Leonardo ENERGY
Home of the Future

Distance care: an initial overview of future benefits to the EU and its health care services

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Summary, conclusions and next steps

Telemedicine/care can alleviate national health services financial pressures

As the available financial resources of EU health systems are being placed under ever increasing strain, so more attention is being paid to Home-Telecare and Home-Telemedicine across Europe as a means of alleviating this pressure.

The situation is exacerbated by the dramatic demographic changes society experiences and by increased life expectancy that is often accompanied by an increase in life threatening medical conditions in terms of their extent (morbidity) and their frequently terminal nature (mortality). Both of these place higher demands on traditional medical resources such as regular treatment procedures and frequent hospital (re-) admissions. As people age, so they tend to require more care of one kind or another.

...and address the needs of evolving demographic profiles and patient demands

In this context, the supply and demand for care and care work has to be addressed in the light of a growing preference for innovative care services that are synchronised with and accepted by existing services, at a time when care demands increase as:

- Family care resources if not disappearing are significantly declining
- Single-households, as a share of all households, are also increasing.

ICT-technologies offer possible ways first to supplement the existing forms of patient care and supervision in patients' own domestic environment and second to place more emphasis on this and on medical care taking place in the home rather than in hospital.

This interest in ICT devices is derived from:

- both the increase of chronic diseases (e.g. diabetes mellitus, congestive heart failure, blood hypertension or chronic obstructive airway diseases) and

- an overall increase in the desire by older members of society to live independently in their own homes for as long as possible.

EU Health Systems are faced with untenable and growing demands on their resources due in part to the current system for medical care and treatment of chronic diseases, to the growing number of patients as well as to the long-term medical treatment and nursing interventions often associated with them.

Telecare and / or telematics offer the potential of improving the quality of life for the elderly, who suffer from physical and / or cognitive impairments (e.g. dementia) and for volunteer/ family carers, who would also derive respite benefits.

Although still relatively early days, these technical applications are recognised as being a potential benefit to society. However, what is also recognised is the potential complexity of the sector and these applications. The scope of the activity ranges from user aspects – simple use – to the sensitive ethical questions regarding the limits of the use of technology.

A route map for future developments

Four fields of action have been identified for this overview:

- Development of active and passive security technologies
- Support through ICT for family carers of people suffering from dementia
- Development of technologies (eg multimedia occupational programmes, virtual partners for conversation, structuring the activities of daily living) that can be a help to and used by people with varying degrees of senility, as well as the
- Use of telemedicine for the chronically ill who need continuous medical care.

Effective integration of ICT applications could improve the quality of life of all citizens and enable safer independent living. The benefits of such integration can be measured in terms of the extent to which people are able to live more independently and the extent to which they may be empowered and socially included through the availability and use of such technologies.

ICT and telecare models and applications may reduce resource utilisation in the health care sector especially in the case of the elderly that are suffering from chronic diseases such as those mentioned above.

Future quantification of the economic benefits

To date the economic advantages of telemedicine to society have not been quantified, as, apart from a few research projects into patients with specific chronic diseases, there are no published telemedical projects, which evaluate the broader cost benefits of telemedicine/care. The approach taken so far is mostly viewed from a purely medical and more technical perspective, mainly focusing on the impact on the individual's quality of life as well as

the social benefits. These are some of the reasons why telemedicine/care is not more universally adopted and why it currently is by no means "standard" procedure.

Because of the small sample sizes and lack of research controls, more carefully designed follow-up trials are needed to determine relative cost efficiency levels for different chronic diseases. Most researchers are convinced that home telemedical devices offer a great cost saving potential for society now and in the long term. However, additional research is needed to quantify this. The estimated societal cost-benefits could be forecast in terms of:

- decreased hospital re-admission rates
- reduced emergency visits (either A&E or to the patient's home)
- increased survival rates and associated advantages
- decreased medical treatment costs and, travelling costs to medical and / or nursing facilities and last but not least
- from a less tangible standpoint, an increase in quality of life.

Because of the limited data available, no adequate recommendations can be given to estimate either the economic cost-benefits or the long-term consequences of home-telecare for the elderly. Both of these depend on understanding the implications of the time dimension and taking it into account.

