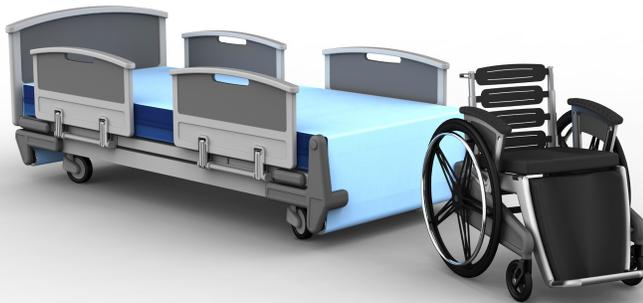


Health and Economic Benefits of Improving Mobility for the Bedridden Patient at Home

White Paper

AgileLife™

Patient Transfer System



Contributors:

Jon E. Block, Ph.D., Inc.

2210 Jackson Street, Suite 401, San Francisco, CA 94115
www.jonblockphd.com (415) 775-7947

Larry E. Miller, Ph.D.

422 Mountain Wasp Drive, Biltmore Lake, NC 28715
www.millerscinc.com (928) 607-9657

BioMed Marketing

PO Box 1384, Palo Alto, CA 94302
www.biomedmarketing.com (650) 704-8581

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Executive Summary

Moving bedridden patients from bed to a wheelchair to facilitate transfer to the bathroom and/or table, is one of the most difficult and burdensome tasks facing patients and their caregivers, resulting in substantial direct and indirect costs to government and private payers.

Next Health, LLC is preparing to launch the AgileLife Independent Living System for transfer assistance at home. The AgileLife System requires no manual lifting and only minimal assistance from a single caregiver. Users of the AgileLife System can dramatically reduce transfer expense and risk of injury, while enhancing patient care, and hastening release to care at home.

For economic reasons and improved quality of care, there is a growing impetus among payers, providers and patients to move bedridden patient care to homes and communities rather than institutions. To expand care options and as a project demonstrating the viability of home care for the functionally impaired, the Centers for Medicare and Medicaid Services (CMS) launched the Money Follows the Person program in 2005 and extended it into 2016 based on positive early results.

Immobility is a major reason that patients are institutionalized. Chronic immobility often results in numerous complications, including patient injury and deterioration of body systems, as well as psychological decline. For these patients, the ability to safely and efficiently transfer between bed and wheelchair is a critical inflection point for release to or continuing with home care.

Patient transfer in institutions has been shown to be physically demanding and time-consuming, with risk of injury to both patient and caregiver. The current standard for mechanical assistance in institutions is a sling lift system (e.g., Hoyer Lift). However, performing a transfer with a sling lift requires two or more specially-trained caregivers using extreme caution. Even with transfer assistance devices, staff and patient suffer injuries, resulting in workman's compensation claims, medical bills, and civil and criminal lawsuits. In addition, difficulties in the transfer procedure can tempt caregivers to limit transfers, further jeopardizing patient well-being.

Similarly, home caregivers, many of whom are elderly spouses with their own medical issues, often find transferring their loved ones to be difficult and dangerous. The sling lift, with its complex requirements, is generally inappropriate for home care use.

The backdrop for these issues is a stunning statistic: more than 88% of American adults want to age in place, to remain at home for life, rather than move to a nursing home or assisted living facility.

Having elderly Americans remain at home as long as possible is one of those rare issues where public good and private interest are perfectly aligned. The cost of nursing home care is substantial, and transfer to home care can result in significant savings.

In Montana, for example, if just 600 nursing home patients were moved to their homes, the state could save over \$25 million per year in direct medical costs.

Why Effective Patient Transfer Is Key

The issue of patient mobility intersects with most of the areas that determine whether patients' lives are satisfying or not and, in many instances, determines whether a patient can be released to his home or remain at home.

Being able to safely and efficiently transfer from bed to wheelchair and back is the critical "inflection point" for judging whether a person can maintain or regain his independence.

Both for economic reasons and for improved quality of care, government and private payers want to serve patients in their homes and in their communities rather than in institutions. Most patients and their loved ones feel the same way. Costs decline, and patients are more likely to thrive.

Since the early 1980s, government agencies have been striving to improve long-term medical and custodial care services and supports, and to increase the capacity of these systems to serve patients in their communities. Medicaid currently supports Home and Community Based Services (HCBS) through waivers for people with very specific needs.

