

BRIDGING THE UNCOMPENSATED CAREGIVER GAP: DOES TECHNOLOGY PROVIDE AN ETHICALLY AND LEGALLY VIABLE ANSWER?

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The long-term care of the elderly population has increasingly been a concern. The problem grows as the senior population ages. Despite the availability of institutional and community based care, most people, for emotional and financial reasons, still prefer to remain in the comfort of their homes as long as possible and to receive whatever care is available from spouses, children, siblings, and close relatives, or the so-called uncompensated caregivers. The psychological and financial stress for the care of elderly relatives and the growing demand for caregivers is the catalyst for the invention of senior-focused technologies. Technologies such as robots, simulated pets, and wearable accelerometers are designed to help seniors to carry on with their daily activities and to help caregivers provide better care for their loved ones. Legal problems such as privacy issues and regulatory concerns still lurk in the corner. The future of elderly care will inevitably involve technologies, but there is much to explore in the ethical and legal terrain.

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In the recent film *Robot & Frank*,¹ an elderly man (Frank), who is living alone in a small, rural community, keeps forgetting things.² His house is a mess, his days lack structure, milk remains in the refrigerator until it sours, and a restaurant that he believes he patronized “just last week” has been out of business for years.³ He is somewhat irascible and his adult children, who have moved away from the community, are worried about him.⁴ At the same time, his adult children are absorbed by the demands of their own lives.⁵ Frank is still in good general physical health, but his ability to live independently is seriously in question.⁶ Neither of his adult children are available to serve as caregivers, so the threat of placement in a long-term care facility is very real, and is clearly something that Frank does not want.⁷ Were the story set in the present, the only option available to keep Frank in his home would be contracting with a home health agency or individual caregivers to provide around-the-clock care, an option that neither Frank nor his children can afford.⁸ But the story is set slightly in the future, and so Frank’s son is able to purchase a mannequin-sized robot, programmed to serve as a caregiver, to enable his father to remain in his home.⁹ As the story continues, legal and ethical issues arise concerning the appropriateness of entrusting a human being’s health and well-being to a robot, of relying on technology to solve problems of daily living, of preserving confidentiality, and of accepting a robot as a companion.

Fanciful? Such a scenario is certainly beyond the reach of existing technology, and development of a robot sophisticated enough to

1. ROBOT & FRANK (Park Pictures et al., 2012).

2. *Id.*

3. *Id.*

4. *Id.*

5. *Id.*

6. *Id.*

7. *Id.*

8. *Id.*

9. *Id.* No price is cited for the robot, but when the son insists on leaving it over Frank’s objections, he states it was “expensive.” Some of the technology that is currently available, such as the Paro robotic seal, for example, sells for between \$6,000 and \$8,600. See Carrie Gann, *A \$6000 Seal Becomes Robotic Companion for Older Adults*, ABC NEWS, (Oct. 19, 2011), <http://abcnews.go.com/Technology/furry-cuddly-medical-devices-social-robots-older-adults/story?id=14763822>; Alexia Attwood, *Comfort Robots Trialled in Nursing Homes*, ABC RADIO NAT’L (Mar. 27, 2014, 8:49 AM), <http://www.abc.net.au/radionational/programs/breakfast/robots-the-future-of-dementia-treatment/5348482>.

truly substitute for a human caregiver may never be possible,¹⁰ but the concept of caregiving supplemented by various types of automated gadgets and devices already surrounds us, as will be discussed more fully below. It is therefore not unreasonable to assume that society will look increasingly to technology to help address whatever gaps may be perceived to exist in the availability of affordable caregiving options as the elderly population continues to grow.

Although the use of technology was only tangentially mentioned, the projected shortfall in caregiver availability was expressly recognized at the 2002 Second World Assembly on Ageing, held in Madrid.¹¹ The Assembly's Madrid Report challenged the world community to act collaboratively to address the issue and in response, the U.N. General Assembly has established the Open-ended Working Group on Ageing,¹² which just completed its fifth working session¹³ and received statements from international non-governmental entities concerning the need to ensure "quality of care for older persons to age

10. Yet, the technology that is currently available is nothing short of amazing. In Japan, robots already do such tasks as "make sushi . . . plant rice and tend paddies" and can be seen "serving as receptionists, vacuuming office corridors, spoon-feeding the elderly." Hiroko Tabuchi, *Japanese Robots Enter Daily Life*, ASSOCIATED PRESS, Mar. 1, 2008, available at http://usatoday30.usatoday.com/tech/news/robotics/2008-03-01-robots_N.htm. The Artificial Intelligence Laboratory at the University of Zurich, Switzerland, has developed Roboy, a "service robot" designed to autonomously perform personal care type activities, such as household chores, for the elderly. *Advanced Humanoid Roboy To Be 'Born' in Nine Months*, KURZWEIL ACCELERATING INTELLIGENCE (Dec. 26, 2012), <http://http://www.kurzweilai.net/advanced-humanoid-robey-to-be-born-in-nine-months>. Finally, in the United States, Hanson Robotics has developed Jules, a "Conversational Character Robot," an eerily realistic interactive robot capable of displaying a remarkable range of facial emotions and engaging in what seems to be fully responsive and meaningful conversation. See *Hanson Robotics' "Jules" Says Goodbye*, VISION SYSTEMS DESIGN (Dec. 18, 2012), <http://www.vision-systems.com/topics/m/video/68423639/hanson-robotics-jules-says-goodbye.htm>. Hanson Robotics has further established a "Robokind" Advanced Social Robotics division with a mission to "design and build a new series of social robots that allow people to interact with robots in a more natural manner and on a more personal level than ever before." ROBOKIND, <http://www.robokindrobots.com/our-mission/> (last visited Nov. 3, 2014).

11. Second World Assembly on Ageing, Res. 1, Rep. of the Second World Assembly on Ageing, Apr. 8-12, 2002, U.N. Doc. A/CONF. 197/9, at 1-8, 17, 35-36, 40-42 (2002).

12. G.A. Res. 65/182, ¶28, U.N. Doc. A/RES/65/182 (Feb. 4, 2011).

13. *Open-ended Working Group on Ageing*, UNITED NATIONS, <http://social.un.org/ageing-working-group/index.shtml> (last visited Nov. 3, 2014). The Fifth Working Session of the Open-ended Working Group on Ageing was held in New York from July 30th through August 1, 2014. *Id.*

with dignity, longevity, and human rights.”¹⁴ The recently promulgated Chicago Declaration on the Rights of Older Persons, presented as an ancillary event to the Open-ended Working Group’s proceedings, posits that “older persons have the right to the benefits of scientific progress and health and long term care related research,” as well as the right to receive adequate long-term care in institutional or community-based settings.¹⁵

With that as background, the goals of this paper are: 1) to investigate the basis for projections that a caregiver gap—in the form of decreasing numbers of available uncompensated caregivers—is reasonably likely and can be expected to have a negative impact on both the availability and cost of long-term care; 2) to determine the extent of uncompensated care that is currently being provided, both in terms of the kind of care being provided and the identity of those who are providing it; 3) to examine what options, if any, exist for those elderly persons who lack anyone willing to serve as an uncompensated caregiver; 4) to describe a sampling of the technological alternatives for caregiving that are either already available or are being developed worldwide; and 5) to identify and discuss the legal and ethical problems which use of technology in this fashion may be expected to raise, and which need to be comprehensively addressed as a component of international advocacy on behalf of the elderly.

14. INT’L ASS’N OF HOMES AND SERVS. FOR THE AGEING, STATEMENT: HUMAN RIGHTS OF OLDER ADULTS AND THEIR CAREGIVERS, CAREGIVERS 2, *available at* <http://social.un.org/ageing-working-group/csoinputfifth.shtml>.

15. *See* 2014 INT’L ELDER LAW AND POLICY CONFERENCE, CHICAGO DECLARATION ON THE RIGHTS OF OLDER PERSONS (2014), *available at* www.jmls.edu/braun/pdf/chicago-declaration-v11.pdf. The document is intended to be a “work-in-progress;” draft version eleven was presented on August 1, 2014 to the Fifth Session of the United Nations Open-ended Working Group on Ageing as part of the Briefings, Side Events and Declarations conducted throughout the session. The Chicago Declaration on the Rights of Older Persons was adopted on July 11, 2014 at the final session of the twenty-first Belle R. and Joseph H. Braun Memorial Symposium, 2014 International Elder Law and Policy Conference sponsored by the John Marshall Law School, Roosevelt University of Chicago, and the East China University of Political Science and Law. *Id.*

I. Support for Projections of an Uncompensated Caregiver Gap and Resultant Negative Impact on Cost and Availability of Long-Term Care

Americans spent \$138 billion on institutionalized nursing home care in 2008.¹⁶ Nursing homes offer both skilled and custodial long-term care, and are consequently a relatively expensive form of care.¹⁷ Because nursing homes offer both personal care assistance with activities of daily living, such as feeding, bathing, toileting, etc. and medical care, the staffing required includes supervision by a licensed physician and continuous onsite presence of qualified licensed nurses, in addition to less highly trained aides.¹⁸ As expensive as it is, providing such care in an institutional setting is actually less expensive than attempting to provide comparable care twenty-four hours a day, seven days a week in a home setting.¹⁹ But for many older people, the need for long-term care is not that extensive, particularly where there are relatives available to provide the custodial care that is required. Thus placement in an institution will result in an unnecessary expenditure on healthcare that is in excess of what the person needs. In addition, the clear preference of older persons is to remain in their homes as long as possible and to receive whatever care is needed in the home environment.²⁰ Families have attempted to accommodate this desire, and anecdotal accounts of the sacrifices made by “sandwich generation” caregivers have become commonplace.²¹ A recent report gener-

16. Cynthia Ramnarace, *Cost of Taking Care of Mom and Dad*, AARP BULLETIN (July 18, 2011), <http://www.aarp.org/relationships/caregiving/info-07-2011/caregivers-save-us-health-care-system-money.html>.

17. Shana Siegel & Neil T. Rimsky, *Residential Models for Today's and Tomorrow's Older Adults*, 9 NAELA J. 225, 226 (2013).

18. Joanna Saison et al., *A Guide to Nursing Homes*, HELPGUIDE.ORG (Nov. 2013), http://helpguide.org/elder/nursing_homes_skilled_nursing_facilities.htm.

19. *Id.* The key is determining what the older person's needs are and what level of care is necessary in order to meet those needs. *Id.*

20. KATHRYN LAWLER, JOINT CTR. FOR HOUS. STUDIES OF HARV. U. & NEIGHBORHOOD REINVESTMENT CORP., *AGING IN PLACE: COORDINATING HOUSING AND HEALTH CARE PROVISION FOR AMERICA'S GROWING ELDERLY POPULATION* 14-16 (2001).

21. Among the many examples are author Robert Tell, who spent fifteen years as the caregiver for his widowed mother. Tell chronicles his experience of balancing his work life and psychological well-being against the stress, sadness, and pressure of caring for an aging parent suffering from multi-infarct dementia, a condition that caused her to steadily decline until it resulted in her having to be placed in a nursing home. ROBERT TELL, *DEMENTIA DIARY: A CAREGIVER'S JOURNAL* (Kindle ed. 2006). Author Amy Goyer, a former music therapist, activi-

ated by the AARP Public Policy Institute has determined that the economic value of the long-term care provided by such caregivers in 2009 was equal to \$450 billion, or approximately three times the amount spent on nursing homes during the prior year.²² Further, the 2009 figure represented an increase of \$75 billion over the estimated economic value of such care provided in 2007, or a twenty percent growth over a two-year period.²³ These cost figures were estimates based simply on an average hourly amount of care of less than twenty hours per week for an average caregiver wage of \$11.16 per hour; for comparison, at the 2014 median rate of \$19.00 per hour for homemaker services,²⁴ the cost of such care would increase to \$765 billion.²⁵ The report went on to discuss the economic opportunity costs experienced by the average caregiver to an older person and noted that the cost in terms of the toll on the caregivers' physical and emotional health is significant.²⁶ Those providing care to seniors can expect to spend in excess of ten percent of their own annual income on expenses associ-

ties director, nursing home administrator, and head of AARP's intergenerational and grandparents programs, also shares her experiences, along with those of other caregivers, in caring for her aging parents. She acknowledges that her situation, while stressful, was mitigated by the fact that her employers were at least sympathetic to her plight. See AMY GOYER, *JUGGLING WORK AND CAREGIVING* (Kindle ed. 2013), at Introduction, para. 4-7.

22. LYNN FEINBERG ET AL., AARP PUB. POL'Y INST., VALUING THE INVALUABLE: 2011 UPDATE THE GROWING CONTRIBUTIONS AND COSTS OF FAMILY CAREGIVING 1 (2011), available at <http://assets.aarp.org/rgcenter/ppi/ltc/i51-caregiving.pdf>. For clarification, the \$450 billion figure includes the estimated costs of providing uncompensated long-term care to "all those adults age eighteen and over." Don Redfoot, *Just How Valuable Is Family Caregiving*, AARP PUB. POL'Y INST. (July 19, 2013), <http://blog.aarp.org/2013/07/19/just-how-valuable-is-family-caregiving/print/>. According to the Congressional Budget Office, the estimated cost of uncompensated care provided to just those age sixty-five and older in 2011 was \$234 billion. *Id.*

23. Feinberg et al., *supra* note 22, at 1.

24. See GENWORTH, 2014 COST OF CARE SURVEY 4 (11th ed. 2014), available at https://www.genworth.com/dam/Americas/US/PDFs/Consumer/corporate/130568_032514_CostofCare_FINAL_nonsecure.pdf.

25. This figure is obtained by applying the formula outlined in Appendix A of Feinberg's report, which takes the number of caregivers at any given time (42.1 million in the U.S.) multiplied by the number of estimated hours per caregiver per week (18.4), multiplied by the number of weeks in a year, multiplied by the average caregiver hourly wage. Feinberg, *supra* note 22, at 23. A more modest estimate of \$362 billion can be obtained by using \$9.00, the 2014 national hourly rate for caregivers determined by Payscale, (a company that conducts material market research into pay rates and develops software to help companies determine competitive pay rates). See PAYSACLE, <http://www.payscale.com> (last visited Nov. 3, 2014).

26. Feinberg, *supra* note 22, at 2, 7-8. See also GOYER, *supra* note 21, at Chap. 1, Sec. 3, para. 5.

ated with providing uncompensated care, a cost figure which in 2007 averaged \$5,531 per year per caregiver.²⁷ A caregiver who is over age fifty and who must quit his or her job in order to provide care to a loved one can expect to lose lifetime income and benefits averaging \$303,880.²⁸ Finally, caregiving is stressful, and caregivers are known to be subject to psychological fatigue and mental health issues, with estimates that as high as seventy percent of those providing care to older adults suffer from clinical depression.²⁹

The number of older persons is increasing, as is their projected life expectancy.³⁰ Those born in 2011 can expect to live 78.7 years,³¹ as compared to those born in 1900, who could only expect to live to age 47.³² Projections of life expectancy in 2050 range from 80 to 88 years, depending upon the source of the projection.³³ This represents a global trend, with the United Nations Department of Economic and Social Affairs projecting that the number of persons aged sixty and over will exceed two billion and constitute twenty-two percent of the population by 2050.³⁴ The same dramatic increase in the number of people living to extreme old age is also reflected all over the world.³⁵

At the same time, the number of younger people available to care for those who are older is decreasing.³⁶ As of 2010, there were over 7 people available to serve as possible caregivers for every per-

27. Feinberg et al., *supra* note 22, at 6.

28. *Id.*

29. *Id.* at 7-8.

