physical consequences) and used by elders, a group of people who are often taken advantage of, extra care must be taken by third party organizations to ensure that abuse and mistreatment do not proliferate.

2. **Implement new programs outlining the rights of patients interacting with robots and require acknowledgement of receipt of this information to elderly patients or their legal caretaker** – Technology can be particularly confusing to older people, but this confusion does not mean that adequate instruction and information should not be readily available to consumers.

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