In 2005 CMS launched the Money Follows the Person (MFP) Demonstration Program. The program aims to help states reduce their reliance on institutions and to expand options for the elderly and other individuals with disabilities to receive care in the community and in their homes.

As the largest demonstration program in the history of Medicaid (encompassing 30 states and \$1.75 billion authorized through fiscal 2011), MFP reflects a growing understanding that long-term supports must be transformed from being institution-based and provider-driven to "person-centered," consumer-directed and community-based.

This trend continues with the new Affordable Care Act, a continuing commitment to

patient independence, choice and dignity for countless Americans who prefer to remain at home. This new legislation extends the MFP Demonstration program through September 30, 2016, and appropriates an additional \$450 million per year (2012-2016), totaling \$2.25 billion.

Early results of MFP have been positive,¹ underscoring a growing need and desire for devices such as the AgileLife System that promote aging in place. Generally, patients have enjoyed low rates of re-institutionalization lasting more than 30 days and high quality of life ratings. A baseline survey published in 2010 from all MFP programs showed that approximately 85% of respondents needed assistance with bathing, meals, medications and using the bathroom, and equated having these needs fulfilled with leading satisfying lives. Respondents who felt their needs were satisfied in these four areas reported a life satisfaction that was nearly eight times higher than those with unmet needs in three of four areas.

Further demonstrating the alignment between public good and private interest, some respondents reported that while in institutional care they could not participate in community activities and sometimes missed medical care because they had no way of getting to an appointment. Only slightly less than half of respondents who faced these restrictions reported that they were satisfied with their lives.

Finally, the degree of choice and control respondents had over their lives was also associated with life satisfaction. Respondents with choice and control in five or six areas of their lives were two and half times more likely to be satisfied with their lives than respondents who reported no areas of choice and control.

Immobility: A Major Cause of Patient Decline

Many chronically immobile patients are confined to their beds for most of their waking and sleeping hours. The effects are often a deterioration of numerous body systems, and increased dependence on caregivers to assist with activities of daily living.^{2,3}

Complications associated with chronic immobility include patient injury, development of pressure ulcers, muscle atrophy, metabolic decline, joint contractures, microvascular dysfunction, atelectasis, thromboembolic disease, and psychological decline.

Patient Injury

Approximately four in 10 patients report injury during handling by their caregivers, with most of these the result of falls. Caregivers report that helping patients into and out of bed is one of the most difficult tasks. Non-professional caregivers are often elderly. And when assistive devices are used, they are often cumbersome, time-consuming, difficult to use, and dangerous to operate. There is a clear and pressing need for patient transfer devices that require little or no physical exertion for the caregiver and, at the same time, greatly lower patient injury risk.

Pressure Ulcers

Immobility is one of the main risk factors for pressure ulcer development,⁴ largely due to the muscle wasting (kikexia) that compounds the effects of pressure from the bony prominences.⁵ Pressure ulcers are localized areas of skin and underlying tissue damage caused by pressure, shear, and/or friction. While healthy people can relieve excess localized pressure by moving, bedridden or neurologically compromised patients are often unable to adjust their positions and may even be unable to recognize the presence of these ulcers. If left untreated, pressure ulcers can ultimate-

ly progress to cause irreversible damage to the muscle, connective tissue, and even bone.

Being able to transfer to and from a bed easily and often would likely lower the risk of developing pressure ulcers.

Muscle Atrophy

Confinement to bed and long periods of remaining in place cause skeletal muscle atrophy and weakness, and related functional limitations.^{6,7} Being immobile results in muscle mass losses of 1.5 - 2.0% per day during the first two to three weeks of confinement, with comparable decreases in muscular strength. Muscle atrophy is most pronounced in the weight-bearing muscles of the legs, buttocks, and torso. In practical terms, the muscle wasting associated with immobility and confinement to bed results in further decrements in independence, functional limitations, and greater requirement for caregivers to assist with basic activities such as transfers, toileting, bathing and dressing.