30. Debra H. Kroll, *To Care or not to Care: The Ultimate Decision for Adult Caregivers in a Rapidly Aging Society*, 21 TEMP. POL. & CIV. RTS. L. REV. 403, 403 (2012). Prof. Kroll notes that as of 2010, there were 1.9 million people age ninety plus, three times the number of those that age in 1980. *Id.*

31. Arialdi M. Miniño, *Death in the United States*, NCHS Data Brief No. 115 (Mar. 2013), available at <http://www.cdc.gov/nchs/data/databriefs/db115.pdf>.

32. Elizabeth Arias, *United States Life Tables, 2008*, 63(3) NAT'L VITAL STATS. REPS., Table 19 (Sept. 24, 2012), available at http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_03.pdf.

33. S. Jay Olshansky, et al., *Aging in America in the Twenty-first Century: Demographic Forecasts from the MacArthur Foundation Research Network on an Aging Society*, 87 THE MILBANK Q. 842, 842-62 (2009); Lauren Cox, *We Will Live Longer in 2050, Study Predicts*, ABC NEWS (Dec. 14, 2009), <http://abcnews.go.com/Health/ActiveAging/humans-live-longer-2050-scientists-predict/story?id=9330511>.

34. U.N. Dep't of Econ. & Soc. Affairs, *Population Ageing and Development: Ten Years After Madrid*, POPULATION FACTS, Dec. 2012, at 1, available at http://www.un.org/esa/population/publications/popfacts/popfacts_2012-4.pdf [hereinafter POPULATION FACTS].

35. *Id.*

36. DONALD REDFOOT ET AL., AARP PUB. POL'Y INST., *THE AGING OF THE BABY BOOM AND THE GROWING CARE GAP: A LOOK AT FUTURE DECLINES IN THE AVAILABILITY OF FAMILY CAREGIVERS* 3 (2013).

son over eighty.³⁷ This ratio actually represented an increase over the prior two decades from 6.6 potential caregivers for every person over eighty in 1990 to 7.2 in 2010, and occurred because the Baby Boomer cohort caused the rate of population increase in the number of younger persons to be greater than the rate of increase of those eighty and over.³⁸ Going forward, however, this trend is expected to reverse as the Baby Boom generation ages.³⁹ Between 2010 and 2030, the number of people aged eighty and over is expected to skyrocket by seventy-nine percent, while the number of caregivers is expected to increase by only one percent.⁴⁰ By 2030, this projected ratio of potential caregivers to older persons is expected to drop to 4.1 to 1, and by 2050 to be as low as 2.9 to 1.⁴¹ These are figures cited for the United States, but global projections in the developed countries reflect much the same trend, with predictions that the ratio of younger persons may fall as low as 3 to 1 in the European countries (Italy, Germany, and Sweden) and in Japan.⁴² Countries in the “Western and South-Central Asia, as well as in sub-Saharan Africa,” are expected to continue with higher ratios, ranging from 5-20 younger persons per older person.⁴³ Worldwide it is expected that the number of older persons will exceed the number of children by 2050, which suggests further shrinkage in the number of caregivers over time.⁴⁴

But does this apparent growing gap between the number of older persons and the number of younger persons necessarily presage a crisis with respect to the provision of long-term care to older persons who need assistance? To the extent that the existing system of long-term care relies so heavily upon the availability of uncompensated caregivers, the answer would seem to be yes. Projecting even the current level of need into the future with less individuals available to meet it will mean the escalation of long-term care costs that must be borne by society as a whole. It is of course possible that an increase in the number of older persons will not necessarily generate greater utilization of long-term care results, particularly if the increased longevity is a product of better overall health, and especially if a cure is found

37. *Id.* at 3.

38. *Id.*

39. *Id.*

40. *Id.* at 5.

41. *Id.* at 5-6.

42. POPULATION FACTS, *supra* note 34, at 4.

43. *Id.*

44. *Id.* at 1-3.

for Alzheimer's Disease.⁴⁵ At the 2013 G8 Dementia Summit held in London, world leaders agreed to work together to fund research aimed at finding a cure for Alzheimer's by the year 2025, pointing to the dramatic success achieved in the fight against AIDS as a model.⁴⁶ Scientists engaged in the study of longevity have concluded that "healthy aging" is less a factor of genetic inheritance than a product of lifestyle choices.⁴⁷ If the spectre of Alzheimer's and dementia can be eliminated, and if longevity ceases to be equated with disability, there is definitely ground for optimism that having a greater number of older people in the population will not necessarily mean that there will be a need for a greater number of caregivers.

On the other hand, even now, both public and private financial resources are strained to pay for the costs of long-term care.⁴⁸ It is estimated that seventy percent of older people will require some type of long-term care during their remaining lifetimes and that the average older person will require three years of such care, at a lifetime cost

45. On a global scale, the annual cost of caring for persons with Alzheimer's and dementia is estimated at \$604 billion, a figure that exceeds the GNP of "all but 20 nations and represents one percent of total global economic output." George Vradsburg, *George Vradsburg: Alzheimer's, a ticking time bomb*, COM. APPEAL MEMPHIS, Oct. 13, 2013, <http://www.commercialappeal.com/news/george-vradsburg-alzheimers-a-ticking-time-bomb>. If no cure is found, the number of persons expected to be stricken with such cognitive impairments is expected to triple by 2050. *Id.*

46. Press Release, Global CEO Initiative, World Leaders Make Historic Commitment to Stop Dementia by 2025 at Landmark G8 Summit (Dec. 11, 2013), <http://www.usagainstalzheimer.org/press/world-leaders-make-historic-commitment-stop-dementia-2025-landmark-g8-summit>. See also UK DEP'T OF HEALTH, *G8 dementia summit concludes with international agreement to work together*, GOV.UK (Dec. 12, 2013), <http://dementiachallenge.dh.gov.uk/2013/12/12/g8-dementia-summit-agreements>.

47. Bruce Grierson, *6 Lessons on Living Longer and Staying Sharp From a Nonagenarian Track Star*, PARADE MAG., Dec. 28, 2013, at 1, available at <http://communitytable.com/245849/brucegrierson/6-lesson-on-living-longer-and-staying-sharp-from-a-nonagenarian-track-star>, (discussing the traits and lifestyle choices of "super seniors"—elders who have retained significant physical and mental ability into their eighties and nineties, apparently as a consequence of having incorporated healthful patterns of sleeping, exercising, eating and remaining engaged with the world around them). See also Nancy Churnin, *Americans are living longer but not as long as other countries*, COM. APPEAL MEMPHIS, Jan. 13, 2014, at M1, available at <http://www.commercialappeal.com/lifestyle/big-hed-here-jj-20140321022831400> (discussing the lifestyle changes that seniors aged fifty-five to seventy-five can adopt to improve their health and longevity).

48. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-05-564T, LONG-TERM CARE FINANCING: GROWING DEMAND AND STRAINING FEDERAL AND STATE BUDGETS (2005).

ranging from \$63,000 to \$260,000.⁴⁹ Such costs are in excess of what many are able to pay, and thus about thirty percent of older people must turn to Medicaid (or public assistance) to fund the cost.⁵⁰ The growth of home and community based care options as an alternative to institutionalized nursing home care has been as much a response to cost containment initiatives as it has been to consumer desire to age in place.⁵¹ As a result of “increased demands and budget cuts for home and community-based services,” informal, unpaid caregivers are having to shoulder an increasing level of the care that is provided outside of an institutional setting.⁵² In addition to the deleterious effect that the stress of caregiving has been demonstrated to have on the caregiver’s health, there is also evidence to suggest the existence of an indirect relationship between caregiver stress and elder abuse.⁵³ In any event, common sense would suggest that the quality of care provided by a fatigued, distressed, depressed, and uncompensated caregiver is probably less than optimal, even if that person loves the older person dearly.⁵⁴ Therefore, even if there is reason for some optimism that the projected caregiver gap may not be quite as catastrophic as some be-

49. DONALD REDFOOT & WENDY FOX-GRAGE, AARP PUB. POL’Y INST., MEDICAID: A PROGRAM OF LAST RESORT FOR PEOPLE WHO NEED LONG-TERM SERVICES AND SUPPORTS 1–2 (2013), available at http://www.aarp.org/content/dam/aarp/research/public_policy_institute/health/2013/medicaid-last-resort-in-sight-AARP-ppi-health.pdf.

50. *Id.* at 2.

51. Lawler, *supra* note 20, at 15.

52. Feinberg et al., *supra* note 22, at 9.

53. LISA NERENBERG, NAT’L CTR. ON ELDER ABUSE, PREVENTING ELDER ABUSE BY FAMILY CAREGIVERS 8–10 (2002), available at <http://www.ncea.aoa.gov/Resources/Publication/docs/caregiver.pdf>; see also Sue Lanza, *When Caregiver Stress Leads To Abuse*, ELDERCARELINK, <http://www.eldercarelink.com/Other-Resources/Caregiving-Support/danger-at-home-when-caregiver-stress-leads-to-abuse.htm>.

54. It is important to note that the fact of being uncompensated does not appear to be the critical factor with respect to the quality of care issue. There are studies that in fact suggest that care provided by volunteers in health care settings may actually result in the perception of higher quality service by those receiving the care. R.B. Hotchkiss, et al., *Valuing Volunteers: The Impact of Volunteerism on Hospital Performance*, 32(2), HEALTH CARE MGMT. REV. 119, 119–28 (2009); Eve M. Block et al., *Got Volunteers? Association of Hospice Use of Volunteers with Bereaved Family Members’ Overall Rating of the Quality of End-of-Life Care*, Vol. 39(3) J. PAIN & SYMPTOM MGMT. 502, 502–06 (2010). That being said, however, because caregivers often have to perform extensive caregiving functions on top of maintaining full time jobs outside the home, adoption of programs that provide compensation for family caregivers would surely help in alleviating some of the stress that caregivers experience. Feinberg et al., *supra* note 22, at 15; see also Bridget Haeg, *The Future of Caring for Elders in Their Homes: An Alternative to Nursing Homes*, 9 NAELA J. 237, 242–47 (2013).

lieve, a critical need for mechanisms that can offer greater support and relief to uncompensated, informal caregivers already exists.

II. Uncompensated Long-Term Care: What Type of Care is Being Provided and Who is Providing It?

Before discussing how to address a projected future scarcity of available uncompensated care, it may be helpful to consider what kind of care is being provided and who it is that is willing to devote such a significant amount of time towards providing such care without being paid.⁵⁵ Those providing uncompensated long-term care are basically performing the following services:

- 1) social interaction and reassurance;
- 2) housekeeping;
- 3) paying bills and handling insurance issues;
- 4) personal care, such as dressing and bathing;
- 5) routine in-home nursing procedures (changing dressings, Foley catheter maintenance, etc.);
- 6) medication administration;
- 7) coordination of care;
- 8) employing and supervision of in-home care workers;
- 9) obtaining information from and talking with health professionals;
- 10) advocating for the patient;
- 11) ensuring the implementation of the patient's plan of care; and
- 12) assisting with and ensuring continuity when transitions in care are required.⁵⁶

These tasks do not require the services of a highly skilled healthcare professional; they are largely personal, custodial care services that can be provided by the average layperson.⁵⁷ Within the institutional nursing home setting, these services are typically provided by registered nurses, licensed practical and vocational nurses, certified

55. According to a report generated by the U.S. Department of Health and Human Services, uncompensated "informal" caregivers provide the bulk of long-term care services, and are expected to continue to do so. U.S. DEP'T. OF HEALTH & HUMAN SERVS., REPORT TO CONGRESS ON THE FUTURE SUPPLY OF LONG TERM CARE WORKERS IN RELATION TO THE AGING BABY BOOM GENERATION 3 (2003), available at <http://aspe.hhs.gov/daltcp/reports/lcwork.pdf>.

56. Feinberg et al., *supra* note 22, at 4–5. See also GOYER, *supra* note 21, at Ch. 1, sec. 2, para. 1.

57. GOYER, *supra* note 21, at Ch. 1, sec. 2, para. 1.

nursing aides, orderlies or attendants, home health aides and personal care aides.⁵⁸ Such employees are paid wages ranging from close to minimum wage to close to \$30 per hour,⁵⁹ all of which is absorbed into the \$77,380 overall median annual cost of receiving care in such a facility.⁶⁰ Regardless of whether the provider is an informal caregiver or a professional healthcare worker, these services are critical. A patient requiring long-term care must receive this kind of custodial care assistance with activities of daily living, in addition to whatever skilled care they receive, in order to survive.⁶¹ If no skilled care is necessary, these services may constitute the only care that is required, but they are essential to the patient's health and survival.⁶²

Unsurprisingly, the individuals who provide such care for free in a community setting generally consist of spouses and/or domestic partners, children, siblings and other relatives or very close friends of the patient.⁶³ The profile for a "typical" caregiver in the United States is a "forty-nine-year-old woman who works outside the home and spends nearly twenty hours per week providing unpaid care to her mother for nearly five years."⁶⁴ As of 2009, there were 42.1 million such caregivers who were consistently assisting other adults, with the

58. U.S. DEP'T OF HEALTH & HUMAN SERVS., *supra* note 55, at 17–23.

59. U.S. BUREAU OF LABOR STATS., OCCUPATIONAL OUTLOOK HANDBOOK (2014), available at <http://www.bls.gov/ooh/healthcare/home.htm>; see also *Staff Nurse-RN-Nursing Home*, SALARY.COM, <http://www1.salary.com/Staff-Nurse-RN-Nursing-Home-salary.html> (last visited Nov. 3, 2014).

60. GENWORTH, *supra* note 24, at 5. Some estimates place the average annual nursing home cost at over \$90,000. See *Five Key Facts about the Delivery and Financing of Long-Term Services and Supports*, KAISER FAMILY FOUNDATION, (Sept. 13, 2013), <http://kff.org/medicaid/fact-sheet/five-key-facts-about-the-delivery-and-financing-of-long-term-services-and-supports/>.

61. Saison, *supra* note 18, at 1–2.

62. For just a sampling of the egregious harm that arises due to neglect (and abuse) of the elderly in nursing homes, see Amanda Bassen, *Patient Neglect in Nursing Homes and Long-Term Care Facilities in New York State: The Need for New York to Implement Programs and Procedures to Combat Elder Neglect*, 8 CARDOZO PUB. L. POL'Y & ETHICS J. 179, 180–88 (2009); and David R. Hoffman, *Failing to Care: How Effective Compliance Prevents Institutional Elder Neglect*, 10 MARQ. ELDER'S ADVISOR 1, 3–7 (2008).

63. U. S. DEP'T OF HEALTH AND HUMAN SERVS., INFORMAL CAREGIVING: COMPASSION IN ACTION 5–10 (1998), available at <http://aspe.hhs.gov/daltcp/reports/carebro2.pdf>; see also Nerenberg, *supra* note 53, at 4–5; Redfoot et al., *supra* note 36, at 1; KAISER FAMILY FOUNDATION, *supra* note 60. The vast majority of working caregivers (72%) are taking care of their parents; 7% care for grandparents, 5% for a spouse, 5% for friends, 3% for a sibling, 2% for an aunt or uncle, and 5% for other more distant relatives. GOYER, *supra* note 21, at ch. 1, sec. 3, para. 4.

64. Feinberg, et al., *supra* note 22, at 1.

number spiking to 61.6 million if expanded to include those who were called upon to provide such care at some point during the year.⁶⁵ The provision of unpaid care by family members is considered to be the natural outgrowth of familial affection,⁶⁶ and it is also a legal obligation on the part of spouses.⁶⁷ Experts that have written on the topic of imposition of a legal obligation on adult children to furnish long-term care to aging parents concede that no consensus currently exists and that enforcement of filial responsibility laws is inconsistent both within the United States and internationally.⁶⁸

Instead, the provision of uncompensated care to older family members has seemingly arisen out of a tradition of families caring for each other, not only in the United States, but globally.⁶⁹ In European Union nations, over eighty percent of all long-term care to the elderly is provided by family caregivers.⁷⁰ In Great Britain, where nursing home care is free, family caregivers still elected to furnish the equivalent of \$86 billion in U.S. dollars for uncompensated care to their elderly relatives.⁷¹ In Asian countries, anywhere from sixty-eight percent to ninety percent of the elderly receive financial support from younger family members.⁷² In Latin American countries, between eighty-five percent and ninety-three percent of the elderly received

65. *Id.*

66. GOYER, *supra* note 21, at Forward, para. 1–2.

67. *See generally* 41 C.J.S. *Husband & Wife* § 66 (2013).