Cost benefit studies of proposed care innovations, in which the effect of implemented changes is compared with the current system of service delivery, have therefore to be complemented with a dynamic consideration of the process of change.

On a restricted time horizon, home-telecare will possibly be more financially viable when benefits to the broader health care sector (rather than being limited to the social care sector) are included.

Analysis of pilot projects shows an increased quality of care by using telecare / telemedicine for the following reasons:

- Enabling the patient to stay in familiar surroundings
- Shortened reaction time between the pathological change of the patient's conditions and the medical decisions/ treatment
- Optimisation of care – organisation (simplified administration, communication)
- More self-determined and as appropriately independent living as practical

As described, today's problem of telecare / telemedicine is mostly one of lack of market recognition and consequent misconception. Current parameters suggest that telecare /

telemedicine is more expensive than hospitalisation, for example, additional expenditure (time and costs) for physiotherapist to visit patients at home.

Because of the complexity of this aspect of the acceptance of telecare, more investigation is required to ascertain the real and presumed operational and economic potential barriers to adoption that exist.

In contrast, there is also a high and largely unrecognised potential for cost savings if administrative costs (typically ranging from 33 % to 50 % of total costs) can be reduced using telecare / telemedicine. The challenge is to find (technical) solutions in terms of the values delivered in this broader context.

Need for electrical system design and installation integration

In the representative projects under consideration ICT is always set up as an isolated solution, unintegrated into and superimposed on existing home installations. Integration into building automation and multimedia offers further possibilities for cost savings in terms of energy consumption, of increasing safety aspects, of comfort and other benefits. As an illustration, we can take controlling and monitoring medication in the refrigerator via the Internet and email. The 'fridge is not only a gadget that can order more beer when the user is about to run out; it can now order, say, insulin and act as a support medication. An automated data based building with consumption management can also work with medical data and can facilitate monitoring, of, for example, someone living on their own and worried about having no-one to contact in emergencies. As another example, for the handicapped, comfort functions in a smart building, like centralised switching lights at the front door or beside the bed, are essential elements of independent living.

The integration of technical solutions in telecare / telemedicine, building control and multimedia leads to new requirements for technical installations in buildings. The quality of the power supply must be ensured to guarantee a reliable and consistent functionality of sensitive and sometimes critical medical measuring equipment e.g. electrocardiogram.

Future commercial opportunities & training requirements

On top of the societal and economic benefits outlined there are also some commercial ones. For example, professional electrical installers will find a new market for checking and improving power quality in buildings, not to mention upgrading existing home installations to accommodate new applications. A new segment of customers will emerge comprising older people who want to renovate their apartments' electrical systems to cope with the new way of living.

Additional education is needed to ensure telecare / telemedicine be developed successfully. Training is required as much for engineers and planners of building technologies as for the electrical installers.

Next steps

The integration of telecare / telemedicine into the home is not just a technical challenge but also a socio-economic one, especially where it is necessary to approach the problem holistically to find the most appropriate and user friendly solutions. User friendliness, moderate costs and consequent critical mass use are the key to success of telecare / telemedicine in a new market. But what do we mean by "user friendliness" in the context of disease management or of the elderly living at home? To answer this question the topic needs to be addressed from social, economic and technical standpoints.

This initial overview of future benefits to the EU and its health care services provides the necessary background on which to base subsequent work and the next stage in which the answers to this and other major questions can be elaborated.

Chapter 2

Socio-economic review

2.1 Demographic position

Population ageing is consistent across the globe and this fact will have considerable impacts on a wide variety of social aspects, such as economic growth, capital markets, pension systems but also on technological progress and innovations, education and human capital, family and household structures and last but not least, on health and social care systems.

These trends have led to a markedly increased interest in improving society's ability to deliver effective care to older people and chronically ill patients at home. The first part of this report will present some selected demographic trends across Europe including life-expectancy and disability rates by gender.

Demographic trends and developments in selected countries: life expectancy, mortality, dependency by gender

Demographic trends including declining birth rates and increasing life expectancy have occurred throughout Europe. However the exact time at which the birth rates declined in each country vary, with Hungary being one country that experienced a low birth rate several decades ago and Ireland being a country with a relatively recent decline.