Metabolic Decline

Just the first five days of confinement to bed promotes increases in fasting glucose and insulin, and in total cholesterol and triglycerides.^{8,9} These indicators tend to worsen over time, although at a slower pace, and place immobile individuals at risk for metabolic syndrome, which is a constellation of insulin resistance, hypertension, obesity, and hypercholesterolemia. This syndrome exponentially increases the risks for heart disease, stroke and diabetes.

Much of this is thought to be preventable with even modest levels of physical activity, including periodic wheelchair ambulation.

Joint Contractures

Skeletal joint range of motion due to contractures of muscles and/or tendons¹⁰ declines as a consequence of immobility. Over time, these contractures result in significant muscle weakness, loss of function and permanent disability, regardless of physical rehabilitation strategies. In fact, in the later stages of contracture, patients often assume a chronic fetal-like position due to widespread contractures of numerous muscular groups. Contractures are largely preventable in the bedridden patient with regular range of motion exercises and brief periods of mobility.

Microvascular Dysfunction

Bedridden patients also tend to experience systemic vascular endothelium dysfunction, contributing to vascular and metabolic perturbation via several mechanisms.^{11,12} First, microvascular dysfunction increases peripheral vascular resistance and encourages hypertension. Second, endothelium dysfunction promotes atherogenesis. Finally, the risk for insulin resistance increases due to impaired glucose delivery and uptake. Modest amounts of physical activity, including engaging in the basic activities of daily living, improve vascular endothelium function.

Atelectasis

Atelectasis (lack of gas exchange due to a collection of fluid) of the left lower lobe of the lung is apparent on chest radiographs of bedridden patients within 48 hours of their confinement. Lung compliance is greatly reduced in the supine position, thereby raising oxygen requirements. Atelectasis also greatly increases the risk for pneumonia.¹⁰ Immobile patients are at increased risk for atelectasis, due not only to long stays in the supine position, but also due to the concomitant wasting of the torso muscles, which limits the ability to cough or otherwise expel mucus.

Thromboembolic Disease

The primary contributors to thromboembolic disease are decreased blood flow, vascular injury and coagulopathy. The physical inactivity associated with being bedridden promotes venous stasis. The sustained compression of veins further contributes to venous stasis and may also damage the vascular endothelium. Therefore, bed rest is a primary risk factor for the development of thromboembolic disease.¹³ Thromboembolic disease may, however, be offset by regular mobilization.

Psychological Decline

Reduced mobility is associated with lower quality of life, cognitive decline, and loss of dignity and independence.^{14,15,16} Dependence on caregivers to assist with activities of daily living, including dressing, bathing, and toileting, is associated with depression and loss of self-esteem.² There is evidence that this psychological dependence on caregivers is exacerbated over time, as caregivers become increasingly protective, which, in turn, leads to increased patient reliance on the caregiver, thus leading to continued physical and psychological dependence of the patient. This downwardly spiraling syndrome can be remedied only by increasing independence and mobility.

The Role of Transfer Assistance

During 2008, 3.2 million people in the United States resided in a nursing home. Nearly half, 1.6 million, needed extensive assistance with four or more activities of daily living (bathing, dressing, eating, toileting or transferring).¹⁷

In 1994–95 the National Health Interview Survey on Disability (NHIS-D) showed that an estimated 1.6 million Americans residing outside of institutions used wheelchairs, and over 55% of those experienced difficulty transferring.¹⁸

For the patient, immobility increases reliance on others to aid in activities of daily living, and raises injury risk due to falls during transfer from bed to wheelchair and back. For the caregiver, transferring patients is physically demanding and time-consuming.

Current Standard: The Sling Lift Transfer System

The current standard for mechanical assistance in transferring bedridden patients between bed and wheelchair is a sling lift (Hoyer Lift). Transferring a patient with a sling lift requires two or more caregivers, 10 to 25 minutes and extreme caution.

First the caregiver(s) must place the sling under the patient, generally using a “log roll” technique. Rolling a heavy, impaired patient onto the sling and adjusting for correct sling position requires multiple caregivers and several steps to reduce the risk of a lift injury.¹⁹

Once the patient is positioned properly onto the sling, the lift process can begin, as illustrated below.²⁰

Positioning the Lift for Use:

1. With the legs of the base open and locked;
2. Use the steering handle to push the patient lift into position.
3. Lower the patient lift for easy attachment of the sling.
4. When the patient is clear of the bed surface, swing his/her feet off the bed.
5. Using the steering handle, move the lift away from the bed. When moving the patient lift away from the bed, turn the patient so that he/she faces assistant operating the patient lift.
6. Press the DOWN button (electric) or open the control valve (manual/hydraulic), lowering patient so that his feet rest on the base of the lift, straddling the mast. Close the control valve.