68. *See generally* Seymour Moskowitz, *Adult Children and Indigent Parents: Intergenerational Responsibilities in International Perspective*, 86 MARQ. L. REV. 401 (Winter 2002); Usha Narayanan, *The Government's Role in Fostering the Relationship Between Adult Children and Their Elder Parents: From Filial Responsibility Laws to...What?, A Cross-Cultural Perspective*, 4 ELDER L. J. 369 (1996); Katherine C. Pearson, *Filial Support Law in the Modern Era: Domestic and International Comparison of Enforcement Practices for Laws Requiring Adult Children to Support Indigent Parents*, 20 ELDER L. J. 1 (2012); Allison E. Ross, Note, *Taking Care of Our Caretakers: Using Filial Responsibility Laws to Support the Elderly Beyond the Government's Assistance*, 16 ELDER L. J. 167 (2008).

69. Moskowitz, *supra* note 68, at 406–08; *see also* Edwin Rosenberg et al., *Informal Caregiving: Cross-Cultural Applicability of the Person-Environment Model*, 18(4) HEALTH SOC'Y REV. 399, 400–01 (2009).

70. FREDERIQUE HOFFMAN & RICARDO RODRIGUES, EUROPEAN CENTRE FOR SOCIAL WELFARE POLICY AND RESEARCH, *INFORMAL CARERS: WHO TAKES CARE OF THEM?* 3 (2010), available at http://www.euro.centre.org/data/1274190382_99603.pdf.

71. Jane Koppelman, *A Cross-National Comparison of Caregiving Policies*, THIRD INTERNATIONAL CONFERENCE ON FAMILY CARE, 3 (2002), <http://www.caregiving.org/data/conferencereport.pdf>.

72. *See* PETER UHLENBERG, ED., *INTERNATIONAL HANDBOOK OF POPULATION AGING* 658 (2009).

some sort of help from younger relatives.⁷³ In Africa, the picture becomes more complex. The high number of HIV/AIDS cases among the generation that would have constituted the adult children of those who are now elderly has caused many elderly members to serve as caregivers to their own adult children, or as caretakers of the grandchildren left orphaned.⁷⁴

Part of the tradition of uncompensated care may have arisen out of the fact that families all over the world used to be composed of intergenerational households.⁷⁵ At the beginning of the twentieth century in the United States, the majority of seniors were a part of intergenerational households, living under the same roof with adult children and grandchildren.⁷⁶ Increasing societal mobility brought dramatic change by the beginning of the twenty-first century, with intergenerational households decreasing to just twelve percent by 1980.⁷⁷ The recent economic downturn, a trend toward later marriage, and an influx of immigrants from Latin America and Asia, areas which have a strong cultural inclination to favor multi-generational households, have resulted in a slight trend upward in the number of people living with extended family members to 16.1% as of 2008,⁷⁸ but this is offset by the growth in the number of people age sixty-five and older who live alone. In 1900, only 5.9% of older adults lived by themselves; as of 2008, 27.4% did so.⁷⁹ When one considers the increasing geographic separation of family members, the increase in the rate of divorce, and consequent alienation from children born of the former marriage(s), growth in the number of older persons living alone seems logical.⁸⁰ There has also been a decrease in the overall birth rate and increase in the number of those elderly persons who are either childless or who have outlived their children.⁸¹ These trends not only impact the num-

73. *Id.*

74. *Id.*

75. Moskowitz, *supra* note 68, at 403; INT'L LONGEVITY CTR. GLOBAL ALLIANCE, GLOBAL PERSPECTIVES ON INTERGENERATIONAL HOUSEHOLDS AND RELATIONS 6 (2012), available at http://www.ilcfrance.org/realisations/docs/2011/annexe_5-Global_Alliance_Intergenerational_Relations.pdf.

76. *The Return of the Multi-Generational Household*, PEW RES. CENTER (Mar. 18, 2010), available at www.pewsocialtrends.org/files/2010/10/752-multi-generational-families.pdf.

77. *Id.*

78. *Id.* at 1–2.

79. *Id.* at 6.

80. UHLENBERG, *supra* note 72, at 653–54.

81. *Id.* at 648–50.

ber of persons available to serve as uncompensated caregivers, but also impact the number of persons who will be willing to serve as caregivers for those seniors who are alone, without a spouse or close relative, for whatever reason.⁸²

III. What Long-Term Care Options Exist for Those Who Lack Available Uncompensated Caregivers?

Because much of what is provided in the form of long-term care is custodial in nature, traditional healthcare insurance has not included coverage for such care.⁸³ Many seniors are stunned to discover that Medicare offers very limited long-term care coverage, and although long-term care insurance is available for purchase, it is expensive and remains underutilized.⁸⁴

Medicaid will provide coverage, but only to those who have exhausted their income and assets to a point where they qualify as either categorically or medically needy.⁸⁵ Long-term care insurance, Medicare, and Medicaid do offer in-home benefits in the form of home health care and home—and community—based care, but the benefits provided do not cover the cost of in-home care provided on a twenty-four hour, seven day a week basis.⁸⁶ Thus, in order for these vehicles to support residential long-term care, it is virtually a requirement that the older person have someone available to furnish the supplemental services that will not be included in what these programs provide.

82. Feinberg et al., *supra* note 22, at 10.

83. *Who Pays for Long-Term Care*, U.S. DEP'T OF HEALTH AND HUMAN SERVS., <http://longtermcare.gov/the-basics/who-pays-for-long-term-care/>; U.S. ADMIN. ON AGING, NATIONAL CLEARINGHOUSE FOR LONG-TERM CARE INFORMATION 4, available at <http://www.nasud.org/documentation/hcbs2011/Presentations/M2RegencyC.pdf>.

84. Redfoot & Fox-Grage, *supra* note 49, at 2–3; see also HOMECARE PLANNING SOLUTIONS, Long-Term Care, <http://www.hpsny.com/about/long-term-care>.

85. *Eligibility*, CTRS. FOR MEDICARE AND MEDICAID SERVS., <http://www.medicaid.gov/Medicaid-CHIP-Program-Information/By-Topics/Childrens-Health-Insurance-Program-CHIP/CHIP-Eligibility-Standards.html> (last visited Nov. 3, 2014).

86. *Long Term Services & Support*, CTRS. FOR MEDICARE AND MEDICAID SERVS., <http://www.medicaid.gov/Medicaid-CHIP-Program-Information/By-Topics/Long-term-services-and-supports/Long-Term-Services-and-Support.html> (last visited Nov. 3, 2014).

There are a number of programs that have been developed in an effort to facilitate caregiving and to support caregivers.⁸⁷ Some have focused on providing economic support to caregivers in the form of kinship care payments, tax breaks, and personal care contracts.⁸⁸ Other approaches have sought to foster intergenerational households and communities both among families and among older and younger people who are not related by family or previous friendship ties.⁸⁹ Pursuit of these efforts is laudable, and critical to the creation of a system of sustainable long-term care, but still fails to address the probability that even with such support the number of persons requiring care may far outstrip the number of those willing to serve as uncompensated providers, particularly for those seniors that are most vulnerable. Over a decade ago, the ABA Commission on Law and Aging conducted a study examining the plight of the “unbefriended” elderly, who were described as “incapacitated and alone,” lacking any relative or friend willing or able to even make health care decisions on their behalf, much less to engage in any other aspect of caregiving.⁹⁰ These individuals were already receiving long-term care in an institutional setting, and their number was estimated to constitute between three to four percent of the overall nursing home population, a percentage deemed to be “significant” and involving about sixty thousand persons nationwide.⁹¹ In the event that consent is required for treatment beyond routine care for such persons, the nursing home or

87. Haeg, *supra* note 54, at 242–46; Narayanan, *supra* note 68, at 396–402; *Getting the Government to Pay Family Caregivers*, NAT’L CARE PLANNING COUNCIL (Mar. 19, 2008), <http://www.longtermcarelink.net/article-2008-3-19.htm>.

88. *Id.*

89. Candace Baldwin, *The Village Movement: Creating Solutions to Support Aging in Place*, 35 NO. 1 BIFOCAL 14, at 15 (Sept.–Oct. 2013); Siegel & Rimsky, *supra* note 17, at 227–31; Alyson Martin & Nushin Rashidian, *For Veterans, an Alternative to the Nursing Home*, N.Y. TIMES July 18, 2012, <http://newoldage.blogs.nytimes.com/2012/07/18/for-veterans-an-alternative-to-the-nursing-home/>; *Medical Foster Homes*, DEP’T OF VETERANS AFFAIRS http://www.va.gov/GERIATRICS/Guide/LongTermCare/Medical_Foster_Homes.asp (last visited Nov. 3, 2014); *Multigenerational Households*, GENERATIONS UNITED <http://www.2.gu.org/OURWORK/Multigenerational/MultigenerationalHouseholdInformation.aspx> (last visited Nov. 3, 2014); *Multi-generational Houses Bring Young and Old Together* DEUTSCHLAND, (Feb. 21, 2013), <http://www.deutschland.de/en/topic/life/society-integration/multi-generation-houses-bring-young-and-old-together>.

90. NAOMI KARP & ERICA WOOD, A.B.A. COMM’N ON LAW & AGING REP., INCAPACITATED AND ALONE: HEALTH CARE DECISION-MAKING FOR THE UNBEFRIENDED ELDERLY (2003), available at http://www.americanbar.org/content/dam/aba/administrative/law_aging/2003_Unbefriended_Elderly_Health_Care_Decision-Making-7-11-03.authcheckdam.pdf.

91. *Id.* at 13.

other health care provider must look to “de facto” decisionmakers: persons who by virtue of direct involvement in the situation,⁹² nomination by statute or other legal process,⁹³ or service on an institutional ethics committee,⁹⁴ find themselves responsible for determining what someone they do not know would want with respect to his or her healthcare.⁹⁵ One can only speculate as to how many of these “unbefriended” elderly might have been able to remain living in the community had they been fortunate enough to have spouses, family members, or friends willing to provide uncompensated assistance and support.⁹⁶ Absent volunteer caregivers, the ability to live outside of an institution and receive community based long-term care is contingent upon one’s ability to pay for the twenty-four hour custodial care that will be needed, in addition to whatever home health and other supportive services Medicare and Medicaid are willing to provide.⁹⁷ By definition, Medicare will only pay for home health services if the Medicare beneficiary’s need for nursing care is “intermittent” or part-time. This means that services are needed less than seven days a

92. These “de facto” decision makers include physicians, hospital and nursing home social workers, and Adult Protective Services workers, among others. *Id.* at 18.

93. All states now have statutes that establish a procedure for the selection of surrogate health care decision makers, either through judicial process or by some extra-judicial mechanism. LAWRENCE A. FROLIK & RICHARD L. KAPLAN, *ELDER LAW IN A NUTSHELL* at 44–52, 253–56 (6th ed. 2014); A.B.A. COMM’N ON LAW & AGING, *MAKING MEDICAL DECISIONS FOR SOMEONE ELSE: A HOW TO GUIDE 4* (2009), available at http://www.americanbar.org/content/dam/aba/uncatergorized/2011/2011_agomg_bk_proxy_gen.authcheckdam.pdf. Such decision makers may include persons having no familial or nonprofessional ties to the patient, but as a general rule, they are persons with sufficient connection to the patient that they are willing to accept the responsibility for making very personal decisions on behalf of the person, as well as to serve without compensation. Karp & Wood, *supra* note 90, at 1.

94. Karp & Wood, *supra* note 90, at 18.

95. Of course, objective standards exist for making such decisions, and even family members must sometimes resort to such standards in the absence of detailed knowledge of the patient’s wishes. Linda S. Whitton & Lawrence A. Frolik, *Surrogate Decision-Making Standards For Guardians: Theory and Reality*, 2012 UTAH L. REV. 1491, 1510–15; ABA COMM. ON LAW AND AGING, *supra* note 93, at 6. Where family members are involved, however, the patient still has the benefit of a decision maker who is emotionally vested in the patient’s welfare. Karp & Wood, *supra* note 90, at 1.

96. Feinberg et al., *supra* note 22, at 8–9; U.S. DEP’T OF HEALTH AND HUMAN SERVS., *supra* note 63, at 12–15.

97. KAISER FAMILY FOUNDATION, *supra* note 60, at 1–2.

week and less than eight hours per day.⁹⁸ A beneficiary having greater need would not be eligible and would be relegated to private pay home health or entry into a nursing home if an uncompensated caregiver was not there to fill in during the time that the paid home health aides are not there.⁹⁹ Although Medicaid does provide home and community based long-term care supports and services to assist those in need of long-term care who want to remain in their homes, the home health, personal care, rehabilitative therapy, adult day care, case management, transportation and respite care services that are provided all presuppose that there will be a primary caregiver who is either uncompensated or paid through some other means.¹⁰⁰ The situation is much the same throughout the world.¹⁰¹ In European Union countries, similar to the United States, informal caregivers provide the majority of long-term care services for the elderly.¹⁰² While medical services are generally free in the United Kingdom, personal and custodial care services are classified as “social services” and are provided according to a person’s ability to pay.¹⁰³ Consequently, an older person can receive free care in an institutionalized setting. However, there will be a charge for long-term care supportive services if one wishes to try to remain in the community.¹⁰⁴ In France, family caregivers supply eighty percent of the total long-term care received.¹⁰⁵ In countries outside Europe, the same expectation that younger family members will care for older ones as their health declined continues to exist, and is

98. CTRS. FOR MEDICARE AND MEDICAID SERVS., MEDICARE AND HOME HEALTH CARE 6 (2010), available at <http://www.medicare.gov/Publications/Pubs/pdf/10969.pdf>.

99. *Id.*

100. KAISER FAMILY FOUNDATION, MEDICAID’S ROLE IN MEETING THE LONG-TERM CARE NEEDS OF AMERICA’S SENIORS 1–2 (2013), available at <http://kaiserfamilyfoundation.files.wordpress.com/2013/02/8403.pdf>; Haeg, *supra* note 44, at 240–42.

101. ELIZABETH MESTHENEOS & JUDY TRIANTAFILLOU, EUROFAMCARE, PAN-EUROPEAN BACKGROUND REPORT (2005), http://www.ukc.de/extern/eurofamcare/documents/nabares/peubare_a5.pdf.

102. Hoffman & Rodrigues, *supra* note 70, at 3; Mestheneos & Triantafillon, *supra* note 101.

103. Koppelman, *supra* note 71, at 3.

104. *Id.* The UK does provide an Invalid Care Allowance, equal to \$69 per week in U.S. dollars, to caregivers that provide a minimum of thirty-five hours per week of caregiving services. *Id.*

105. INT’L LONGEVITY CTR. GLOBAL ALLIANCE, *supra* note 75, at 17.

reflected in the prevalence of informal caregiving as a major source of long-term care, whether governmental assistance is provided or not.¹⁰⁶

The more discomfoting possibility is that the number of elderly needing long-term care will exhaust the number of those younger persons willing to provide care even when paid to do so, at least at existing pay rates, which people already cannot afford.¹⁰⁷ As will be discussed more fully below, the existing strain on the long-term care system caused by increasing costs, coupled with the decreasing availability and morale of quality custodial nursing care employees, has been the catalyst for the development of various technological devices designed to both decrease costs and ease the stress and burden of chronic and continuous custodial long-term care. With the options for institutional long-term care being overloaded, use of technology to ease the burden seems inevitable.

