

bon dioxide, carbon monoxide, and other chemicals and combine these with effectors such as battery powered ventilation windows, the system controlled by a microprocessor. Such systems should be designed for easy installation both in new and existing windows and mass-produced.

The second reaction, somewhat more angrily, tells us not to worry and simply await the fast developments ahead. Now I welcome any serious effort, pilot project and real project that makes the home a better place to live for older persons². But we must not beg the question how we can accelerate developments and solve difficulties and unwanted side effects proactively. We might learn a lot from experiences in different countries and different environments. One of the channels for this is discussions such as the present one in our journal, on our discussion site³, in workshops and conferences⁴, and anywhere else. If we agree that innovation comes too slowly in the housing environment, we admit that our housing is less healthy, less safe, less secure, less communicative, and less comfortable than the present state of technology permits. As responsible social and technical researchers, senior groups, engineers, designers, builders, and advisers we cannot leave older people in such a backward situation without actively making up leeway.

The drive toward innovative technology for better housing is wide open!!

References

1. Bouma H. Why cannot houses be as smart as cars? *Gerontechnology* 2002; 1:304
2. Berlo A van. Smart home technology: have older people paved the way? *Gerontechnology* 2002; 2:77-87
3. isgdiscussion@jdc.org.il
4. Symposium on Domotics and Networking. *Gerontechnology* 2002;2:145-148

Herman Bouma, The Netherlands
e-mail address: heebouma@xs4all.nl

Hard Tech, Soft Touch Technology to aid indoor mobility and transfer of immobilised older persons

It is well known that most elderly people are healthy, and more and more are getting wealthy, at least in western world. Gerontechnology fits their ambitions, wishes and needs¹. But what about disabled elderly persons: for them too gerontechnology can 'assure a minimal dignified standard of life'².

If we have a glimpse onto such a 'niche market', we easily realise that developing technology for disabled old persons can bring advantages far beyond the final user. In the long term, the future course of disability amongst elderly people is uncertain. The literature offers little insight into the fundamental question as to whether longer life means better health and a reduction of years spent in disability. Surprisingly few population-based studies have addressed this question and there are significant inconsistencies within the literature.

It has been suggested³ that the balance between the demographic trend towards longevity and the evolution of active life expectancy could lead to more disability adjusted years of life. However, the opposite outcome could also occur. A recent study in Finland⁴ suggests a secular trend towards better physical functioning and decreased need for assistance over ten years in the older people aged up to 85 years. In the USA there is new evidence⁵ of an overall improvement in the health status of older persons, although there are some inconsistencies in respect to different disability measures and population subgroups.

However, a sharp rise in the absolute and relative number of very frail oldest-old persons over the next decade⁶ will inevitably lead to an increase in the prevalence of disability. For example, a recent Danish

study of nonagenarians⁷ categorised 22 % of women and 19 % of man as severely disabled. Whatever the exact future, disability will remain as a major challenge for health and welfare systems.

The ability to move into and out a chair or a bed (transfer mobility) is a major challenge for elderly persons, especially amongst very old people. For example, in Italy, the percentage of bed-ridden persons rises from 0.3 % at ages 60 to 64 years, to 2.6 % at ages 75 to 79. Similarly, the prevalence of people who are confined to a chair rises from 0.4% to 1.7%⁸. This has been the subject of a recent survey carried out in Lombardia⁶, in northern Italy. Lombardia is one of the richest and most densely populated regions in Europe, with over 1.5 millions people aged over 65 years (with about 200,000 more expected in 10 years). In Lombardia, some 50,000 elderly persons are at high risk of institutionalisation, especially those over age 85, the fastest growing segment of the elderly population. A similar number of old persons are already institutionalised. In a representative sample of 3,000 older people in Lombardia, the percentage of bed-ridden persons rises from 0.4 % for people aged 65 to 74, to 1.2% (75 to 84 years) to 4.9 % (85 +). In another Italian survey of 7,337 long-term inpatients in 78 nursing homes, it was found that two persons in five were totally dependent in respect to transfer ability⁹.