The Boom of the lift does not swivel. The patient's weight must be centered over the base legs at all times. Do not attempt to lift patient with the mast/boom assembly swiveled to either side. Always keep patient facing the attendant operating the lifter.

The sling lift procedure requires extreme caution, experience, skill and time. If the patient is not centered over the legs of the lift, s/he may fall. Additionally, the patient can suffer skin tears, burns or chafing from the metal hooks or the sling fabric. Many become fearful of the lift after a bad experience, and many regard sling lifts as stripping them of dignity. Injuries caused by improper use or malfunction of sling lifts in institutions have led to lawsuits and criminal prosecution.²¹

Institutional caregiver staff is also at risk for injury during patient transfer, when using manual and electric lifts. Each year there are some 200,000 work-related injuries and illnesses to first-line employees at nursing homes and rehabilitation centers. Many of these result from patient transfer.²² Costs associated with back injuries are estimated to be \$20 billion annually. More than one-third of these costs (\$7.4 billion) are related to back injuries sustained by nurses while handling patients. The direct and indirect costs of back injuries stem from workman’s compensation claims, medical bills, and staff replacements.²³

In institutions that have sling lifts, the equipment is regularly used by only one in four health care workers, largely due to difficulty of use and additional time to perform the required maneuvers. The standard for operating mechanical lifts is using two attendants. Institutions that comply with the standard report fewer injuries to patients and caregivers, but the incidence of injuries is still significant.

Proper care of bedridden patients may require six to 10 daily transfers from bed to

wheelchair and back. But because transferring bedridden patients is so difficult, dangerous and time-consuming, patients do not get transferred as often as they should.²⁴

Burdens on Professional and Family Caregivers

Home care experts know that transferring bedridden patients frequently contributes to their health. Writing in the 2006 edition of Home Care Nursing Practice, Concept and Application, Robyn Rice states, “A rigidly adhered to routine of getting the patient out of bed (OOB), sitting in a specialized chair, and ambulating as soon as possible is vital to the prevention of long-term complications of immobility and to achieve the expected



outcome. Special equipment, the training of caregivers or volunteers, and a schedule for OOB activities are needed. Exercises performed independently by the patient or by the family should be repeated up to eight or more times per day.” [emphasis added]²⁵ While the bedridden patient may be unable to accomplish these things on his own, they are achievable, and more frequent intervention in favor of mobility should lead to increased health.

However, home healthcare workers, similar to institutional staff, risk injury during patient transfer as documented in a NIOSH report:

“In 2007, America’s 896,800 home healthcare workers reported a staggering 27,400 injuries. The most common injuries were sprains, strains, and other musculoskeletal injuries related to lifting and moving patients. The rate of patient lifting injuries in 2007 was 20.5 per 10,000 healthcare workers. In homes, the lifting equipment and adjustable beds that are often available in hospitals are conspicuously absent. Also, nurses, aides, hospice care workers, and other in-home care providers tend to work alone. Moving a patient without help, in cramped quarters, and without assistive equipment is a recipe for injury. In fact, research indicates that if any caregiver is required to lift more than 35 pounds of a patient’s weight, assistive devices should be used for the transfer.”²⁶

Many home health caregivers are elderly spouses. Over one-half of them report a medical condition that restricts their physical activity. Difficulty with lifting and handling a loved one is a common complaint.²⁷ In fact, over two-thirds of caregivers have reported injuries while handling their dependents.²⁸ Of those who sustained injuries, over one-third reported injuries sufficient to prevent them from continuing to provide care. Informal caregivers also suffer from a number of indirect consequences associated with patient transfer and care including fatigue, anxiety, and depression.^{29,30}

In a home healthcare setting, a sling lift presents multiple barriers to use. Lift operation requires specially trained attendants and significant physical exertion to maneuver and protect the patient from falls or other injuries. Strong evidence exists that even proper caregiver education has no impact on caregiver injury.^{31,32}

Therefore, it is clear that new techniques and assistive devices should be explored that promote patient mobility, while reducing the physical burden and time required for home caregiver assistance.

