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The demographics in the US and elsewhere is shifting toward an older population. These individuals would like to maintain their independence and remain in their own homes. Most of these individuals have at least one chronic disease or condition limiting their independence. It is estimated that 40% of the US population are living with chronic disease. In addition to the challenges of chronic disease and functional decline, the rural elderly also face geographic isolation.

The primary desire to maintain independence is directly linked to the need to maintain mobility. Poor gait and balance often limit mobility of older adults. Mobility limitations are an important aspect of health status which affect the ability to obtain and maintain employment as well as participate in society. Approximately 25% of individuals in the U.S. report some level of difficulty with mobility. An estimated 7.4 million persons in U.S. households use assistive technology devices for mobility impairments. More people use assistive devices to compensate for mobility impairments than any other general type of impairment. As age increases the use of mobility devices also increases. For persons over age 65, the rate of mobility device usage is over 4 times greater than for persons less than 40 years of age. Assistive technology can have a major impact on the lives of people with mobility challenges by enabling them to use their abilities more effectively. Further, the desire for independence by older adults has stimulated the interest, if not need, for home health-care services delivered via telecommunications. These devices need to provide viable, remote monitoring. It is estimated that remote monitoring systems can cut medical costs by ~20%.

Biomechanical science is an important contributor to our understanding of human movement disorders through characterizing, monitoring, and modeling the effects of human movements on the human body. Tremendous advancements have been made in human movement science to predict function and failure in the context of preventing injuries, maximizing ability and participation levels, and improving treatment techniques. New methods and devices are needed that can be used to enhance the life of a person with a physical disability. A unique opportunity exists to combine experience in biomechanics, development of specialized electronics and rehabilitation in order to improve the functional performance of individuals with activity limitations and participation restrictions.

RESEARCH RECOMMENDATIONS

1. Advanced Assistive Technology

Physical amplification technologies have been used during much of recorded history. Although the goal of constructing such technologies is not new, great scientific and technological hurdles still remain. Even today, assistive devices are viewed by the physically challenged as separate, lifeless mechanisms and not intimate extensions of the human body—structurally, neurologically, and dynamically. Advanced technologies are needed that accelerate the merging of body and machine, including device architectures that resemble the body's own musculoskeletal design, actuator technologies that behave like muscle, and control methodologies that exploit principles of biological movement. These advanced technologies need to address mobility, dexterity, and social integration issues.

2. Home Health Monitoring

The ability to reduce future healthcare costs, which could reach unsustainable levels within a decade, may depend in part on emerging technologies that allow patient monitoring in the home. Home health monitoring uses technological developments to assist patients who suffer from chronic or long-term medical conditions that historically may result in frequent visits to the hospital. A number of chronic disease states could be studied. One example is falls, a significant problem that affects older adults with more than one-third falling each year. Among older adults, falls are the leading cause of injury deaths and the most common cause of nonfatal injuries and hospital admissions for trauma. In 2000, the direct cost of all fall injuries to older adults was slightly more than \$19 billion. Importantly, falling experience can lead to a loss of balance confidence and fear of falling. In turn, fear of falling can lead to loss of mobility and balance deterioration, which actually increases the likelihood of a fall. Further, decreased social contact subsequent to developing a fear of falling diminishes quality of life.