IV. A Sampling of Technological Alternatives for Personal Caregiving Services

As people age, the occurrence of a fall is one of the principle risk factors that leads to serious injury and hospitalization due to hip and other bone fracture.¹⁰⁸ Elders may be at risk for falling due to a variety of factors, including muscle weakness, poor balance, uneven

106. Australia provides two cash allowances for eligible caregivers: a Carer Allowance of approximately \$6 per day in U.S. dollars regardless of means and an additional means-tested Carer Payment that is more substantial and is intended to furnish subsistence income to fulltime caregivers that have had to relinquish employment outside the home. Koppelman, *supra* note 71, at 5. Israel provides no direct support, but does allow for a tax credit; Canada provides for both a stipend and a tax credit. *Id.* at 5–6. Japan does not provide for any income support but did pass a mandatory Long-Term Care Insurance law with benefits that do cover both residential and in-home long-term care. *Id.* at 6. In countries as diverse as Argentina, the Czech Republic, the Dominican Republic, India, Singapore, and South Africa, strong cultures of family loyalty ensure that a majority of long-term care is provided by informal caregivers. INT’L LONGEVITY CTR. GLOBAL ALLIANCE, *supra* note 75, at 9, 12, 15, 20, 33–34, and 38–39.

107. Kaiser Comm’n on Medicaid and the Uninsured, *Five Key Facts About the Delivery and Financing of Long-Term Services and Supports*, THE HENRY J. KAISER FAMILY FOUND. (Sept. 13, 2013), <http://kff.org/medicaid/fact-sheet/five-key-facts-about-the-delivery-and-financing-of-long-term-services-and-supports/>; see also Kelly Greene, *Are You Overpaying for Your Parents’ Care?*, WALL ST. J., July 20, 2013, at B9.

108. Sharwari Kulkarni & Mainak Basu, *A Review on Wearable Tri-Axial Accelerometer Based Fall Detectors*, 1 J. BIOMED. ENG’G & TECH. 36, 36 (2013); see also *Technologies for Remote Patient Monitoring for Older Adults*, CTR. FOR TECH. & AGING 1, 15 (2010), available at <http://www.techandaging.org/RPMpositionpaperDraft.pdf>.

gait, postural hypertension, impaired vision, dementia, and side effects of medications.¹⁰⁹ Falls can occur at any time or any place, but over fifty percent of falls occur while the elderly person is at home, engaged in normal activities.¹¹⁰ Consequently, there are a number of technological devices aimed at either preventing falls or detecting and locating a person after a fall has occurred, so that immediate assistance can be provided.¹¹¹ Examples of such devices include things as simple as a push button or cord attached to a bracelet or necklace worn by the senior, or a “big button” cell phone, with oversize, backlit buttons, pre-programmed to call 911 or the caregiver.¹¹² Of course, such devices presume that the senior will still be conscious after the fall, and both physically and mentally capable of pushing the button or pulling the cord. In the event that the older person suffered from dementia, or was rendered unconscious by the fall, such a device would not be effective.

So, rather than depending on the senior to trigger the device, more sophisticated fall detection technologies rely on strategically placed pressure and motion sensors on “walls, ceilings, . . . floorboards and furniture,” in conjunction with a “wearable” accelerometer¹¹³ and/or gyroscope¹¹⁴ fastened to the older person.¹¹⁵ Should the device detect or perceive motion on the part of the older person that it identifies as constituting a fall,¹¹⁶ then, courtesy of an application called iFall that can be uploaded on to the older person’s Android smart phone, a message will be sent to the person, who can

109. *Falls and Older Adults: Causes and Risk Factors*, NIH SENIOR HEALTH, (Jan. 2013), <http://nihseniorhealth.gov/falls/causesandriskfactors/01.html>.

110. *Id.*

111. Nell Bernstein, *Aging in Place Gadgets*, CARING.COM, (Oct. 24, 2014), <http://www.caring.com/checklists/useful-gadgets-for-elderly>.

112. *Id.* at *1–3.

113. A tri-axial accelerometer detects falling by collecting and measuring a person’s motion “in three dimensions” (e.g., vertically, horizontally and diagonally). Kulkarni & Basu, *supra* note 108, at 36. Such a device can easily be worn embedded in a wrist watch. *Id.* at 38.

114. A gyroscope is a “mechanical or optical device used to maintain orientation during motion.” *Gyroscope Definition*, MERRIAM-WEBSTER ONLINE FREE DICTIONARY, <http://www.merriam-webster.com/dictionary/gyroscope> (last visited Nov. 3, 2014).

115. CTR. FOR TECH. & AGING, *supra* note 108, at 17.

116. *Id.* As these devices were being developed, the challenge was to create a technology that could distinguish between the motions involved when the older person would pick a piece of paper up off the floor and an actual fall. The technology is now at a level where at least one study “found that use of an accelerometer device can discriminate between falls and ADLs [activities of daily living] with a sensitivity of 97.5% and a specificity of 100%.” *Id.*

then respond to cancel the alert if there was not in fact a fall, or if no assistance is required despite the fall.¹¹⁷ If the user fails to respond, the phone will send text alerts to preprogrammed contact persons.¹¹⁸ A more sophisticated application, entitled "Lively," has recently been developed that determines the older person's "daily routine" and notifies the caregiver if it detects deviation from that routine in the person's behavior.¹¹⁹ There is also "Grand Care," which enables a caretaker to custom program a set of behavioral parameters into the device, such as the older person's failure to get up at a certain time or departure from the premises after a certain time in the evening, that will result in an alert being sent.¹²⁰ The presence of this sort of technological oversight provides reassurance that the older person is safe and behaving normally.

In addition to detecting falls and detecting evidence of abnormal behavior, research is being conducted to see if this kind of technology can also be used to monitor an older person's "functional activity" level for purposes of designing, implementing and assessing the efficacy of various prescription drug and hormone therapies and programs of rehabilitation intended to preserve or improve functional ability.¹²¹ Because aging is associated with functional decline, which in turn is associated with increased incidence of "disability, dependency, falls, and mortality," studies aimed at developing effective strategies and treatments to counteract functional decline are ongoing.¹²² Research on objective measurement of the effectiveness of these experimental therapies conducted on subjects remaining in their homes has either been lacking or has been limited in the past. Researchers have depended on questionnaires completed by the test subjects or, at best, on video recordings of the subjects' movements while at home in or-

117. Wouter Stomp, *iFall: An Android Fall Detection App*, MEDGADGET.COM, available at http://www.medgadget.com/2010/04/ifall_an_android_fall_detection_app_1.html/.

118. *Id.*

119. Heather Somerville, *Silicon Valley Poised to Take Lead on Technology for Seniors*, SAN JOSE MERCURY NEWS, June 21, 2013, http://www.mercurynews.com/ci_23514687/silicon-valley-poised-to-take-lead-technology-seniors.

120. Eric A. Taub, *The Technology for Monitoring Relatives*, N.Y. TIMES, July 28, 2010, http://www.nytimes.com/2010/07/29/garden/29hometech.html?pagewanted=all&_r=0.

121. R.C. Wagenaar, et al., *Continuous Monitoring of Functional Activities Using Wearable, Wireless Gyroscope and Accelerometer Technology*, BOS. UNIV., MCL Technical Report No. 04-03-2011, available at <http://hulk.bu.edu/pubs/papers/2011/TR-2011-04-13.pdf>.

122. *Id.* at 2.

der to assess whether or not the subject's functional ability is in fact increasing as a consequence of a particular drug or therapy.¹²³ The ability of these wearable accelerometer and gyroscope technologies to accurately identify and measure the duration and frequency of functional activities like "sitting, standing, lying, transfers, and walking" on the subjects while they are at home or out in the community will make them an extremely valuable research tool.¹²⁴

Similarly, such technologies could potentially enable health care providers to assess and corroborate the level of compliance with prescribed treatments, particularly those requiring the patient to perform a certain number of repetitions of a rehabilitative movement or exercise at a given set of intervals.¹²⁵ Wearable devices could ensure that the patient is performing the exercise properly, and could presumably be programmed to emit a signal alerting the patient if the patient's movements do not conform to what has been prescribed.¹²⁶ The data generated would help the patient's physician in determining the extent to which a treatment's failure was attributable to the inefficacy

123. *Id.* at 2.

124. *Id.* at 5.

125. Studies indicate that patient compliance with medication regimens can be described by what is called the "rule of 1/6", i.e. that compliance falls into six categories, as follows: 1) 1/6th of patients are almost perfectly adherent; 2) 1/6th will take all doses, but may not always do so at the prescribed intervals; 3) 1/6th occasionally miss a single daily dose and be irregular as to the time when medication is taken; 4) 1/6th will simply discontinue taking medication altogether for several days or weeks on a quarterly basis, with some skipping of dosages even when taking the medication regularly; 5) 1/6th may discontinue medication altogether for several days or weeks on a monthly basis and skipping dosages even when taking the medicine; and 6) 1/6th take minimal or no medication, but may claim that they are compliant if asked. John Urquhart, *The Electronic Medication Event Monitor: Lessons for Pharmacotherapy* 32 CLIN. PHARMACOKINET. 345, 345 (1997). Rates of non-compliance with rehabilitative exercise regimens range from a low of nine percent to a high of sixty percent, with approximately twenty to thirty percent failing to even appear for the appointments they have scheduled. Duane Millslagle, *Compliance to Rehabilitation: The Patient and Physical Therapist*, at 7, Fall 2009, <http://www.d.umn.edu/~dmillsla/documents/PTpresentationf09.pdf>. Compliance with recommended therapeutic life-style changes, such as diet and exercise, can be as low as twenty percent to thirty percent. Jing Lin, et al., *Factors Affecting Therapeutic Compliance: A Review From the Patient's Perspective*, 4 THERAPEUTIC AND CLINICAL RISK MGMT. 269, 269-70 (2008), available at http://www.dovepress.com/articles.php?article_id=1300.

126. See Press Release, PR Newswire, Study Shows Leaf Healthcare Wearable Sensor Dramatically Improves Compliance with Pressure-Ulcer Prevention Efforts (Oct. 15, 2014), available at <http://www.prnewswire.com/news-releases/study-shows-leaf-healthcare-wearable-sensor-dramatically-improves-compliance-with-pressure-ulcer-prevention-efforts-279291272.html>.

of the treatment itself as opposed to lack of compliance on the part of the patient.¹²⁷

It should be noted that “medication adherence” technology is already being developed to monitor patient compliance with the taking of prescription medications, where patient noncompliance has been a long standing issue.¹²⁸ Such technologies include “smart packaging” that clearly delineates the appropriate timing and dosage, and provides cues, such as individual wrapping and color-coding of pills set in a calendar format, supplemented by electronic prompts in the form of flashing lights or text messages that remind the patient to take the medication.¹²⁹ In addition to serving as a reminder, the newest smart packages are able to store and transmit data concerning whether the patient has taken the medicine; as with the iFall technology, in the event the medication is not opened at the prescribed time, a wireless text or email reminder messages can be transmitted to the patient and/or to family members or other pre-programmed recipients.¹³⁰

Of course, simply because a medication is removed from its packaging still does not guarantee that it has actually been taken by the patient. To the extent that the patient and his or her caregivers sincerely want to comply with taking the medication, the use of such technology would be extremely helpful in increasing adherence. Patients whose noncompliance is deliberate, however, can easily circumvent smart packaging technology by simply opening the package and disposing of the medicine.¹³¹ In order to address this, and to ease the burden on caregivers dealing with this kind of resistance on the part of an elderly patient with diminished capacity, “smart pills” containing an “edible microchip” have been developed and are actually available to consumers in the United States, Europe, and Great Brit-

127. *Id.*

128. Katherine Boshinski Sparks, *Medication Adherence Technology: Medicine of the Future, Emerging Privacy Concern*, 28 J. CONTEMP. HEALTH L. & POL'Y 324, 324–25 (2012). As Sparks notes, the “misuse and nonuse of prescription medication is rampant” and is “particularly a problem for the elderly population.” *Id.* at 326. Older people are more likely to be taking multiple medications and thus having a more complicated medication schedule to deal with than younger persons, while simultaneously having visual, mobility, and cognitive impairments that make coping with such details more difficult. *Id.*

129. *Id.* at 328.

130. *Id.* at 329.

131. Helen L. Figge, *Electronic Tools to Measure and Enhance Medication Adherence*, U.S. PHARM. (Apr. 20, 2011) available at <http://www.uspharmacist.com/content/s/162/c/27847/>.

ain.¹³² The patient ingests medication in pill form, and the pill will contain a miniature edible sensor, which is activated after the pill is swallowed by contact with stomach acids and either sends a message to a receiver patch attached to the patient's arm or transmits it directly to a computer.¹³³ The receptor device then decodes the message and transmits health data that the sensor has collected, plus information concerning when the patient should take the next dose to the patient's smart phone, the health provider's office, or to family members.¹³⁴

Caregiving to elders with Alzheimer's is particularly challenging, especially with those patients whose disease has progressed to the point that they will wander and become lost if not kept under constant supervision.¹³⁵ Wearable radio tracking devices in the form of bracelets and pendants are available, which sound an alarm to alert the caregiver if the elderly person travels beyond a certain distance, as do wearable electronic GPS tracking applications, which may be monitored remotely by the caregiver.¹³⁶ Use of this technology is non-invasive and effective, assuming that the older person is wearing the device. However, in those instances where the person with Alzheimer's removes or forgets to wear the tracking device, there is nothing that can be done except to organize a search party. To guard against this kind of risk, the FDA has approved what is called "Radio Frequency Identification" technology, or RFID, which consists of subcutaneously injected microchip that would enable a caregiver to identify and track the location of the elderly person at all times.¹³⁷ The

132. Ariana Eunjung Cha, 'Smart Pills' with Chips, Cameras, and Robotic Parts Raise Legal, Ethical Questions, WASH. POST, May 24, 2014, http://www.washingtonpost.com/national/health-science/smart-pills-with-chips-cameras-and-robotic-parts-raise-legal-ethical-questions/2014/05/24/6f6d715e-dabb-11e3-b745-87d39690c5c0_story.html; Jenny Hope & Claire Bates, *On Sale, Smart Pill with 'Edible Microchip' that Tells You and Your Doctor When the Next Dose is Due*, DAILY MAIL, (Jan. 17, 2012), <http://www.dailymail.co.uk/health/article-2087275/New-smart-pill-tells-patients-dose-due>.

133. Cha, *supra* note 132.

134. Leo Sun, *Will Smart Pills Revolutionize Health Care?*, DAILY FINANCE (Sept. 12, 2012 10:56 AM), <http://www.dailyfinance.com/2013/09/11/will-smart-pills-revolutionize-health-care/>.

135. *Wandering and Getting Lost*, ALZHEIMER'S ASS'N, <http://www.alz.org/care/alzheimers-dementia-wandering.asp> (last visited Nov. 3, 2014).

136. *10 Ways to Prevent Wandering*, WEBMD, <http://www.webmd.com/brain/10-ways-to-prevent-wandering> (last visited Nov. 3, 2014).

137. Sparks, *supra* note 128, at 341-42. See also Andy Greenberg, *Want An RFID Chip Implanted Into Your Hand? Here's What The DIY Surgery Looks Like*, FORBES (Aug. 13, 2012), <http://www.forbes.com/sites/andygreenberg/2012/08/13/want-an-rfid-chip-implanted-into-your-hand-heres-what-the-diy-surgery-looks-like-video/>.