Costs Associated with Caring for Bedridden Patients

Bedridden patients often require institutionalization simply because it is difficult to transfer them.

The average home health aide is paid \$21 per hour.³³ Assuming that aides provide 16 hours of total care each day, the total direct cost burden equals \$122,600 per year, a sum that is unaffordable to the vast majority of patients. This financial burden often forces the patient to relocate to a nursing home, which severely detracts from patient independence, privacy, and self-esteem.

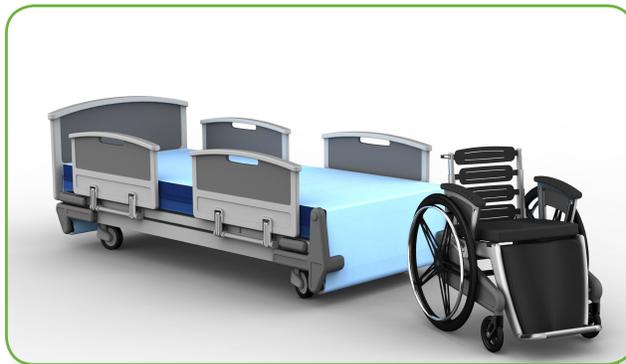
However, the average U.S. annual cost of nursing home care at \$72,270 is not trivial.³⁴ Medicaid reimbursement, which varies by zip code, does not usually consider needs for assistance with ADLs, leaving families to pay any uncovered costs. Medicare payment is limited to 100 days, usually for medical related reasons, and a different pay schedule.

Taking Montana as an example, nursing homes cost the state at least \$5,000 per month per patient, compared to home assistance costs estimated at \$3,000 per month. There are perhaps 6,000 patients in Montana nursing homes who could live at home if transfer between bed and wheelchair could be improved; moving only 10% (600) of these patients into home healthcare would save the state over \$14 million per year. Federal incentive programs would save the state another \$11 million, for a total cost reduction of over \$25 million per year.

Benefits of the Next Health AgileLife System

Next Health, LLC was formed in 2009 to help bedridden patients improve their mobility, enabling them to come home sooner and stay home longer.

Next Health is preparing to launch a new assistive device, the AgileLife System, which presents great potential to reduce the physical and psychological burden of bedridden patients and their caregivers, and to dramatically reduce the labor costs involved in patient transfer. With the assistance of just a single caregiver and a small amount of training, the AgileLife System will quickly and easily move the patient from the supine position to a wheelchair and back.



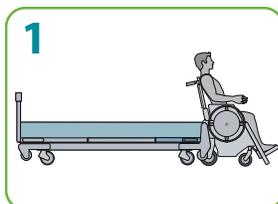
AgileLife™ Patient Transfer System



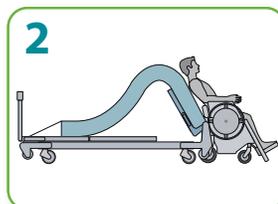
The AgileLife System is a transfer bed and mobility wheelchair appropriate for use at home or within a nursing home or hospital.

With the patient supine in the bed, the caregiver begins the transfer simply by pressing the button on the handheld command unit. The transfer bed, operating similarly to a conveyor belt, then moves the patient gently and safely down to the foot of the bed, and into the seat of the specially designed wheelchair attached to the bed. This is accomplished without skin scraping or lifting, and without

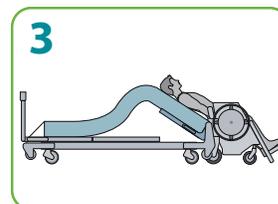
any physical assistance required from the patient or caregiver, aside from removing and replacing the backrest on the wheelchair. In concert with the bed movement, the chair seat lifts and accepts the patient's lower torso. After the patient is gently moved onto the seat, the bed becomes the back support for the patient to assume an upright position.



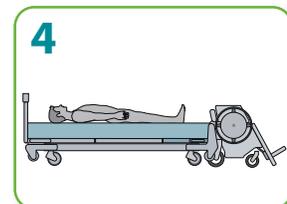
1
Dock the wheelchair at the foot of the bed.