This aspect of demographic change should not be ignored since it provides an understanding of the 'stock' of kin and family members available to care in the population both currently and in the future. Other demographic changes that have occurred also have a substantial impact on the availability of family carers. These include:

- the decline of marriage rates,
- the rise in divorce rates (excluding Poland),

- the decline in the size of households,
- the increase in single person households with growing numbers of older people living alone without children,
- more equal workforce participation between men and women
- and evolving patterns of rural-urban and international migration.

Each of these factors has to be taken into account as they impact significantly on the topic of this paper. In addition, the economic viability by socio-economic grouping (poverty rates and the distribution of income between the generations and age groups with variations between the European (23) countries analyzed in the EU-project -EUROFAMCARE – [Mestheneos and Triantafillou 2005, p.19]) is also a key factor.

Increased life expectancy is often accompanied with an increase in mortality and morbidity as well as medical treatment frequencies and duration. In this context the supply and demand for care and care work has to be addressed in the light of the emerging preference for innovative yet mainstream services and the putative link to the disappearance of or reduction in family care resources. Last but not least the financial pressures placed on health provision sectors will face new demands (Meyer 2004).

2.1.1 Germany

In Germany currently > 60 year-olds account for 24,1 % of the population and the > 80 year-olds 3,9 %. By the year 2030 the > 60 year-olds group share is forecast to account for 34,4 % and the > 80 year-olds for 7,3 % of the population. At the same time it is estimated that there will be an increase in the numbers of the aged needing care.

In Germany about 1, 37 Mio. people in need of care, and living at home, received benefits in accordance with the statutory long-term care insurance and around 1,2 Mio. people are main care-givers and responsible for people in need of care and support. Since the introduction of the long-term care insurance there has been a slight increase in the number of informal carers involved in support and care at home. 36 % of all people in need of care are cared for by one main care-giver, 29% are cared by 2 people and 27% are cared by 3 or more people. On average 2 people, including the main family care-giver, are involved in domestic care arrangements and in providing regular care and support (Meyer 2004, 2006; BMGS 2003a, Stat. Bundesamt 2003, 2003a).

In order to increase comparability with other countries, the Eurostat population projection on Germany is used for this report. See table 2.1 for details:

Table 2.1: Population projections according to Eurostat

Age	**2000**	**2030**	**2050**	**2000-2030**	**2000-2050**
	Numbers in 1,000			**Growth in %**	
Male					
65-70	1,887	3,150	2,379	67	26
70-75	1,486	2,440	2,060	64	39
75-80	933	1,832	1,922	96	106
80-85	375	1,118	1,873	198	399
85-90	281	728	1,145	159	308
90+	102	326	471	220	363
65+	**5,064**	**9,595**	**9,851**	**89**	**95**
Female					
65-70	2,129	3,279	2,422	54	14
70-75	2,066	2,716	2,202	31	7
75-80	1,915	2,280	2,229	19	16
80-85	920	1,558	2,412	69	162
85-90	850	1,222	1,733	44	104
90+	369	722	942	95	155
65+	**8,250**	**11,777**	**11,939**	**43**	**45**
Total					
65-70	4,016	6,429	4,800	60	20
70-75	3,552	5,156	4,262	45	20
75-80	2,848	4,112	4,151	44	46
80-85	1,296	2,676	4,285	107	231
85-90	1,131	1,950	2,878	72	155
90+	471	1,048	1,413	122	200
65+	**13,313**	**21,371**	**21,790**	**61**	**64**

Source: Rothgang cit. from Eurostat in Comas-Herrera and Wittenberg 2003, p. 28.

This projection shows growing numbers of older people in each age band between 2000 and 2030 with a 61% increase for older people aged 65 and over. Interestingly, the number of men increases much faster (89%) than the number of women (43%). One reason for this is the assumption that there will be a slight increase in male life expectancy levels, which would bring male and female expectancy closer together. Second, this effect is due to the gradual replacement of WW II cohorts by post-war cohorts.

From 2030 to 2050, however, there is a different picture:

- The total number of older people remains almost constant, but shows a dramatic change in composition.

- While the numbers of people between 65 and 75 are declining and the numbers of those aged 75-80 remain almost constant, the number of the very old (80 or more) is increasing rapidly (by 51%).
- The number of dependent people can be expected to grow considerably between 2030 and 2050, even though the total number of older people (65+) is not noticeably growing in that period.