FDA has warned that RFIDs may interfere with the operation of a pacemaker or other health-related devices that are electronically based.¹³⁸ In addition, there are animal studies on laboratory mice and rats dating from the 1990s suggesting that implantation of RFIDs might lead to cancer.¹³⁹ Although RFIDs have been approved, their use in humans in the United States has been virtually nil, and largely confined to use of external RFID technology on things like passports and driver's licenses.¹⁴⁰

Returning to the *Robot & Frank* scenario described at the beginning, one of the most compelling revelations portrayed within the movie is Frank's devastating loneliness.¹⁴¹ As an elderly retiree, he spends day after day living by himself in a home that now contains way more space than he needs and which is located in a rural area, separated from any close neighbors.¹⁴² Although he receives calls from his adult children on a voice activated telescreen and a weekly in person visit from his son, the calls are infrequent and the once a week visit is largely consumed with his son trying to get everything done that needs to be done in order to prepare Frank for the following week.¹⁴³ In short, like many older people trying to remain living independently in the community, Frank is isolated and seriously deprived of human contact.¹⁴⁴ Studies have shown that this social deprivation and isola-

138. Sparks, *supra* note 128, at 343.

139. Todd Lewan, *Chip Implants Linked To Animal Tumors*, WASH. POST, Sept. 8, 2007, http://www.washingtonpost.com/wp-dyn/content/article/2007/09/08/AR2007090800997_pf.html.

140. Margaret Hu, *Biometric ID Cybersurveillance*, 88 IND. L.J. 1475, 1500–03 (2013). Sparks, *supra* note 128, at 342–43; Crystal Spivey, *Breathing New Life Into HIPAA's UHID-Is The FDA's Green Light To The Verichip™ The Prince Charming Sleeping Beauty Has Been Waiting For?*, 9 DEPAUL J. HEALTH CARE L. 1317, 1334–42 (2006). The controversy engendered by the development and marketing of an implantable RFID by Verichip™ for purposes of assisting in the supervision and care of Alzheimer's patients (among other beneficial uses) was so vitriolic that Verichip™ ceased production of the RFID in 2010. The company has changed its name to Positive ID and abandoned the RFID marketing effort, at least for the present, choosing to concentrate instead on technological devices aimed at "biological detection and diagnosis." *Positive ID Corporation Changes Ticker Symbol to PSID and Unveils New Logo*, ADVFN (Nov. 11, 2009), http://www.advfn.com/news_PositiveID-Corporation-Changes-Ticker-Symbol-to-PS_40310613.html. See also POSITIVE ID CORPORATION, <http://positiveidcorp.com> (last visited Nov. 3, 2014).

141. ROBOT & FRANK, *supra* note 1.

142. *Id.*

143. *Id.*

144. SOL ENCEL ET AL., CONSULTATIVE COMM. ON AGING, KEEPING IN TOUCH: OLDER PEOPLE LIVING ALONE 7–8, 11–13 (1996), available at http://www.maca.nsw.gov.au/_data/assets/pdf_file/0015/141531/Keeping_in_touch.pdf; Jill M. Burke, *The Effect of Social Isolation and Aging in Place*, AGE IN PLACE <http://>

tion have an adverse effect on the health of older persons.¹⁴⁵ Are there any actual technological developments designed to supplement and/or replace the psychological stimulation and emotional companionship provided by human caregivers?

Although there are none quite as sophisticated as Frank's robot, the surprising answer is yes.¹⁴⁶ On the simpler end of the scale, there is the PARO robot, a fluffy robotic pet seal weighing 5.9 pounds with huge expressive eyes and facial features designed to exhibit happiness and surprise.¹⁴⁷ Studies have shown that the presence of pets, such as dogs, cats, birds or rabbits, either in one's home or in an institutional setting, has a positive effect on the residents, calming those who suffer from anxiety and reducing behavior arising from agitation in those suffering from dementia.¹⁴⁸ In addition, pets may help decrease depression, and give residents a feeling of connection.¹⁴⁹ To the extent that residents have needed medication to cope with anxiety, agitation or depression, the presence of pets has generally resulted in a reduced need for the medications.¹⁵⁰ This in turn yields benefits in the form of reduced medication costs and reduced problems generated by

ageinplace.com/elderly-health/the-effect-of-social-isolation-and-aging-in-place/ (last visited Nov. 3, 2014); Sarah J. Stevenson, *Dangers of Seniors Living Alone*, A PLACE FOR MOM (Apr. 2, 2013), <http://www.aplaceformom.com/blog/2013-4-1-dangers-of-seniors-living-alone/>.

145. Erin York Cornwell & Linda J. Waite, *Social Disconnectedness, Perceived Isolation, and Health Among Older Adults*, 50 J. HEALTH & SOC. BEHAV. 31, 31-33 (2009); Dara Korkin et al., *Loneliness, Lack of Emotional Support, Lack of Companionship, and the Likelihood of Having a Heart Condition in an Elderly Sample*, 24(4), ANNALS OF BEHAV. MED. 290, 290-91, 294-97 (2002).

146. Louise Aronson, *The Future of Robot Caregivers*, N.Y. TIMES, July 19, 2014, at SR4, available at <http://www.nytimes.com/2014/07/20/opinion/sunday/the-future-of-robot-caregivers.html>.

147. Elise Worthington, *Fluffy Robot Seals Comfort Dementia Patients in Nursing Homes*, ABC NEWS (Nov. 20, 2013), <http://www.abc.net.au/news/2013-11-20/robot-seals-help-dementia-patients-5104582>.

148. Marian R. Banks & William A. Banks, *The Effects of Animal-Assisted Therapy on Loneliness in an Elderly Population in Long-Term Care Facilities*, 57 7 J. GERONTOLOGY: MED. SCIENCES M428, M431-32 (2002); Erin Courtenay, *Pet Therapy Provides Far-reaching Health Benefits for Older Adults*, EVERYDAY HEALTH (July 16, 2008), <http://www.everydayhealth.com/longevity/emotional-wellness/pet-therapy.aspx>; Barbara Sharnak, *Pets for the Elderly: A Therapeutic Match*, EVERYDAY HEALTH (Aug. 1, 2009), <http://www.everydayhealth.com/pet-health/pets-for-the-elderly.aspx>.

149. Giovanni Colombo, et al., *Pet Therapy and Institutionalized Elderly: A Study on 144 Cognitively Unimpaired Subjects*, 42 ARCHIVES GERONTOLOGY & GERIATRICS 207, 214 (2006); Sharon L. Bass, *Nursing-Home Pets A Boon to Residents*, N.Y. TIMES, June 1, 1986, available at <http://www.nytimes.com/1986/06/01/nyregion/nursing-home-pets-a-boon-t-residents.html>.

150. Worthington, *supra* note 147.

the negative side effects of such medications, which often include falls, increased confusion, over-sedation, and other effects.¹⁵¹ Of course, the presence of live animals within an institutional setting raises its own set of problems: some residents may either be allergic to the animal, or may be afraid or uncomfortable around animals, and someone must be tasked with seeing to it that the animal is fed, properly exercised, and is otherwise cared for to prevent it from becoming diseased or ill.¹⁵² These collateral concerns can be avoided by adoption of the PARO technology, which was developed by Professor Takanori Shibata with the National Institute of Advanced Industrial Science and Technology.¹⁵³

Another option is the GeriJoy “virtual elder care companion,” which basically consists of the adaptation and programming of a tablet computer to provide “conversational companionship and pet therapy” as well as care management services that family members can access remotely.¹⁵⁴ GeriJoy was developed by Massachusetts Institute of Technology researchers Victor Wang and Shuo Deng as an assistive device to provide constant reassurance, reminders, and re-orientation assistance to older persons suffering from mild cognitive impairment.¹⁵⁵ At the 2013 TEDMED conference, CEO Wang announced his intention to provide GeriJoy in other languages besides English, being especially interested in pursuing a Chinese version to help older persons like his own grandmother.¹⁵⁶

151. *Id.*

152. Bass, *supra* note 149. Prof. Wendy Moyle, Director of the Research Centre for Clinical and Community Practice Innovations at Griffith University in Queensland, Australia found that the nursing home patients that she studied responded well to the PARO technology, and noted that therapeutic animals often become stressed by being placed in a nursing home because residents may shower them with too much attention all at once and overfeed them. She further found that even though the residents were fully informed that the seal was a robot, over time the residents clearly came to think of it as being alive, and to interact with it in ways that not only indicated reduced anxiety and agitation but actual enjoyment and improved quality of life, concluding, “people who hadn’t communicated for a couple of years start actually communicating through the use of the PARO; so very exciting results from that small pilot.” Worthington, *supra* note 147.

153. Worthington, *supra* note 147.

154. GERIJOY, INC., <http://www.gerijoy.com/> (last visited Nov. 3, 2014).

155. *GeriJoy’s Virtual Elder Care Companions to be Available for Chinese Seniors and Families; CEO Victor Wang Visits China as Part of Exclusive Entrepreneurial Delegation*, PRWEB (Apr. 25, 2013), <http://www.prweb.com/releases/elder-care-companion-pets/tedmed-chinese-investment/prweb10669723.htm>.

156. *Id.*

More ambitious and sophisticated interactive robotic devices are also being developed. Mamoru, a diminutive table-top robot about the size of a large cookie jar, was designed by researchers at the University of Tokyo to help older persons to “remember where they left their remote control or their slippers,” and to help in reminding them both when it is time to take medications and of the fact that they have already taken medications in the event they should forget.¹⁵⁷ Mamoru contains a wide-angle camera lens that scans the room that it is in and employs image recognition software to identify and track the location of items within the room.¹⁵⁸ When the older person picks up a bottle of medicine, Mamoru recognizes that the bottle is medication, and further recognizes, records, and verbally announces to the older person the fact that he or she has actually taken the medication.¹⁵⁹ Should the older person return a half hour later, having forgotten whether or not he or she has taken the medication, Mamoru will speak up and advise the older person that the medication was in fact already taken, the time at which it was taken, and how many hours and/or minutes ago that the event took place.¹⁶⁰

For elders that are no longer able to feed themselves due to physical disability, the Japanese have developed a “My Spoon” robotic device that eases the burden on caregivers and increases independence by enabling the elderly person to push a button or manipulate a joystick that activates an automated spoon that will transport food from the plate to the person’s mouth.¹⁶¹ Most recently, a voice activat-

157. Kevin Hall, *Mamoru, Japan’s Helpful Little Assistant for the Elderly*, DVICE (Dec. 15, 2008, 12:04 PM), http://www.dvice.com/archives/2008/12/mamoru_japans_h.php.

158. *Id.*

159. *Id.*

160. *Id.* The reader is invited to see Mamoru in action on YouTube. NTDTV, *Japanese Robots for Forgetful Elderly*, YOUTUBE (Feb. 25, 2009), <http://www.youtube.com/watch?v=NtD2vwV61-w> (originally aired on New Tang Dynasty TV).

161. Ryoji Soyama et al., 8 *Selectable Operating Interfaces of the Meal-Assistance Device “My Spoon,”* in *ADVANCES IN REHABILITATIVE ROBOTICS*, 155, 155–56 (Z.Z. Bien & D. Stefanov, eds., 2004); Bill Christensen, *My Spoon Robot On Full Auto*, <http://www.technovelgy.com/ct/Science-Fiction-News.asp?NewsNum=850>. In addition to the “My Spoon” device, there are a number of robotic feeding systems: the “Handy 1”; the “Winsford feeder”; the “Neater Eater”; the “Meal Buddy”; and the “Mealtime Partner.” See Won-Kyung Song & Jongbae Kim, *Novel Assistive Robot for Self-Feeding*, in *ROBOTIC SYSTEMS-APPLICATIONS, CONTROL AND PROGRAMMING* 43, 43–45, (Ashish Dutta, ed., 2012), available at <http://www.intechopen.com/books/robotic-systems-applications-control-and-programming/novel-assistive-robot-for-self-feeding>.

ed version has been designed by Isao Wakabayashi, a Japanese undergraduate attending Chukyo University.¹⁶² Caregiver support is still required for food preparation and cleaning of the device after use, but the technology clearly makes mealtime a less arduous experience for both caregiver and patient.

Although not currently available for general consumer use, so-called “humanoid” robots are being developed that are intended to provide assistance to elderly persons still living in their homes with instrumental activities of daily living, like common household chores that have become a stumbling block for the older person, either because of physical disability or cognitive impairment.¹⁶³ An example is “Domo,” designed by Aaron Edsinger, former engineer and Ph.D candidate with the MIT Humanoid Robotics Group.¹⁶⁴ Domo is equipped with cameras located inside its eyes that enable it to continuously capture and record information concerning its environment, and it contains approximately a dozen computer components that absorb the information and update the unit’s database.¹⁶⁵ According to Edsinger, this culminates in a robot that is capable of “visually sens[ing] what it’s working with and adapt[ing] how it behaves based on what it is working with.”¹⁶⁶ This adaptive aspect makes Domo especially interesting: unlike other humanoid robots, for example Japan’s Wakamaru robot,¹⁶⁷ or Nao,¹⁶⁸ developed by a French company,

162. *Voice-Activated Robot Follows Voice Commands To Choose Your Next Bite*, GIZMOWATCH (May 23, 2011), <http://www.gizmowatch.com/entry/voice-activated-robot-follows-voice-command-to-choose>.

163. See *Robots: The Next Generation: Robots That Do the Chores*, SCI. DAILY (Aug. 1, 2007), http://web.archive.org/web/20130503073059/http://www.sciencedaily.com/videos/2007/0808-robots_the_next_generation.htm.

164. HUMANOID ROBOTICS GROUP, <http://www.ai.mit.edu/projects/humanoid-robotics-group/> (last visited Nov. 3, 2014). Edsinger is co-founder of several cutting edge robotic development companies, as well as the Roboticist Director at Google. LINKEDIN, *See Profile: Aaron Edsinger*, LINKEDIN <http://www.linkedin.com/pub/aaron-edsinger/4/5a5/516> (last visited on Nov. 3, 2014). *Robots: The Next Generation: Robots That Do the Chores*, SCI. DAILY (Aug. 1, 2007) http://web.archive.org/web/20130503073059/http://www.sciencedaily.com/videos/2007/0808-robots_the_next_generation.htm [hereinafter *Robots That Do the Chores*].

165. *Robots That Do the Chores*, *supra* note 164.

166. *Id.* at *1.

167. Wakamaru, manufactured by Mitsubishi, is a “robot receptionist” programmed to recognize a vocabulary of about ten thousand words, to respond in basic sentences, to recognize faces and to avoid obstacles in its path. *Japanese Robot Receptionists for Hire*, SPACE DAILY (June 14, 2007), http://www.spacedaily.com/reports/Japanese_Robot_Receptionists_For_Hire_999.html. The reader can view how Wakamaru was show-cased in the United States by Uniqlo at its retail

both of which are preprogrammed to respond to set environmental prompts,¹⁶⁹ Domo is programmed instead to adjust its responses depending on input received from the environment.¹⁷⁰ Domo will calculate and determine the size of an object, and then make a judgment concerning what shelf space is large enough to accommodate it and where on that shelf it should be placed in relation to other objects.¹⁷¹ Thus, instead of having to function according to a pre-determined script, Domo “can take the lead and adapt to a situation,” eliminating the need for training and input from the user.¹⁷² Although not yet ready to release for consumer use, it is hoped that one day Domo and other such humanoid robots will serve as in-home assistants to elderly persons, performing simple household tasks, such as putting away groceries or dishes.¹⁷³

store in SoHo, where the robot served as combination of welcoming host, tour guide and novelty, answering simple questions from browsing customers. NEWYORKTOKYO2000, *New York –Tokyo Wakamaru @ Uniqlo on CWII’s Totally Tam-sen*, YOUTUBE (Oct. 16, 2008), <http://www.youtube.com/watch?v=IJ4M1AHj40o>.