2
Touch a button and the mattress bows to cradle the patient.



3
Conveyor gently transports patient towards the head of the bed.



4
Conveyor automatically stops when patient is comfortably positioned.

Once the patient is upright in the seat, a prompt alerts the caregiver to insert the backrest into the wheelchair. After the backrest is in place, the chair disengages from the bed, and the patient can be wheeled to the desired location.

When the patient is ready to return to bed, the wheelchair is simply backed into the bed, and the chair and the bed automatically engage. The caregiver is prompted to remove the backrest from the chair, and then initiates the transfer on the handheld module. The chair and bed again work in coordination as the patient is effortlessly and safely moved back into a supine position in the bed.

This easily operated system provides safe, dignified, and comfortable transfers for pa-

tients weighing up to 500 lbs. The AgileLife chair also serves as a commode when the seat is removed.

The core innovations of the AgileLife System make patient transfers easier and more routine by automating the process of moving a bedridden individual from bed to wheelchair and back, thus facilitating more frequent, less stressful movement, and enabling patients to remain at home who would otherwise have to move to institutions.

With minimal caregiver involvement in the transfer, the risk of fall-related patient injuries is likely to be reduced substantially. Additionally, the AgileLife System saves time for the caregiver, reducing a process that occurs six to 10 times per day from over 30 minutes to less than two minutes.

Comparing costs between the assisted standard of care (a sling lift) and the AgileLife System shows a significant saving on both a monthly and a per transfer basis.³⁵

Patient Transfer: Homecare Monthly Cost Comparison

	Sling Lift	AgileLife System
Total Expense	\$3,265	\$2,670
Hospital Bed & Supplies	\$190	\$2,100
Wheelchair & Commode	\$200	Included
Electric Lift Device	\$320	Included
Labor	\$2,555	\$570
Transfers per day	2	6
Cost per transfer	\$54.42	\$14.83

The AgileLife System saves \$595 per month, and lowers the cost per transfer by over 70% to \$14.83 each.

Conclusions

For economic reasons and improved quality of care, payers, health care providers, and patients themselves want to move longer term healthcare to the home whenever possible. Chronic immobility often results in deterioration of numerous body systems, increasing risks of patient injury, pressure ulcers and other complications.

However, in-home care is challenging for the 1.6 million nursing home patients who need assistance with four or more ADLs, including bed/wheelchair transfer. In fact, a critical “inflection point” in determining whether a patient requires institutional care or can live at home is the safe and efficient transfer from bed to wheelchair and back.

Patient transfer between bed and wheelchair has resulted in both patient and caregiver injury, as evidenced by workman’s compensation claims and injury court cases. In addition, transferring increases the burden on the informal caregivers in U.S. homes, many of whom are elder spouses with their own medical limitations.

The institutional standard of care for patient transfer has moved to mechanical lift assistance devices, of which the sling lift is the most common. However, using these lifts have been shown to be physically risky

for both patients and caregivers, involving a complex two-assistant process with significant manual labor, creating the temptation of performing less frequent transfers that may further jeopardize patient health. As a result, these sling lifts are generally inappropriate for home healthcare use.

The Next Health AgileLife System offers numerous benefits to the bedridden patient and their caregiver. This system is automated in a way that represents a real breakthrough. It requires minimal assistance from a caregiver, and the system costs less to operate than a comparable sling lift system. Injury risk during patient transfer can be dramatically reduced, with the AgileLife System, enabling patients and caregivers alike to enjoy increased freedom and improved quality of life associated with greater patient independence.

By facilitating easier, more frequent, less stressful movement, and supporting patient release to home healthcare, the AgileLife System can further enhance patient care, independence, dignity and comfort, while reducing long term health care costs.