The prevalence of dependency

Definition of dependency: The definition of dependency used is receipt of help with instrumental activities of daily living (IADL, e.g. cooking, shopping...) or basic activities of daily living (ADL, e.g. eating, clothing, mobility or personal hygiene).

In Germany, data on the prevalence of dependency can be taken from surveys and from Long-term Care Insurance –LTCI– sources. Generally surveys tend to ask whether people regard themselves as dependent, thus incorporating a high element of subjectivity.

According to these data more than 10% of older people (defined as being 65 or more) are dependent. As Table 2.2 shows, the prevalence of dependency increases as age increases:

- For people aged 80 and over, dependency prevalence is markedly higher for women than for men.
- Up to the age of 90, it is slightly lower for members of private LTCI, whereas for those under 90, the opposite is true.

Table 2.2: Prevalence rates of dependency in 2001 (in % of the respective population)

	Public LTCI			**Private Mandatory LTCI**			**Together**		
Age	**Men**	**Women**	**Total**	**Men**	**Women**	**Total**	**Men**	**Women**	**Total**
65 - 70	3	3	3	2	1	2	3	2	3
70 - 75	5	5	5	3	3	3	5	5	5
75 - 80	8	10	9	6	8	7	8	10	9
80 - 85	14	20	18	12	17	15	14	20	18
85 - 90	26	38	35	24	34	30	26	38	35
90+	41	58	55	42	61	57	41	58	55
65+	**7**	**13**	**11**	**6**	**12**	**9**	**7**	**13**	**11**

Source: Rothgang ibid. p. 29 from Federal Department of Health, figures are based on LTCI funds payments.

69 % of people with dependency and 66 % of older dependent people, live in private households (BMG 2002). Their care is provided by informal carers and/or professional carers.

2.1.2 United Kingdom

In the UK, the numbers of older people are projected to increase very substantially in the next fifty years. See table 2.3: The population projections for the UK by Eurostat forecast that, between 2000 and 2050, there will be a 66 % increase in the numbers of people aged 65 and over. During this period, the number of people aged 85 or more are projected to rise even faster, by 154 %. Much of this increase is a result of a projected rise in male life expectancy. Between 2000 and 2050, the numbers of men aged 85 or more are projected to rise by 236 %, compared to a 122 % rise in the number of women in that age group (Comas-Herrera et al. 2003, p.77ff).

It is important to point out that demographic projections so far in the future carry a substantial degree of uncertainty. The principal population projections by the UK Government Actuary's Department (GAD, 2001) project substantially larger increases in the numbers of older people than Eurostat. The number of people aged 65 or more is projected by GAD to rise by 75 % between 2000 and 2050 (compared to 66 % projected by Eurostat), and the number of those who are 85 or more by 175 % (compared to 154 % projected by Eurostat).

Table 2.3: UK population projections for people aged 65 and over for the years 2000, 2030 and 2050 (in thousands).

	2000	**2030**	**2050**	**% increase**	**% increase**
Males				**2000-2030**	**2000-2050**
65-69	1,231	2,088	1,766	70	44
70-74	1,050	1,584	1,512	51	44
75-79	829	1,198	1,456	45	76
80-85	428	923	1,217	116	184
85 & over	303	591	1,018	95	236
Females					
65-69	1,354	2,156	1,776	59	31
70-74	1,280	1,760	1,595	38	25
75-79	1,192	1,463	1,667	23	40
80-85	772	1,287	1,591	67	106
85 & over	829	1,135	1,836	37	122
All 65 & over	**9,294**	**14,185**	**15,434**	**53**	**66**
All 85 & over	**1,124**	**1,726**	**2,853**	**54**	**154**

Source: Comas-Herrera et al. 2003, p. 77 from Eurostat.

Prevalence of dependency the in UK The probability of being dependent is much higher for older age groups and for women. Of males aged between 65 and 69 about 6.6 % have problems with two or more activities of daily living, whereas among women in that in age group 8.9 % have problems with two or more ADL. Of males aged 85 and over 27.5 % have problems with two or more activities of daily living, whereas among women in that age group 43.5 % have problems with two or more ADL.