It is clear that severe impairment of transfer ability is a major problem for elderly persons. Among 970 long term care inpatients of 3 skilled nursing homes in the Milan area, 2 persons in 5 were found to require considerable help (including hoists) for transfers. Data from USA¹⁰ show that transfer problems affect over 6 % of community-dwelling persons aged over 65 years, and more than 60 % of nursing homes residents.

Yet, the basic statistics hide a complex picture. One should consider people with special needs, such as immobilised older persons with dementia. These people may experience caring actions they cannot interpret, and may undergo 'catastrophic reactions' in case of caring manoeuvres not properly performed. During transfers, they rather need a '...warm touch and a cheerful hug'. There are also an estimated 526,000 people aged over 60 with mental impairments and other developmental disabilities in the USA (half of whom live at home), a figure likely to double by 2030¹¹. For people with mild to moderate mental impairment, motor problems may be experienced as early as 50, either gradually or abruptly. Further, there are more than 400,000 adults with cerebral palsy in the USA, and again their number is growing¹².

In order to face the complex pattern of needs, brought by such limitations in physical and cognitive functioning, we need technologies by no means trivial¹³. So far, three solutions are currently employed to move immobilised elderly: (i) wheeled lifter, with electric motor powered by battery (accumulators); (ii) wall mounted lifter, powered by the electric grid; (iii) ceiling mounted (or rail) lifter, powered by battery. In all cases, the immobilised person is embraced into a suitable cloth, before being moved, and the tool lifts, moves and lowers the sling with her / him inside. The most critical phase of the transfer occurs at the end of the manoeuvre: actually it is difficult to centre the immobilised person – especially if not cooperating - onto the target site (e.g. a wheel chair). Centring is not easy for a single operator, mostly at home, for informal carers (spouse, parent, son or daughter). Indeed, older people should not just be seen as passive receivers of care, but also as active actors and providers of care, even in unfavourable situations. For example, the Lombardia survey⁶ surprisingly showed

that 6.8% of people aged over 85 and 9.5% of frail older carers were involved in providing demanding physical help to people in need.

A large number of people could be helped by assistive technology tailored to their needs, especially in respect to lifters and hoists to aid transfer. Despite a large number of actual and potential users, literature on caring issues relating to hoists is scanty. Provisional data suggest that there is wide room for technical improvement in mobilisation systems. User issues are also important. While field surveys¹⁴⁻¹⁷ show that elderly people do use the technical aids they are equipped with, bed hoists are the exception and are the least used of home aids (36% unused). User/equipment interaction could be optimised by properly suited support services¹⁸. Moreover, huge amounts of money are wasted because of health related problems amongst carers. Hoist usage has even been included amongst independent risk factors for back pain¹⁹.

However, 'Care Support & Care Organisation' scores lowest in the Gerontechnology matrix as to new technologies studied and developed, as has been shown in the editorial of this issue²⁰. Why is this? To overcome transfer inability, and to support caregivers, multidisciplinary approach represented by gerontechnology is most appropriate. Zero gravity technology – derived from industry – could be an innovative as well as appropriate answer: How can we stimulate this line of study?

