

Testimony of

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Mr. Chairman, Sen. Corker, Distinguished Members of the Committee:

My name is Robin Felder. For the past 26 years I have been on the faculty of the University of Virginia, School of Medicine. I currently hold the academic rank of full professor and serve as an Associate Director of Clinical Chemistry. Previously, I was the founding director of the Medical Automation Research Center <http://marc.med.virginia.edu>, an academic “think tank” that focused on the development of advanced technologies that improve the quality while reducing the high cost of health care. Our work on health care processes and technologies resulted in the publication of over 100 papers, chapters, reviews, and 3 textbooks and numerous awards. In addition, 8 companies were founded based on the 13 patents resulting from our work. In addition, I currently serve as founding Chair of Medical Automation <http://medicalautomation.org>, a non-profit educational organization focused on bringing process improvement and cost reductions to medical care. The information that I will present in testimony and in print will be my own opinion and neither that of The University of Virginia nor Medical Automation.

As part of our research, we focused on technologies that could take advantage of the broad band infrastructure in order to allow elders to age in place of choice while lowering the cost of care. Our work in aging technologies attracted the interest of two of the nation’s largest faith based non-profit eldercare providers who funded our research. Following successful clinical trials, these two organizations formed a consortium and funded the launch of a for profit entity, WellAWARE systems <http://wellawaresystems.com>, that has attracted venture capital funding in order to become one of the leading home-based eldercare health technology providers. Today’s testimony, and the accompanying written statement will address how an expanded broad band infrastructure can result in dramatic cost savings, yet higher quality of health and wellness in elders. This information is based on my experience as both an academic researcher as well as my experience in successfully marketing medical technologies.

Broadband based telemedicine has the potential to reduce the cost of medicine by over 50% (1), stimulate economic growth in the medical technology sector, and raise the quality of life for senior Americans to unprecedented levels (2). Estimates show that 10,000 Americans will retire every day starting in May of 2011 and continue at this pace producing over 43 million retired seniors by 2023. Since chronic diseases are common in elders, they will account for a high percentage of the estimated \$4.2 trillion total annual economic burden of chronic disease by 2023 (3).

How are we, as a nation, going to deal with the enormous challenge of managing the health of our elders? Already significant progress is being made in understanding the underlying etiology of chronic disease, however, detection and treatment does not always have to rely on traditional clinic or hospital based health care delivery. Patient can do an effective a job of self-managing their chronic disease. This self-help process can delay or even prevent disability and reduce costs associated with chronic illness (4). However, additional home-based healthcare paradigms can add costly burdens to our already over burdened health care system. We need more affordable approaches. Advances in telemedicine, sensors, communication, and information technologies will enable distance based health care that rivals hospital based care. In-home monitoring has the added benefit of measuring individualized health as well as psychosocial status and reporting it to the individual, primary care providers, and caregivers alike. The benefit will be quicker and understandable wellness information and targeted preventive interventions (1,4). In-home monitoring may be the key solution that addresses

efficient and effective means of care delivery to elders while allowing them to age in their place of choice.

Health monitoring in home environments has been accomplished by wearable ambulatory monitors that record physiological signals (5,6), or sensors embedded in the home environment and furnishings to unobtrusively collect behavioral and physiological data, or a combination of the two. For example, sensors embedded in a mattress pad can provide high quality sleep assessments that rival sleep lab monitoring in hospitals (7). Continuous monitoring of vibrations in the floor can detect falls and classify them according to the best choice of first responders (either a 911 call or a visit from a caregiver)(8).

The issues of privacy and acceptance of unobtrusive wellness and psychosocial status are generally well accepted by both the participants and their primary care providers (9, 10). Furthermore, data gathered unobtrusively demonstrates clinical utility (11-14). Passive in-home monitoring is beneficial since it overcomes the challenges associated with health exaggeration and compliance in patient reporting. Furthermore, continuous monitoring is a richer data set as compared to data obtained in a single patient encounter with the health system. For example, chronic ambulatory blood pressure monitoring at home provides more medically relevant information to physicians than blood pressure cuffs used in a doctor's office under some circumstances (15).

What does in home monitoring cost, and what are the potential economic benefits? We conducted a case-controlled study comparing monitored vs non-monitored elders in a senior living facility in the Midwest over a 3 month period. Our results demonstrated a 36% reduction in billable medical procedures, a 78% reduction in hospital days, and a 68% reduction in the cost of care. Despite the reduced cost of care, the efficiency of the caregivers increased by over 50%. Thus, monitoring technologies can significantly reduced billable interventions, hospital days and cost-of-care to payers, and has a positive impact on professional caregivers' efficiency.

Medication compliance is also a significant challenge in the eldercare environment. Polled U.S. individuals 65 years old and older who use medications (N>1,000) responded that 51% take at least five different prescription drugs regularly, and one in four take between 10 and 19 pills each day. 57% of those polled admit that they forget to take their medications (16). New devices have been developed that can automatically dispense pre-loaded medications on a timed schedule into a receptacle easily accessed by elders. The devices can either sound an alarm (or flash a strobe light) after dispensing the medications until they are consumed (17). Emerging technologies allow pills to be electronically outfitted with transmitters to communicate with the user's wristwatch that shows that the pill has been consumed but also the effect of the pill on the users pulse and respiration rate and stomach pH (18). Broadband connectivity of these devices would allow the electronic medical record to be updated with regard to medication compliance and efficacy. Entire formularies targeted to selected diseases could be dispensed at home in order to facilitate the often laborious task of finding effective medications. For example, pill dispensing kiosks will be miniaturized for dispensing blood pressure medication that will facilitate finding optimal doses that minimize side effects. At home pill dispensing can have significant economic benefit. For example, the Global antihypertensive drug sales were \$39 billion in 2008 with many antihypertensive drugs currently generating more than \$1 billion in annual revenue. Despite these large markets, the American Heart Association reports that over 18 million Americans who are taking medication still do not have their high blood pressure under control (19).

Nutritional support is often an overlooked factor in managing health and wellbeing in elders. Meals on Wheels, a non-profit largely volunteer organization serves over 3 million elders a day, yet 11% of elders are a risk for malnutrition. Even more startling is that over 50% of elders sent home following hospital based medical intervention that requires nutritional support did not get that support. Lack of proper nutrition can be a significant factor in hospital readmissions. Broad band based in home monitoring can determine if meals were delivered, if the elder is consuming the meal, and if there are steady improvements in health as a result. Thus, automated nutrition support is one of the easiest challenges to solve and one of the most costly to ignore.

In conclusion, broad band access with passive technologies will enable even those with little interest in their health to be encouraged to adopt healthy lifestyles. Delaying or arresting chronic disease, providing nutritional support and assuring psychosocial well being are some of the proven benefits of home based monitoring technologies. Finally, since home based wellness results in cost benefits that exceed 50% over that of traditional care, it provides a basis for using broad band to revolutionize the nation's health care system.

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