168. Nao is a “robot assistant” manufactured by Aldebaran Robotics, and presently designed to be used for educational, therapeutic, and research purposes. ALDEBARAN ROBOTICS, <http://www.aldebaran-robotics.com/en/#> (last visited Nov. 3, 2014). A video of the attempt to use Nao as a “robotic butler” inside a home with appliances programmed to respond to Nao’s commands illustrates both how far technology has come and how excruciatingly far it still has to go before such robots will come close to functioning effectively as caregivers. Naresh Marturi, *Integration of the Humanoid Robot Nao Inside A Smart Home*, YOUTUBE (Apr. 26, 2010), <https://www.youtube.com/watch?v=snIdenidcUI>.

169. Tabuchi, *supra* note 10.

170. Bill Christensen, *Domo Robot No Mere Housekeeper*, TECHNOVELGY.COM, <http://www.technovelgy.com/ct/Science-Fiction-News.asp?NewsNum+1003>.

171. Aaron Ladd Edsinger, *Robot Manipulation in Human Environments*, at 31–32, 205–07 (Jan. 2007) (unpublished Ph.D. dissertation, on file with Massachusetts Institute of Technology), available at http://people.csail.mit.edu/edsinger/doc/edsinger_thesis_defense_2006.pdf.

172. *Robots That Do the Chores*, *supra* note 164.

173. *Id.* Other “service robot” prototypes that are under development include the previously mentioned “Roboy,” designed by researchers at the University of Zurich’s Artificial Intelligence Laboratory; Kompai, designed by Robosoft, a French company, and Carebot, designed by GeckoSystems, an American company. See KURZWEIL ACCELERATING INTELLIGENCE, *supra* note 9; Brian T. Horowitz, *Cyber Care: Will Robots Help The Elderly Live At Home Longer?*, SCI. AM. (June 21, 2010), <http://www.scientificamerican.com/article.cfm?id=robot-elder-care&print=true>.

V. Legal and Ethical Issues Raised By Use of Technological Caregivers

Despite their arguable benefits, use of the foregoing technological devices raises a number of legal and ethical concerns. To facilitate discussion, these concerns will be divided into three main areas: 1) privacy; 2) quality of care; and 3) bioethical considerations.

A. Privacy issues—The Challenge of Keeping So Much Information Confidential

The dramatic shift in the medical field over the past decade from the use of paper files and records to electronic ones has already engendered both a vast literature and federal legislative response to issues of privacy and confidentiality.¹⁷⁴ The Health Insurance Portability and Accountability Act of 1996 (HIPAA)¹⁷⁵ and regulations promulgated pursuant thereto,¹⁷⁶ are intended to safeguard “individually identifiable health information” from unintended and unapproved disclosure by an entity that is subject to the law.¹⁷⁷ Covered entities include health insurance plans, healthcare information “clearinghouses” (data processing companies that transform or process healthcare information from non-standard to standard formats, and vice versa, for purposes of transmittal between health plans and health providers), or healthcare providers.¹⁷⁸ A technological caregiving device, such as an accelerometer, smart pill, or robot, would therefore not appear to be included within the definition of a covered entity for HIPAA purposes.¹⁷⁹ Such devices are clearly not health plans or health information clearinghouses, and although they are arguably providing healthcare services, do not fall within the current HIPAA

174. ARTHUR PEABODY, JR., HEALTH CARE IT 177–303 (2013); Sharon Hoffman & Andy Podgurski, *Balancing Privacy, Autonomy and Scientific Needs in Electronic Health Research*, 65 SMU L. REV. 85 (Winter 2012); Sarah S. Mir, *HIPAA Privacy Rule: Maintaining the Confidentiality of Medical Records, Part 2*, 13 No. 3 J. HEALTH CARE COMPLIANCE 35 (May-June 2011).

175. Pub. L. No. 104–191, 110 Stat. 1936 (1996), codified at 42 U.S.C. § 1302(a), 42 U.S.C. § 1320d–1320d-9 (2012).

176. 45 C.F.R. §160.101 *et seq* (2013).

177. Jenna Caldarella, *Privacy and Security of Personal Health Records Maintained by Online Health Services*, 20 ALB. L.J. SCI. & TECH. 203, 212 (2010).

178. *Id.* at 212–14.

179. *Id.* at 213–14.

definition of a healthcare provider.¹⁸⁰ The HIPAA definition basically requires that a health care provider be a “person”;¹⁸¹ the decision could be made to either include technological devices within the purview of HIPAA law, or perhaps more appropriately, new legislation could be crafted to deal with the specific privacy issues created by the use of a given technological device.

At the outset, it should be noted that the encroachment upon privacy that results as a consequence of use of this technology is a by-product of what has been termed “self-surveillance.”¹⁸² The accumulation of private information is occurring as a result of the patient’s voluntary use of a given device to meet his or her own needs, and is not the result of any intrusion by government or corporate entities.¹⁸³ Thus, the use of an iFall or GeriJoy device allows for the collection, storage and transmission of an immense amount of confidential data, all provided through the willing, if not altogether knowing, participation of the patient.¹⁸⁴ At a minimum, protective legislation should es-

180. See 42 U.S.C. § 1320d(3) (2012) which defines a “health care provider” as “a provider of services (as defined in section 1395x(u) of this title), a provider of medical or other health services (as defined in section 1395x(s) of this title), and any other person furnishing health care services or supplies.”

181. *Id.*

182. Jerry Kang, et al., *Self-Surveillance Privacy*, 97 IOWA L. REV. 809, 814–15 (March 2012).

183. *Id.* at 814–15.

184. *Id.* The extent to which people either “forget” or are unaware that the technological devices they use are not private is astonishing: daily we read in the paper about thieves who use the very cell phones they have purloined, apparently unaware that the GPS within the device will enable law enforcement to find them, criminals who post incriminating evidence on Facebook, and derelict employees who use company computers for various illicit activities. See Amy B. Crane, *Workplace Privacy? Forget It!*, NAT’L WORKRIGHTS INST. (July 18, 2005), <http://workrights.us/?portfolio=workplace-privacy-forget-it>. Unless provided under the employer’s policy, courts have uniformly held that employees have no reasonable expectation of privacy using workplace computers, and thus are not constitutionally protected from search and seizure by the Fourth Amendment; Lauren Hansen & Peter Weber, *9 Suspected Criminals Who Got Themselves Caught Via Social Media* [updated], THE WEEK (May 13, 2013), <http://theweek.com/article/index/227257/7-suspected-criminals-who-got-themselves-caught-via-facebook>; Vivian Ho, *Did Oakland Robber Take Selfie on Stolen Phone?*, SF GATE (Dec. 27, 2013), <http://blog.sfgate.com/crime/2013/12/27/did-oakland-robber-take-selfie-on-stolen-phone/>; Andrew Jones, *Police Surveillance Uses GPS Tracking To Find Criminals*, BOLO 411 (Aug. 9, 2013), <https://www.bolo411.com/police-surveillance-uses-gps-tracking-to-find-criminals/>; Travis Torney, *Denville NJ Police Use GPS Device To Catch Cell Phone Thief*, MORRISTOWN NEW JERSEY CRIMINAL LAW POST (Sept. 11, 2013), <http://www.morristownnjcriminallawpost.com/theft-and-fraud-offenses/denville-nj-police-use-gps-device-to-catch-cell-phone-thief/>; See Robin Miller, Annotation, *Employee’s Expectations of Privacy in the Workplace*, 18 A.L.R. 6th 1, 21 (2014).

establish a standard that conditions a patient's agreement to use of the technology upon informed consent that includes discussion of the privacy implications, including the potential ramifications of the misuse of information as a result of unintended disclosure or wrongful breach. Guidelines requiring the incorporation of heightened security through password protection and encryption of any stored or transmitted data should be enacted to guard against hacking and misappropriation of confidential information.¹⁸⁵

However, there is reason to fear that these sorts of security measures will still fall short, particularly with respect to safeguarding individually gathered health information from discovery by subpoena.¹⁸⁶ To avoid this kind of involuntary disclosure, Professor Jerry Kang and colleagues have proposed the creation of "Personal Data Vault," a secure site analogous to a virtual safety deposit box, managed by a professional Personal Data Guardian, or PDG.¹⁸⁷ The PDG would be a licensed, certified, regulated privacy professional who would be responsible for secure maintenance of information relating to the individual's personal health, and would consequently be entitled to assert a privilege of confidentiality on behalf of his or her clients.¹⁸⁸

B. Privacy Issues—Health Care Monitoring—Third Party Surveillance

The presence of a caregiver implies that the older person requires assistance with and monitoring of his or her health care status. It is the caregiver's job to see that the older person takes his or her medicine in a timely fashion, has not fallen and injured him or herself, and receives any assistance with Instrumental Activities of Daily Living (IADLs) or Activities of Daily Living (ADLs) that may be required. In the ordinary course of things, such "third party surveillance"

185. Juliana Bell, *Privacy at Risk: Patients Use New Web Products To Store and Share Personal Health Records*, 38 U. BALT. L. REV. 485, 493–94 (2009); Arthur Peabody, Jr., *supra* note 174, at 269–86; Sharona Hoffman & Andy Podgurski, *supra* note 174, at 137–38.

186. Kang et al., *supra* note 182, at 833–34, citing a Colorado personal injury case where the trial court ordered the MySpace, Facebook, and Meetup.com websites to honor subpoenas issued by the defendant seeking information relating to the activities engaged in by the injured plaintiffs.

187. *Id.* at 828–29.

188. *Id.* at 829–33.

would not be perceived as either intrusive or oppressive, if performed with the informed consent of the older person or, in the event the older person lacks the capacity to consent, if performed pursuant to the directives of a surrogate decisionmaker acting in the older person's best interests. But clearly such monitoring could become both intrusive and oppressive in the event that the older person is a very private person and does not wish to have such detailed information concerning his or her care to be known to anyone. As it has been observed, it is one thing to tell one's physician that one had taken a certain medication and within a few days had a bowel movement of a certain color; it is quite another to ingest a "smart pill" containing a computer chip that can store and then transmit to potentially anyone the precise moment that it was both ingested and excreted.¹⁸⁹ The contemplation of such an intimate disclosure might make anyone feel a tad queasy. As with many other technological innovations, simply because we now can produce or employ a certain technology does not necessarily mean that we should. Is it really necessary to know this much information? Would it not be enough to record that the medicine was taken and then successfully expelled without having to note the precise moment that either event took place? The necessity of the knowledge would of course be a medical determination, and then, if it were determined to be medically necessary, the decision of whether or not to use technology that would deliver such information, or to use less precise means, should be a matter of informed consent for the patient. Where and for how long the information should be stored should also be examined. If the information indicates that all has gone as it should, it would seem that this simple fact could be all that is stored, with the remainder detail deleted in order to respect and preserve as much of the older person's privacy interests as possible.

189. Sparks, *supra* note 128, at 334–35.

C. Privacy Issues—Health Care Monitoring—Sanctions and Compulsion

As already discussed above, collection and storage of data obtained from monitoring an elderly person's health should facilitate compliance with the taking of medications and adherence to other recommended treatments, which would in turn result in improved health for the older person and decreased costs. But what if the older person has made the knowing, if arguably ill-advised, decision that noncompliance with certain recommended treatments is the course that he or she wishes to pursue? Should this noncompliance result in the imposition of sanctions that affect the older person's access to health care? It is already the case that private health insurance carriers may predicate entitlement to discounted premiums to those insureds that comply with the carrier's "wellness" program, which generally consists of recommendations to quit smoking, lose weight, increase exercise, etc.¹⁹⁰ With the passage of the Patient Protection and Affordable Care Act,¹⁹¹ which prohibits insurance companies from denying coverage based on pre-existing health conditions,¹⁹² health insurers can no longer reduce costs by eliminating those persons whose existing poor health render them high risk. Consequently, insurance companies have an obvious interest in finding other strategies that will enable them to reduce their costs. Although a patient's noncompliance with treatment or with provider recommendations, may save money or be a neutral cost factor in the short run, in the long run the predictable detriment to the patient's health can be expected to cause costs to increase. But at this point, federal laws limit the extent to which a health insurance plan can base rewards or penalties on either "inherited traits" possessed by, or adherence to "specific health standards" imposed on the insured.¹⁹³ There does not appear to be any le-

190. Carey Goldberg, *Can My Company's Wellness Program Really Ask Me To Do That?*, WBUR (Sept. 28, 2012), <http://commnhealth.wbur.org/2012/09/wellness-program-legal-limits>.

191. Pub. L. No. 111-148, 124 Stat. 119.

192. 42 U.S.C. § 300gg-1 (2012).

193. See Jessica L. Roberts, "Healthism" *A Critique of the Antidiscrimination Approach to Health Insurance and Health-Care Reform*, 2012 U. ILL. L. REV. 1159, 1177-89. The Genetic Information Nondiscrimination Act (GINA) of 2008, Pub. L. No. 110-233, 122 Stat. 881, prohibits discrimination on the basis of genetic information. The Health Insurance Portability and Accountability Act (HIPAA) of 1996, Pub. L. No. 104-191-110 Stat. 1936, limits the extent to which employer group health insurance

gal impediment to an insurer's decision to differentiate between insured persons on the basis of conduct, however. This explains the growth of the aforementioned "wellness" programs, designed to target behavior as permitted by law, as opposed to imposition of standards and requirements targeting traits and characteristics, which is illegal.

If insurance companies now view wellness programs as an integral component of cost containment, it only stands to reason that they may have an interest in requiring the use of technology that will assist them in determining whether or not there has been compliance by the insured. Although private insurance coverage is a matter of contract, the law is clear that participation in a "wellness" program must be "voluntary."¹⁹⁴ But there does not appear to be any prohibition against an insurance company's rewarding an insured's consent to the use of "smart" pills and other technology to monitor compliance. It will be up to the elderly person to decide whether the reward is worth the privacy intrusion.

What about entitlement to coverage of government sponsored or administered healthcare programs? At some point in the future, will a senior citizen who has just signed up for Medicare be told that he or she must go on a stringent, low-cholesterol diet, and that further, he or she must consent to the use of a technological device of some kind that will enable the person's healthcare provider to ascertain whether or not the patient has adhered to the diet? Will Medicare be able to deny coverage to a beneficiary or terminate benefits for which the older person would otherwise be eligible, on grounds of such noncompliance? Although there is no constitutional right to healthcare under the U.S. Constitution, Medicare is a federally created entitlement program, and so there are constitutionally protected due process and equal protection rights to receipt of the benefits by those

plans can deny coverage to employees with pre-existing medical conditions. HIPAA nondiscrimination provisions further prohibit any denial of coverage or surcharge based on "health status, genetic history, . . . or claims experience" between otherwise "similarly situated" individuals." See Michelle M. Mello & Meredith B. Rosenthal, *Wellness Programs and Lifestyle Discrimination—The Legal Limits*, 359 NEW ENG. J. MED. 192, 193 (2008). Finally, the Americans with Disabilities Act, as amended, Pub. Law No. 110-325 (2008), prohibits discrimination on the basis of disability, and provides that health insurers may only base coverage and underwriting decisions on disability if they are predicated on "sound actuarial principles or . . . actual or reasonably anticipated experience." *Id.* at 194-95.