Mauro Colombo, Milano, Italy
e-mail: dr.maurocolombo@tiscalinet.it

Andrew Sixsmith, Liverpool, United Kingdom
e-mail: sixsmith@liverpool.ac.uk

Paolo Maestri, Milano, Italy
e-mail: sez.sanluigi@pioalbergotrivulzio.it

Alberto Aldarese, Milano, Italy
e-mail: preve.prote@pioalbergotrivulzio.it

Nicola Fabris, Milano, Italy
e-mail: nfabris@tin.it

Antonio Guaita, Milano, Italy
e-mail: a.guaita@ipab.mi.it

References

1. Bouma H. Creating adaptive technological environments. Editorial. *Gerontechnology* 2001;1(1):1-3
2. Charness N, Czaja S, Fisk AD, Rogers W. Why Gerontechnology? Editorial. *Gerontechnology* 2002; 1(2):85-87
3. Stout RW, Crawford V. Active-life expectancy and terminal dependency: trends in long-term geriatric care over 33 years. *Lancet* 1988; 1:281-283
4. Pitkala KH, Valvanne J, Kulp S, Strandberg TE, Tilvis RS. Secular Trends in Self-Reported Functioning, Need for Assistance and Attitudes Towards Life: 10-Year Differences of Three Older Cohorts. *Journal of the American Geriatric Society* 2001; 49(5):596-600
5. Liao Y, McGee DL, Cao G, Cooper RS. Recent Changes in the Health Status of the Older U.S. Population: Findings from the 1984 and 1994 Supplement on Aging. *Journal of the American Geriatric Society* 2001; 49(4):443-449
6. IRER. Anziani: stato di salute e reti sociali. Milano: Guerini; 2000
7. Nybo H, Gaist D, Jeune B, McGue M, Vaupel JW, Christensen K. Functional Status and Self-Rated Health in 2,262 Nonagenarians: The Danish 1905 Cohort Survey. *Journal of the American Geriatric Society* 2001; 49(5):601-609
8. Pasqualini R, Salvioli G. Mortality decline and the problem of the disability. *Giornali Gerontologia* 2000; 48(8):481-484
9. Bagarolo RA. Validazione di uno strumento di misura della qualità per l'accREDITAMENTO delle residenze sanitarie assistenziali (R.S.A.) della Lombardia. Community Health specialization thesis [dissertation]. Pavia: University of Pavia 1998/1999
10. Alexander NB, Galecki AT, Nyquist LV, Hofmeyer MR, Grunawalt JC, Grenier ML, Medell JL. Chair and Bed Rise Performance in ADL-Impaired Congregate Housing Residents. *Journal of the American Geriatric Society* 2000; 48(5):526-533
11. Hammel J. Assistive Technology and

- Environmental Intervention (AT-El) Impact on the Activity and Life Roles of Aging Adults with Disabilities: Findings and Implications for Practice. *Physical & Occupational Therapy in Geriatrics* 2000; 18(3):37-58
12. Nochajski S.M. The Impact of Age-Related Changes on the Functioning of Older Adults with Developmental Disabilities. *Physical & Occupational Therapy in Geriatrics* 2000;18:5-21
 13. Fozard JL. Gerontechnology—Beyond Ergonomics and Universal Design. *Gerontechnology* 2002;1(3):137-139
 14. Klerk M de. Do Technical aids Affect the Use of Home Care or Institutional Care? Pp 301-304, in: Graafmans J, Taipale V, Charness N, editors, *Gerontechnology: A sustainable investment in the future*. Amsterdam: IOS; 1998
 15. Edwards NI and Jones DA. Ownership and use of assistive devices amongst older people in the community. *Age & Ageing* 1998; 27(4):463-468
 16. Sonn U, Davegårdh H, Lindskog AC, Steen B. The use of assistive devices in an elderly urban population. *Aging Clinical Experimental Research* 1996; 8(3):176-183
 17. Wielandt T, McKenna K, Tooth L, Strong J. Post Discharge Use of Bathing Equipment Prescribed by Occupational Therapists: What Lessons to Be Learned? *Physical & Occupational Therapy in Geriatrics* 2001; 19(3):47-63
 18. Colombo M, Vitali S, Guaita A. The Geriatric Counselling Service: an 18 Years Experience on Preventive Socio-Sanitary Services for Elderly People. In: Michel JP, Rubenstein LZ, Vellas BJ, Albaredo JP, editors, *Facts, Research and Interventions in Geriatrics Serie*. Paris: Serdi;1998; 429-438
 19. Smedley J, Egger P, Cooper C, Coggon D. Prospective cohort study of predictors of incident low back pain in nurses. *British Medical Journal* 1997; 314(7089):1225-1228
 20. Bronswijk JEMH van, Bouma H, Fozard JL. Technology for quality of life: an enriched taxonomy. *Gerontechnology* 2002; 2(2):169-172