References

- 1 Money Follows the Person 2009 Annual Evaluation Report. September 10, 2010. (Accessed at www.mathematica-mpr.com/publications/PDFs/health/MFP_2009_Annual.pdf.)
- 2 Neugaard B, Andresen EM, DeFries EL, Talley RC, Crews JE. Characteristics and health of caregivers and care recipients-North Carolina, 2005. *Morbidity and Mortality Weekly Report*. 2007;56(529-532).
- 3 Rigby H, Gubitz G, Phillips S. A systematic review of caregiver burden following stroke. *Int J Stroke*. 2009;4(4):285-292.
- 4 Benbow M. Pressure ulcer prevention and pressure-relieving surfaces. *Br J Nurs*. 2008;17(13):830-835.
- 5 European Pressure Ulcer Advisory Panel. Guideline on Nutrition in Pressure Ulcer Prevention and Treatment: Report from the Guideline Development Group. *EPUAP Review*. 2003;5(3):80-82.
- 6 De Jonghe B, Sharshar T, Lefaucheur JP, Authier FJ, Durand-Zaleski I, Boussarsar M, Cerf C, Renaud E, Mesrati F, Carlet J, Raphael JC, Outin H, Bastuji-Garin S. Paresis acquired in the intensive care unit: a prospective multicenter study. *JAMA*. 2002;288(22):2859-2867.
- 7 Herridge MS, Cheung AM, Tansey CM, Matte-Martyn A, Diaz-Granados N, Al-Saidi F, Cooper AB, Guest CB, Mazer CD, Mehta S, Stewart TE, Barr A, Cook D, Slutsky AS. One-year outcomes in survivors of the acute respiratory distress syndrome. *N Engl J Med*. 2003;348(8):683-693.
- 8 Hamburg NM, McMackin CJ, Huang AL, Shenouda SM, Widlansky ME, Schulz E, Gokce N, Ruderman NB, Keaney JE, Jr., Vita JA. Physical inactivity rapidly induces insulin resistance and microvascular dysfunction in healthy volunteers. *Arterioscler Thromb Vasc Biol*. 2007;27(12):2650-2656.
- 9 Stuart CA, Shangraw RE, Prince MJ, Peters EJ, Wolfe RR. Bed-rest-induced insulin resistance occurs primarily in muscle. *Metabolism*. 1988;37(8):802-806.
- 10 Brower RG. Consequences of bed rest. *Crit Care Med*. 2009;37(10 Suppl):S422-428.
- 11 Widlansky ME, Gokce N, Keaney JE, Jr., Vita JA. The clinical implications of endothelial dysfunction. *J Am Coll Cardiol*. 2003;42(7):1149-1160.
- 12 DeSouza CA, Shapiro LF, Clevenger CM, Dinunno FA, Monahan KD, Tanaka H, Seals DR. Regular aerobic exercise prevents and restores age-related declines in endothelium-dependent vasodilation in healthy men. *Circulation*. 2000;102(12):1351-1357.
- 13 Geerts WH, Pineo GF, Heit JA, Bergqvist D, Lassen MR, Colwell CW, Ray JG. Prevention of venous thromboembolism: the Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. *Chest*. 2004;126(3 Suppl):338S-400S.
- 14 Buchner DM. Preserving mobility in older adults. *West J Med*. 1997;167(4):258-264.
- 15 Froehlich-Grobe K, Andresen EM, Caburnay C, White GW. Measuring health-related quality of life for persons with mobility impairments: an enabled version of the short-form 36 (SF-36E). *Qual Life Res*. 2008;17(5):751-770.
- 16 Froehlich-Grobe K, Fignoni SF, Thompson C, White GW. Exploring the health of women with mobility impairments. *Women Health*. 2008;48(1):21-41.
- 17 2009 CMS Nursing Home Data Compendium, page i-ii. https://www.cms.gov/CertificationandCompliance/Downloads/nursinghomedatacompendium_508.pdf accessed April 7, 2011.
- 18 University of California San Francisco Center for Personal Assistance Services, Disability Statistics Abstract, online at: http://www.pascenter.org/frames/pas_frame.php?site=http://dsc.ucsf.edu/main.php
- 19 Linda Enos, Safe Patient Handling A Summary of the Issue and Solutions: The Evidence Base; at <http://www.hcergo.org/SPH%20Aug%2009%20Facts%20and%20References.pdf>, accessed on April 6, 2011.