194. Mello & Rosenthal, *supra* note 193, at 197.

who are eligible.¹⁹⁵ But, as with any other benefit, noncompliance with rules and regulations governing the program are a basis for termination or denial. For example, it is already the case that a person whose disability stems from abuse of alcohol or drugs will be denied eligibility for Social Security and SSI disability benefits.¹⁹⁶ In addition, Social Security regulations require all recipients of disability benefits, whatever the cause of the disability, to adhere to recommended treatment prescribed by their treating physicians or risk a finding of ineligibility or termination of benefits on the basis of non-disability.¹⁹⁷ Currently, there are no Medicare rules or regulations that penalize or sanction a beneficiary for non-compliance with a doctor's orders, but it is not too great a stretch to imagine a future in which such rules or regulations might be enacted, particularly if there is technology available that would enable a health care provider to irrefutably determine whether or not there had been compliance. In order to further such a policy, could it also be expected that Medicare might require a beneficiary to submit to the "injection or ingestion" of a "microchip-equipped pill" to monitor the beneficiary's compliance?¹⁹⁸ If this approach were taken, the courts would presumably uphold a beneficiary's right to refuse, on grounds that the government's forcing patients to acquiesce with such a requirement would constitute an unconstitutional "search and seizure" under the Fourth Amendment.¹⁹⁹ There is some cause for concern however, even as to this, in light of the Supreme Court's 2013 ruling upholding warrantless genetic or DNA testing in the case of

195. Erin C. Fuse Brown, *Developing A Durable Right To Health Care*, 14 MINN. J. L. SCI. & TECH. 439, 448–51 (2013).

196. 42 U.S.C. § 423(d)(2)(C) (2012). Under prior law, those with disabilities related to abuse of alcohol or drugs were required to obtain rehabilitative treatment for the addiction, and failure to do so would result in termination or suspension of benefits. 20 C.F.R. § 404.1536(a)(1)–(3) (2013); see also Warnecke Miller & Rebecca Griffin, *Adjudicating Addicts: Social Security Disability, The Failure to Adequately Address Substance Abuse, and Proposals For Change*, 64 ADMIN. L. REV. 967, 975 (2012). With the passage of the 1994 Social Security Independence and Programs Improvements Act, Congress limited the right to receipt of Social Security and SSI disability benefits for those whose disabilities were alcohol or drug-related to a maximum of three years. *Id.* at 976. Finally, in 1996, Congress eliminated eligibility for disability benefits in any case where it could be established that alcoholism or substance abuse materially contributed to the disabling condition. *Id.* at 977; 20 C.F.R. § 404.1535 (2013).

197. 20 C.F.R. § 404.1530(a) & (b) (2013). The regulations do provide for an exception if the recipient has "a good reason" for the failure to follow prescribed treatment. 20 C.F.R. § 404.1530(c) (2013).

198. Sparks, *supra* note 128, at 333.

199. *Id.*

Maryland v. King.²⁰⁰ The defendant in the *King* case was arrested on felony assault charges and as a matter of routine booking procedure was subjected to a DNA swab test which removed a small sample of his cheek cells.²⁰¹ These cells were analyzed and the defendant's DNA matched to that of a sample taken from an earlier rape.²⁰² Although no probable cause existed to arrest the defendant on this other crime at the time the swab was taken, the Court found that the government's legitimate interest in having a "safe and accurate way to process and identify persons . . . taken in custody" outweighed any privacy interest that the arrestee might have.²⁰³ In discussing the reasonableness of the search, the Court did rely heavily on the arrestee's diminished expectation of privacy, a factor which would certainly distinguish the holding from any that would typically involve a patient in a health care setting.²⁰⁴ But the Court also relied significantly on the fact that the swab procedure was a "brief and . . . minimal intrusion," or as the Court put it:

A gentle rub along the inside of the cheek does not break the skin and it 'involves virtually no risk, trauma, or pain.' [citations omitted] 'A crucial factor in analyzing the magnitude of the intrusion . . . is the extent to which the procedure may threaten the safety or health of the individual' [citation omitted] and nothing suggests that a buccal swab poses any physical danger whatsoever. A brief intrusion of an arrestee's person is subject to the Fourth Amendment, but a swab of this nature does not increase the indignity already attendant to normal incidents of arrest.²⁰⁵

As Justice Scalia wrote in the dissent, the problem with this analysis is that it completely overlooked the extremely invasive and far-reaching nature of DNA analysis in terms of the extent of the information about the individual that could be obtained therefrom, which far exceeds what is necessary for simple identification.²⁰⁶ Further, the actual use to which the DNA samples were put illustrates that the purpose was not one of identification, but rather of investigation and resolution of criminal activity having no connection with the activity for which the individual was arrested.²⁰⁷ As Justice Scalia not-

200. *Maryland v. King*, 133 S. Ct. 1958 (2013).

201. *Id.* at 1965.

202. *Id.* at 1965–66.

203. *Id.* at 1977–78.

204. *Id.*

205. *Id.* at 1979.

206. *Id.* at 1986.

207. *Id.*

ed, although the defendant in this case happened to be guilty of the charges for which he was arrested and, in addition, guilty of the rape for which his DNA provided a match, the same DNA swab procedure would be applied to all persons arrested, even those later found to be innocent or victims of mistaken identity, against whom an intrusion of such magnitude without a warrant should clearly be deemed an unlawful search and seizure.²⁰⁸

Such innocent arrestees are more closely analogous to the typical Medicare and Medicaid recipient, and it is hard to imagine more intimate, unique, individual, and private information that could be discovered about a person, than that which is derived from his or her genetic makeup. Yet, this case opens the door for those who have not been proven to have done anything wrong to be the subjects of such an intrusive search without the showing of probable cause for the need for it. It raises the specter that even those patients who have been compliant in taking their medications may be subjected to various “smart pill” technologies on grounds that the government has a legitimate interest in the health of those receiving Medicare and Medicaid and the fiscal integrity of said programs that is sufficient to outweigh any individual privacy interests that may exist. The Court has similarly found no protected privacy interest in seizure and analysis of so-called “abandoned DNA” samples, which refers to hair, saliva, blood, urine, and fecal material left by an individual in some publicly accessible location, and has upheld collection and DNA testing of such materials as being outside the purview of the Fourth Amendment prohibition on unreasonable search and seizure.²⁰⁹ Courts have held that where individuals have voluntarily relinquished control over the genetic material, by leaving traces of saliva on a Styrofoam cup or by licking an envelope, the government was free to retrieve and take control of it and use it for its own purposes.²¹⁰ Thus, if the “smart pill” or other technology is at some point voluntarily “emanated” or discarded, what then is to prevent the government from taking

208. *Id.*

209. Elizabeth E. Joh, *Reclaiming “Abandoned” DNA: The Fourth Amendment and Genetic Privacy*, 100 NW U. L. REV. 857, 863–67 (2006).

210. *Id.* at 861–64. Prof. Joh cites the case of *Venner v. State*, 354 A.2d 483 (Md. Ct. Spec. App. 1976), where a defendant’s attempts to exclude illegal drug evidence obtained from fecal matter excreted in his hospital bedpan and collected by investigators, proved fruitless as the Maryland appellate court found the material to be “discarded-in a legal sense, abandoned-by the person from whom they emanate.” *Id.* at 873.

a similar approach, retrieving what has been discarded and devising lab tests designed to “unlock” and reveal whatever information is contained therein? Will similar public policy concerns and the fact of voluntary relinquishment be enough to remove this kind of search and seizure from the purview of Fourth Amendment protections?

The enactment of stronger privacy laws to guarantee the requirement of a search warrant would eliminate this ambiguity. In any case, for those beneficiaries who do consent, the protection afforded by the Fourth Amendment is waived. Case law indicates that in deciding whether or not consent to a search is voluntary, the government need not show that an individual who was not in state custody, was aware that he or she had the right to refuse.²¹¹ Consequently, while discussing the risks and benefits attendant upon the insertion or ingestion of such technologies, the physician would not need to state explicitly that the patient has the right to refuse; although the lack of such an explicit statement will be one factor that may be considered, whether or not the patient properly understood this will be determined by consideration of all the attendant facts and circumstances.²¹² In addition, if the technological aspects of the pill do not directly impinge upon the physical health of the patient, it might be argued that no consent to or disclosure of its use is even required, just as there is no routine disclosure of the materials used to create the capsule in which a medicine is contained. As a practical matter, as with many instances involving informed consent, the patient will not have a clue concerning what it is that he or she is agreeing to, and certainly will not appreciate the significant intrusion into his or her right to privacy that it may represent. Adoption of laws to require disclosure of the presence of smart technology to patients and a comprehensive discussion of the privacy ramifications of the use of such technology, as well as the patient’s right to refuse to consent to its use, are therefore needed in order to ensure the protection of the human rights and dignity of older persons as contemplated by the Madrid Report and on-going work of the Open-ended Working Group on Ageing.²¹³

211. *Schneckloth v. Bustamonte*, 412 U.S. 218, 232–33 (1973).

212. *Id.* at 247–49.

213. Fifth Working Session of the Open-ended Working Group on Ageing, *supra* note 13.

D. Quality of Care Provided by Technological Devices

Healthcare-related technological devices are regulated by the Food and Drug Administration in the United States, and are not approved for consumer use unless they are found to be safe and effective.²¹⁴ The China Food and Drug Administration,²¹⁵ Pharmaceuticals and Medical Devices Agency, Japan,²¹⁶ Health Canada,²¹⁷ the Australia New Zealand Therapeutic Product Agency²¹⁸ and the newly enacted South African Health Products Regulatory Authority²¹⁹ all perform similar functions for their respective countries. Although there is no centralized governmental agency responsible for performing this function for the European Union, the European Council has established a “temporary, ad hoc, specialized advisory group of the Committee for Advanced Therapies.”²²⁰ Over a decade ago, the World Health Organization, observing the global market for medical devices of all kinds and working from the recommendations of the Global Harmonization Task Force, issued a call for the adoption of uniform standards worldwide to regulate the quality of health care related technological devices.²²¹

Despite their efforts, the lack of uniformity in jurisdictions, definitions, and standards remains a matter of concern; and because the technological devices discussed in this article will be used to provide care to an especially vulnerable elderly population, are of particular

214. David J. Dykeman et al., *Medical Devices in the Digital Age*, in HEALTH CARE IT 83, 90–94 (Arthur Peabody, Jr. ed., 2013).

215. CHINA FDA, GENERAL PROVISIONS ch. 1, art. 1, available at <http://eng.sfda.gov.cn/WS03/CL0755> (last visited Nov. 3, 2014).

216. PHARMS. AND MED. DEVICES AGENCY, Japan, <http://www.pmda.go.jp/english/> (last visited Nov. 12, 2014).

217. HEALTH CANADA, <http://www.hc-sc.gc.ca> (last visited Nov. 3, 2014).

218. AUSTRAL. N.Z. THERAPEUTIC PRODS. AGENCY, <http://www.anztpa.org> (last visited Nov. 3, 2014).

219. *Gov't to Establish Institute for Regulatory Science*, ALLAFRICA.COM (Feb. 18, 2014), <http://allafrica.com/stories/201402190190.html>. The new Health Products Regulatory Authority will replace the current Medicines Control Council, which only regulates electronic medical devices. *The History of Medicine Regulation in South Africa*, MEDS. CONTROL COUNCIL, <http://www.mccza.com/about/default.asp> (last visited Nov. 3, 2014).

220. *EMA/CAT and Medical Devices Notified Body (EMA/CAT-NB) Collaboration Group*, EUROPEAN MEDICINES AGENCY, http://www.ema.europa.eu/ema/index.jsp?curl=pages/contacts/CAT/people_listing_00008 (last visited Nov. 3, 2014).

221. MICHAEL CHERG, WORLD HEALTH ORG., MEDICAL DEVICE REGULATIONS: GLOBAL OVERVIEW AND GUIDING PRINCIPLES 1, 15-17 (2003), available at http://www.who.int/medical_devices/publications/en/MD_Regulations.pdf.

concern. To the extent that a device is expected to operate over a long period of time, development of protocols concerning maintenance and proper calibration of the device will be very important. This will be critical if the device is like the iFall, and intended to perform a monitoring caregiver-type function independent of human operation or supervision. If the device runs on a battery, who will be responsible for seeing to it that the battery is replaced when it runs down? If the device itself is equipped with warning alarms to alert the older person of the need to take action to replace the battery, that may be a workable solution if the older person still has mental capacity and is not inclined to procrastinate. But if the older person is lacking in capacity, an alarm of any sort may just be confusing; the presence of an alarm or warning might simply cause the older person to think the device itself is malfunctioning and lead to an attempt to shut it off or otherwise disable it. The same issue arises if a device like Mamoru, which is intended to remind the elderly person to take medication, does in fact malfunction and keeps telling the older person to take more medication, even though the older person has already taken the prescribed dosage. The presence of an alarm or flashing light may only confuse the older person, who may think that the alarm is sounding because he or she has missed taking the proper medication and thus should be taking the medicine again as the malfunctioning Mamoru is recommending. These are very rudimentary examples. In the event robotic technology becomes sophisticated enough to provide in-home care for older persons with diminished capacity, it will be even more critical to have some back-up monitoring and support systems in place to alert an actual person in the event of malfunction of the device.²²² Standards for use of such technology must include these kinds of safeguards in order to provide adequate protection in these situations.

222. Although not directly on point, a scene from an independent film based on the life of poet Mark O'Brien comes to mind. O'Brien was paralyzed and required the use of an iron lung to breathe. At one point in the story, there is a power outage, leaving O'Brien home, alone, without electricity, and the iron lung shuts down. Desperately, O'Brien tries to dial his bedside phone using a pencil that he holds in mouth, but the person that he is calling is not available and he can only leave a message. As he tries to dial another number, he winds up dropping the pencil, and wonders out loud if this is the end before losing consciousness. As it turns out, it is not, as the person for whom he left a message does call an ambulance, and he is rushed to the hospital and revived, but the episode illustrates the extent of vulnerability that reliance on technology can engender. *THE SESSIONS* (Fox Searchlight Pictures 2012).

Of course, even the most stringent of standards and best practices of regulators cannot anticipate every issue that will arise from the operation and use of any given medical device. The reality is that even the best regulatory system cannot predict the “adverse events” that come from experience with the device over time, with differing populations, or from “off-label” use.²²³ In the United States, technological healthcare device malfunctions that result in injury to a patient may still result in legal liability, despite FDA approval of the device,²²⁴ if there has been a failure to report adverse events, misrepresentation concerning permissible off-label uses, etc.²²⁵ Although prevention of injuries from these situations through the implementation of stringent standards is much preferable to suing providers and manufacturers after the fact, having the option to pursue compensation for injuries suffered by the older person through the courts is invaluable, and should be preserved.²²⁶

223. Jennifer S. Bard, *Putting Patients First: How the FDA Could Use Its Existing Powers to Reduce Post-Market Adverse Events*, 10 IND. HEALTH L. REV. 495, 502 (2013).

224. Mark A. Geistfeld, *Tort Law in the Age of Statutes*, 99 IOWA L. REV. 957, 1002–03 (Mar. 2014). Although beyond the scope of the present article, Prof. Geistfeld discusses the effect of current tort reform laws, federal preemption of state tort law in a number of areas, and the apparent asymmetry between negligence per se and the regulatory compliance defense. With respect to medical devices, federal pre-emption of state tort laws has been held to be expressly articulated in 21 U.S.C. § 360k(a), which restricts plaintiffs to assertion of federal causes of action. See Allison Conroy, *FDA Approval and Federal Pre-emption After Riegel and Levine*, 14 QUINNIAC HEALTH L. J. 285, 288–89 (2010-2011); see generally Jean Macchiaroli Eggen, *Navigating Between Scylla and Charybdis: Preemption of Medical Device “Parallel Claims,”* 9 J. HEALTH & BIOMEDICAL L. 159 (2013).

225. *Beavers-Gabriel v. Medtronic Inc.*, No. 13-00686, 2014 WL 1396582, at *11–17 (D. Haw. 2014). Although the plaintiffs’ original complaint in *Beavers-Gabriel* was dismissed by the Hawai’i District Court on Medtronic’s Rule 12B(6) motion, due to federal pre-emption of state-law based claims imposing requirements that are “different from, or in addition to” those required by federal law, the Court gave leave for plaintiffs to refile and amend those claims relating 1) to fraud arising out of Medtronic’s off-label promotion of the medical device at issue, 2) to strict liability for failure to warn based on Medtronic’s failure to report adverse events, 3) to negligence based on failure to report adverse events and 4) for breach of warranty relating to false warranties allegedly made beyond the FDA approved label for the device. *Id.* at *11–17.