Table 2.4 shows the percentage of the older population of England who report having problems with at least one instrumental activity of daily living (IADL), with one activity of daily living (1 ADL) and with two or more ADL (2 or more ADL). Older people in care homes or long-stay hospital care are included among those with two or more ADL.

Table 2.4: Estimated percentage of the older population of the UK with different levels of functional dependency, 2000.

	None	**IADL**	**1 ADL**	**2+ADL**
Males				
65-69	85	4	4	7
70-74	83	4	6	7
75-79	73	9	7	11
80-84	55	13	16	17
85+	45	12	15	28
Females				
65-69	82	4	5	9
70-74	75	6	8	11
75-79	62	6	15	17
80-84	45	12	17	26
85+	25	17	15	43
All	**67**	**8**	**10**	**15**

Source: Comas-Herrera, 2003 p. 78

2.1.3 Spain

Demographic patterns of the Spanish population are ruled by different fecundity patterns than in other European countries and the US. For example, the 'baby boom' happened ten years later in Spain than in those other countries. But they are also ruled by similar reductions in mortality rates. According to the current fertility and mortality trends, Spain will start loosing population by 2010, and by 2020 the baby boom cohort (those born between 1957 and 1977) enter the older (65+) age groups.

2040 is a relevant date as well because the number of people aged 80 or more will be larger than the number of women between 40 and 60 (Costa-Font, J and Patxot, C. 2003, p.44).

The Eurostat 1999-based central demographic projections for Spain suggest a rise in the number of people aged 65 or more by 43 % between 2000 and 2030 and by 76 % between 2000 and 2050. As table 2.5 shows, the most important rise in the numbers of older people will take place between 2030 and 2050. The number of people aged 85 or more are projected to rise by 92% between 2000 and 2030 and by 193 % between 2000 and 2050. Life expectancy for men is assumed to be rising faster than for women. The number of males aged 85 or more are projected to rise by 106 % between 2000 and 2030 and by 242 % between 2000 and 2050, compared to a rise of 85 % and 172 % respectively for females.

Table 2.5: Projection of the Spanish population age 65 and over

Male	**2000**	**2030**	**2050**	**% increase 2000-2030**	**% increase 2000-2050**
65-69	944,000	1,285,000	1,189,000	36	26
70-74	774,000	1,040,000	1,289,000	34	66
75-79	549,000	775,000	1,127,000	41	105
80-84	289,000	544,000	820,000	88	183
85+	196,000	404,000	670,000	106	242
Female					
65-69	1,099,000	1,440,000	1,263,000	31	15
70-74	982,000	1,258,000	1,461,000	28	49
75-79	795,000	1,036,000	1,398,000	30	76
80-84	526,000	847,000	1,162,000	61	121
85+	442,000	819,000	1,202,000	85	172
All 65&over	**6,596,000**	**9,448,000**	**11,581,000**	**43**	**76**
All 85&over	**638,000**	**1,223,000**	**1,872,000**	**92**	**193**

Source: Comas-Herrera, 2003 p.45

Prevalence of dependency Table 2.6 shows the prevalence of dependency in Spain. Older people are classified according to age, gender and dependency rate.

The third column of table 2.6 gives the share of moderately dependent older people (those who are helped with one more IADLs), while the following column shows the share of severely dependent older people, those who are helped with one or more ADLs. On average, 22 % of the older Spanish population are moderately dependent, 14 % are severely dependent and 63 % are non-dependent. As table 2.6 shows, dependency rates

vary by age and gender. They increase with age and, given the same age, are higher for women than for men.

Table 2.6: Dependency rates by age and gender, Spain 2000

Males	**None**	**1+IADL**	**1+ADL**
65-69	83. 5	12.0	4.5
70-74	83.8	9.7	6.5
75-79	72.5	14.6	12.9
80-84	56.7	26.5	16.8
85-90	43.5	25.9	30.6
90+	14.6	33.7	51.7
Females			
65-69	79.9	17.2	2.9
70-74	65.2	27.0	7.8
75-79	54.7	29.2	16.1
80-84	37.8	34.2	28.0
85-90	18.3	34.6	47.1
90+	6.8	21.6	71.6
All	**63.4**	**22.5**	**14.1**