- 20 [www.phc-online.com/How to use Hoyer-Lift a/146.htm](http://www.phc-online.com/How_to_use_Hoyer-Lift_a/146.htm)
- 21 Examples of lawsuits and cases:
- The Citrus Nursing Center in Fontana CA, was penalized \$100,000 in 2007 after a patient fell from the Hoyer lift, sustained a blunt injury to the head and died nine days later. In violation of Center policy, a single staff person had attempted to perform the Hoyer lift process, instead of the required two persons. http://www.canhr.org/newsroom/AA_citations/fullcits/Cit240004343.html
 - In 1999, two certified nurse assistants were awarded over \$1M for neck and back injuries suffered in attempting to prevent a patient, who weighed approximately 210 pounds, from falling to the floor during a transfer using a hydraulic Hoyer lift. https://apps.fastcase.com/Google/Start.aspx?C=c0917df4c1be7efd_bae8344388411872e8a3013daf886846&D=374530b54fe1b29c61cb051a8837db36515437f84865e95c
 - A 2007 lawsuit in Naples FL contended that a nursing home resident twice suffered fractures in incidents with a Hoyer lift. <http://www.naplesnews.com/news/2008/jan/05/naples-nursing-home-accused-neglect-wrongful-death/>
 - A 2008 case in Oregon found two nursing home employees guilty of criminal charges after a resident broke both legs after being dropped from a sling lift. www.oregonlive.com/news/index.ssf/2008/10/gateway_nursing_home_workers_f.html
- 22 **US Department of Labor** BoLS. Employed persons by detailed occupation, sex, race, and Hispanic origin, 2002. In; 2003.
- 23 **Collins JW, Nelson A, and Sublet** [2006]. Safe lifting and movement of nursing home residents, DHHS (NIOSH) Publication No. 2006-117. Cincinnati, OH: National Institute for Occupational Safety and Health, cited in NIOSH Science Blog, “Preventing Back Injuries in Healthcare Settings”, www.cdc.gov/niosh/blog/nsb092208_lifting.html, accessed April 6, 2011.
- 24 **Koppelaar E, Knibbe JJ, Miedema HS, Burdorf A.** Determinants of implementation of primary preventive interventions on patient handling in healthcare: a systematic review. *Occup Environ Med.* 2009;66(6):353-360.
- 25 **Rice R.** The Patient with Neurological Dysfunction. In: *Home Care Nursing Practice, Concept and Application (Fourth Edition)*. St. Louis, MO: Mosby Elsevier; 2006:313.
- 26 **NIOSH Science Blog,** “Strains, Sprains, and Pains in Home Healthcare”, www.cdc.gov/niosh/blog/nsb041610_nurse-erg.html, accessed April 6, 2011.
- 27 **Williams EI, Fitton F.** Survey of carers of elderly patients discharged from hospital. *Br J Gen Pract.* 1991;41(344):105-108.
- 28 **Brown AR, Mulley GP.** Injuries sustained by caregivers of disabled elderly people. *Age Ageing.* 1997;26(1):21-23.
- 29 **Carnwath TC, Johnson DA.** Psychiatric morbidity among spouses of patients with stroke. *Br Med J (Clin Res Ed).* 1987;294(6569):409-411.
- 30 **Jones DA, Peters TJ.** Caring for elderly dependents: effects on the carers’ quality of life. *Age Ageing.* 1992;21(6):421-428.
- 31 **Hignett S.** Intervention strategies to reduce musculoskeletal injuries associated with handling patients: a systematic review. *Occup Environ Med.* 2003;60(9):E6.
- 32 **Martimo KP, Verbeek J, Karppinen J, Furlan AD, Takala EP, Kuijer PP, Jauhiainen M, Viikari-Juntura E.** Effect of training and lifting equipment for preventing back pain in lifting and handling: systematic review. *BMJ.* 2008;336(7641):429-431.
- 33 The 2009 MetLife Market Survey of Nursing Home, Assisted Living, Adult Day Services, and Home Care Costs p. 4, online at www.metlife.com/assets/cao/mmi/publications/studies/mmi-market-survey-nursing-home-assisted-living.pdf, accessed May 10, 2011

- 34 This is private pay expense for a semi-private room. The 2009 MetLife Market Survey of Nursing Home, Assisted Living, Adult Day Services, and Home Care Costs p. 4, online at www.metlife.com/assets/cao/mmi/publications/studies/mmi-market-survey-nursing-home-assisted-living.pdf, accessed May 10, 2011
- 35 Labor costs: The 2009 MetLife Market Survey of Nursing Home, Assisted Living, Adult Day Services, and Home Care Costs, online at www.metlife.com/assets/cao/mmi/publications/studies/mmi-market-survey-nursing-home-assisted-living.pdf, accessed May 10, 2011