226. Michael D. Green, *Statutory Compliance and Tort Liability: Examining the Strongest Case*, 30 U. MICH. J. L. REFORM 461, 508 (1997). Although the FDA does its best, it simply lacks the resources to “examine thoroughly every aspect of every different product within its jurisdiction...” and thus food and drug regulations can establish only a minimum “safety floor[.]” and not a guarantee of immunity from harm due to negligence. Geistfeld, *supra* note 224, at 1002.

E. The Ethics of Substituting Humanoid Machines for Human Caregivers

A number of ethical issues arise as a consequence of the projected increasing use of technological devices to perform tasks formerly performed by human caregivers. First and foremost is consideration of whether such a trend will lead to increased warehousing and isolation of those who are elderly and frail, abandoning them to a sterile and lonely existence in a wilderness populated by machines. To the extent that people are social in nature, a lack of human contact and interaction is itself counterproductive to good health, and may lead to depression; cognitive decline; higher incidence of illness, e.g. cardiovascular disease, inflammation, high blood pressure, other stress-related ailments; and death.²²⁷

It may be argued in response that a significant number of older persons are already isolated and abandoned, with no relatives or friends who really care for them, and whose human caregivers, if they are lucky enough to be able to afford any, are underpaid, overworked, and marginally educated, no matter how well-intentioned they may be.²²⁸ Further, substituting a humanoid robot or a simulated pet that can be programmed to provide affirming feedback may be preferable to subjecting the elderly to caregivers that do not really care, or worse, who may be actively abusive, mean or demeaning in

227. Cornwell & Waite, *supra* note 145, at 31–32; Nancy E.G. Newall & Verena H. Menec, *Targeting Socially Isolated Older Adults: A Process Evaluation of the Senior Centre Without Walls Social and Educational Program*, XX J. APPLIED GERONTOLOGICAL 1, 2 (2013); available at <http://jag.sagepub.com/content/early/2013/11/19/0733464813510063>; Chris Segrin & Tricia Domschke, *Social Support, Loneliness, Recuperative Processes, and Their Direct and Indirect Effect on Health*, 26 HEALTH COMMUN 221, 221–23 (2011); Chris Segrin & Stacey A. Passalacqua, *Functions of Loneliness, Social Support, Health Behaviors, and Stress in Association with Poor Health*, 25 HEALTH COMMUN 312, 312–14 (2010).

228. MARK MEIS, GERIATRIC ORPHANS: A STUDY OF SEVERE ISOLATION IN AN ELDERLY POPULATION, 20–23 (2007); NAOMI KARP & ERICA WOOD, *supra* note 90, at 13–14; see also Michael James Lepore, *Care Workers' Motivation for Employment in Long-Term Care, Assisted Living, and Particular Facilities: Reconciling Inconsistent Values*, SOCIOLOGY DISSERTATIONS, Paper 34, 3–7 (2008); available at http://scholarworks.gsu.edu/sociology_diss/34/; Andi Van Gogh, *Elder Orphans: Demographic Trends and Economic Woes to Blame for Rise Not Lack of Long-Term Planning*, NE. UNIV. 2–4 (May 9, 2013), available at http://www.academia.edu/6497399/Elder_Orphans_Demographic_Trends_and_Economic_Woes_to_Blame_for_Rise_Not_Lack_of_Long-Term_Planning#.

the attitude they display toward their charges.²²⁹ Questions such as these are serious philosophical ones that cannot be easily answered, and in-depth discussion of them is definitely beyond the scope of this article.²³⁰ Among the questions that will need to be addressed as robotic technology continues to develop and proliferate is the extent to which robotic companions should be designed to substitute for human counterparts.²³¹ Is it acceptable, for example, to design a humanoid robot that resembles the deceased spouse of an elderly Alzheimer's patient? Would such a design help to calm the elderly patient and thus be desirable from a therapeutic standpoint?²³² Would this be enough to justify its use despite the fact that it would undoubtedly confuse the elderly patient further by undermining any recollection

229. For examples of inadequate human caregivers in comparison to which a humanoid robot or simulated per may be preferable, see Jan Hoffman, *Watchful Eye in Nursing Homes*, N.Y. TIMES, Nov. 19, 2013, at D1; Vanessa Herring, *10 Nursing Home Employees Charged*, ROCHESTERHOMEPAGE.NET (Mar. 25, 2014, 11:35 AM), <http://www.rochesterhomepage.net/story/d/story/10-nursing-home-employees-charged/18613/9teMLn4U20aqQVRqFA6NkQ>; Gene J. Puskar, *Nursing Home Abuse Increasing*, CBSNEWS.COM, (July 30, 2001, 4:51 PM), <http://www.cbsnews.com/news/nursing-home-abuse-increasing/>.

230. Noel Sharkey & Amanda Sharkey, *The Crying Shame of Robot Nannies*, 11 INTERACTION STUDIES 161, 179–80 (2010). In this article, Noel Sharkey, who is Professor of Robotics and Artificial Intelligence at Sheffield University, UK, and his wife, Amanda Sharkey, Senior Lecturer at Sheffield, provide an introduction to these issues in the context of robots designed to provide care and companionship for children, and note that while “human infants might do better with a robot carer than with no carer at all,” the data suggests that substituting inanimate caretakers for human ones causes human infants to exhibit “aberrant social responses” of the sort associated with Reactive Attachment Disorder. *Id.* Initial research involving robotic companions like the Paro seal in nursing homes suggests quite the opposite response from the elderly, with reports of decreased need for medications to reduce anxiety and increased use of speech, since the Paro is programmed to respond positively to vocal commands. Atwood, *supra* note 9. Obviously, additional research will be necessary to determine if these favorable results are generally valid and whether there are any negative consequences in terms of reduced interaction with or attachment to other persons that may appear over time. Wendy Moyle, *Robots in Dementia Care*, AUSTL. J. DEMENTIA CARE (Nov. 10, 2013), <http://journalofdementiacare.com/robots-in-dementia-care/>.

231. Prof. Wendy Moyle, Director of the Centre of Health Practice Innovation at Griffith University in Queensland, Australia, is adamant that her approach to the incorporation of companion robots as caregivers is never as a substitute for, but rather an augmentation of the services provided by human caregivers. She notes that studies have shown that staff of nursing homes are able to devote an average of between two and twenty-eight minutes of face to face contact with the residents, illustrating the desperate need for additional sources of social interaction for the majority of each resident's waking day. Atwood, *supra* note 9, at RN Breakfast audio download.

232. Wendy Moyle, et al., *Exploring the Effect of Companion Robots on Emotional Expression in Older Adults with Dementia*, 39 J. GERONTOLOGICAL NURSING 46, 47–48 (2013).

that he or she might have of the fact that the spouse was deceased? Should the robot further be designed to provide sexual stimulation?²³³ Also, what monitoring or data collection should be permitted in accordance with such use of the robot?²³⁴

Given these possible design options, it is foreseeable that elderly patients may become seriously emotionally attached to such robotic devices; is that in keeping with considerations of human dignity and autonomy that are part of the core concerns of the United Nations General Assembly in establishing the Open-ended working Group on Ageing?²³⁵ Further, if the robot is interactive, and its actions are amenable to alteration to suit the preferences of the elderly person, what protections will need to be put in place to keep the elder from co-opting the robot? For example, if the robot is supposed to fix healthy meals for an elderly diabetic patient, but is programmed to elicit the person's preferences, could the robot wind up preparing foods that are harmful because they are what the patient wants?²³⁶ Should the robot always be programmed to generate supportive responses, even if such responses may be untrue? As an example, it may be appropriate for the robot to respond in an affirming fashion to such questions as "does my hair look nice?" but may not be appropriate if the question is "do you think it is a good idea for me to climb up on the roof?"

233. L. Hinman, *Robotic Companions: Some Ethical Questions to Consider*, ACADEMIA (May 17, 2009), available at http://www.academia.edu/3622846/Robotic_Companions_Some_ethical_questions_to_consider. For a radical discussion of the issue, see generally DAVID LEVY, LOVE + SEX WITH ROBOTS: THE EVOLUTION OF HUMAN-ROBOT RELATIONSHIPS (2007). Levy contends that if current technological advances continue, "[R]obots will transform human notions of love and sexuality . . . Humans will fall in love with robots, humans will marry robots, and humans will have sex with robots, all as . . . normal extensions of our feelings of love and sexual desire for other humans." *Id.* at 22.

234. In addition to the privacy concerns already discussed in the sections A through C of this part, *infra* at 29–39, a provocative article challenging the widespread use of so-called "granny cams" to capture incidents of abuse and neglect may be of interest. Lisa Minuk, *Why Privacy Still Matters: The Case Against Prophylactic Video Surveillance in For-Profit Long-Term Care Homes*, 32 QUEENS L. J. 224 (2006).

235. The 2002 Madrid International Plan of Action on Aging, which as already noted earlier, served as the catalyst for the passage of General Assembly Resolution 65/182, explicitly commits to promotion of "human rights and fundamental freedoms . . . [and] that persons, as they age, should enjoy a life of fulfilment, health, security and active participation in the economic, social cultural and political life of their societies. We are determined to enhance the recognition of the dignity of older persons . . ." Second World Assembly on Ageing, *supra* note 11.

236. Although clearly fanciful, in ROBOT AND FRANK, Frank, a former jewel thief, co-opts his robot by training it to assist him in pulling off a heist. See also Laszlo Versenyi, *Can Robots Be Moral?* 84 ETHICS 248 (1974).

And, is it ever ethically permissible to entirely delegate the responsibility for the provision of caregiving for a human being to a technological device, no matter how sophisticated the programming, if there is no human being there to intervene in the event circumstances should arise that call for the exercise of judgment?²³⁷

Secondly, if robotic devices that resemble human beings (or other living creatures) in both form and behavior are going to be used to function in caregiver or companion roles, what is the appropriate way that they should be treated?²³⁸ An alternative iteration of this question is to consider whether or not the development of such technology is not in fact creating a new oppressed class of Robosapiens™.²³⁹ In *Robot and Frank*, one of Frank's daughter's primary objections to the use of the robot to care for Frank is the concern that the robot is being exploited.²⁴⁰ It may be nonsensical to think in terms of an inanimate, or non-sentient, entity as being exploited. From an ethical standpoint, however, it may make sense to be wary of creating devices that resemble human companions, but are designed to be treated as servants or slaves.²⁴¹ The concern is that as the elderly person becomes accustomed both to expecting servile behavior from the humanoid robot and to having no obligation to treat the robot with respect, such expectations and habits would carry over to actual relationships with other humans.²⁴²

If so, the use of humanoid robots may actually interfere with the relationships that exist between the older person and other family

237. For a general discussion of possible uses of robots in circumstances arguably calling for the exercise of judgment, such as consultation with a robotic doctor and use of robotic mediators, see David Allen Larson, *Artificial Intelligence: Robots, Avatars, and the Demise of the Human Mediator*, 25 OHIO ST. J. ON DISP. RESOL. 105 (2010).

238. Hinman, *supra* note 233, at 1.

239. The Robosapien™ is manufactured by WowWee® and described as "a sophisticated fusion of technology and personality." *Robosapien*, WOWWEE, <http://www.wowwee.com/en/products/toys/robots/robotics/robosapiens/robosapien>

240. ROBOT & FRANK, *supra* note 1.

241. Concern over this possibility has already motivated South Korea to consider adoption of a Robot Ethics Charter to insure that robots may exist "free from fear of injury . . . or abuse," and to cause the Hawaii Judiciary to develop a "futures research" program that has considered the issue. See Stefan Lovgren, *Robot Code of Ethics to Prevent Android Abuse, Protect Humans*, NAT'L GEOGRAPHIC NEWS, (Mar. 16, 2007), <http://news.nationalgeographic.com/news/2007/03/070316-robot-ethics.html>. Phil McNally & Sohail Inayatullah, *The Rights of Robots: Technology, Culture and Law in the 21st Century*, METAFUTURE.ORG (1988), <http://www.metafuture.org/Articles/TheRightsofRobots.htm>.

242. Hinman, *supra* note 233, at 2-3.

members. The older person may prefer to relate to the humanoid robot that always acts as instructed without talking back, in contrast to his or her son or daughter, who may be argumentative, and who may resist the demands of the older person. This is in fact the scenario that plays out in *Robot and Frank*. By the time Frank's adult daughter arrives on the scene, prepared to come and live with him as a full time caregiver, Frank has already begun to view the robot as "his friend" and ally. While he still loves his daughter, her plan for taking care of him will impede his ability to do the things that he wants to do.²⁴³ On the flip side, if older people do become attached to their robotic companions and find them to be a satisfactory emotional outlet, adult children may feel increasingly less responsibility to care for older relatives since the technological devices appear to be fully capable of performing all necessary caregiving functions.²⁴⁴ There is already significant debate concerning the continued viability of filial responsibility as a mechanism for ensuring long term care for the elderly.²⁴⁵ One can only speculate as to whether the expansion of these technological options will further exacerbate the deterioration of family ties, and lead to increased separation and segregation of the generations. Obviously, it does not have to do so, and some of the technological devices are in fact specifically designed to facilitate family involvement in the lives of older family members. Mindful development of technology, however, may be necessary to avoid effects that are detrimental to family and other community relationships.

Ultimately, all of these questions will need to be addressed, and some international consensus attained concerning the appropriate and ethical usage of humanoid robot technology with respect to caregiving provided to human beings. Perhaps such questions could be part of the agenda for a future session of the United Nations Open-ended Working Group on Ageing or for another Expert Group Meeting on the Human Rights of Older Persons, such as the one held in New York, on May 29–31, 2012, by the UN Department of Economic

243. ROBOT & FRANK, *supra* note 1.

244. Hinman, *supra* note 233, at 2.

245. See generally Pearson, *et al.*, *supra* note 68. See also Donna Harkness, *What Are Families For? Re-evaluating Return to Filial Responsibility Laws*, 21 *ELDER L. J.* 305 (2014).

and Social Affairs to discuss issues relevant to the human rights of the elderly.²⁴⁶

VI. Conclusion

As noted at the outset, despite all the technological developments that have occurred and the research currently in progress, existing available technology is not even close to the point where it could be relied on to assume the role of primary caregiver for an elderly person with Alzheimer's disease or another cognitive impairment. That said, the problem of too few qualified and caring caregivers for too many needy elders is all too real, and is growing at a pace that threatens to overwhelm not only the United States, but also the entire global community. While technology may not be able to provide a complete answer, certainly "smart" technology can serve to augment the efforts of the limited pool of human caregivers, by providing them with back-up systems, the ability to engage in remote monitoring, and needed respite options. A substantial market therefore exists for such technological solutions.

We can predict that technology will continue to be developed to meet this demand. The attendant privacy and ethical issues are thus matters of serious concern that we need to address with more tailored rules and regulations governing storage and transmittal of information collected by caregiver technology, protocols for ensuring truly informed consent regarding the privacy implications on the part of patients and/or surrogate decision makers prior to use of such technology, and societal discussion of the extent to which such technology may be used to enforce compliance with recommended medical treatments.

Finally, in anticipation of a future during which humanoid robots of sufficient complexity are developed and proposed as surrogate caregivers for the elderly, an international convention should be called now to discuss the ethical use of humanoid robots across the panoply of possibilities. A proactive global discussion while the technology is still in its developmental stages is essential to ensure that

246. OFFICE OF THE HIGH COMM'R FOR HUMAN RIGHTS & DEP'T OF ECON. & SOC. AFFAIRS, UNITED NATIONS, EXPERT GROUP MEETING: HUMAN RIGHTS OF OLDER PERSONS (2012), *available at* <http://social.un.org/ageing-working-group/documents/egm/agenda.pdf>.

safeguards are in place to adequately protect the welfare and human rights of elderly persons whose care will be impacted as technological advances are increasingly used to bridge the caregiver gap.