Source: Comas-Herrera ibid. p.78

2.1.4 Italy

In the last decade, Italy has begun a considerable process of demographic ageing. In 1996 the proportion of the population aged 60 and over was among the highest in the world, estimated as 22.6 % of the total population. This ageing process has evolved, and is still, extremely fast, causing enormous shifts in national demographic balances. The causes of growth in the ageing rate are related to three demographic effects foreseen by the most recent central projections of Istat - the Italian Statistical Office:

- life expectancy, which will increase both for men and for women from 2000 to 2030 (for the period 2030-50 the model estimates a constant scenario);
- the natural dynamics (obtained counting births and deaths, that go from a rate of –0.2 for one thousand inhabitants in 2000 to -1.6 in 2010) and;
- migratory dynamics (considering the relation between home and outside migration), which are assumed to increase by 9 % from 2000 to 2010 (Gori et al. 2003).

According to these central assumptions, Istat calculates that the number of older people (aged 65 and over - 10,343,121 in 2000; 18 % of the Italian population), will reach 28 %

in 2030 and more than 34 % by 2050 (respectively 14,925,254 and 16,100,289). Eurostat has assumed, as its central hypothesis, a growth of 44.3 % in the first three decades and a lower rate, 8 %, for the rest of the period (Table 2.7).

Table 2.7: Population projections for people aged 65 and over for the years 2000, 2030 and 2050.

	2000	**2030**	**2050**	**2000-30**	**2030-50**
Males	**data**	**data**	**data**	**%**	**%**
65-69	1,432,908	1,983,245	1,490,282	38.4	-24.9
70-74	1,185,475	1,581,564	1,598,943	33.4	1.1
75-79	877,013	1,255,670	1,616,581	43.2	28.7
80-85	368,895	979,455	1,334,851	165.5	36.3
85 & over	351,415	772,434	1,200,509	119.8	55.4
Females					
65-69	1,687,249	2,130,962	1,524,571	26.3	-28.5
70-74	1,555,510	1,811,563	1,727,875	16.5	-4.6
75-79	1,364,596	1,572,271	1,890,386	15.2	20.2
80-85	680,222	1,379,863	1,727,101	102.9	25.2
85 & over	839,838	1,458,227	1,989,190	73.6	36.4
All 65 & over	**10,343,121**	**14,925,254**	**16,100,289**	**44.3**	**7.9**
All 85 & over	**1,191,253**	**2,230,661**	**3,189,699**	**87.3**	**43.0**

Source: Gori et al. ibid, P. 59

Prevalence of dependency The demand of social and health care for older people is related to the section of the population aged 65 and over who lose self-sufficiency. The quota of dependent population, defined as the proportion of people with one ADL (Activities of Daily Living)[1] or more is 15 % of older people (see Table 2.8). This figure includes people admitted to residential care, where the proportion of people with dependency is higher than for those living at home. Considering the latter, an Istat survey measures that in the period 1999-2000, 12.4 % of people 65 and over reported being entirely dependent in one ADL or more. On the other hand, 8.9 % declared to be bedridden, confined to a wheelchair or to be at home (Istat, 2001). Bearing in mind this general situation in households, vast differences exist between the genders. Women tend to be more dependent than men. Istat has calculated that in 2000 the percentage of totally dependent males was 5.9 % (of all older people) compared to 11 % of females. Concerning dependency in one ADL or more the gender differences are higher, 8.7 % of males, compared to 15 % of females.

[1] Unable to perform at least one ADL among the following: washing ourselves, taking a bath or shower, eating, sitting, lying down or dressing (ADL Katz scale).

Table 2.8: Percentage of older people aged 65 and over who are dependent in at least one ADL, by age bands and gender. Italy, 1999-2000

Male	**No ADLs**	**1ADL or more**
65-69	95.3	4.7
70-74	93.8	6.2
75-79	89.1	10.9
80-84	70.7	29.3
85+	70.7	29.3
Female		
65-69	94.6	5.4
70-74	92.1	7.9
75-79	82.8	17.2
80-84	58.3	41.7
85+	58.3	41.7
14All	**85.1**	**.9**

Source: Gori et al. ibid. p.60

For most countries, implicit longer life for males translates into a rebalancing of the female/male ratios. These ratios are highest today in France, Germany, Japan, the United Kingdom and the United States. If this does occur, it may dampen the overall demand for formal care in the future, as the number of ageing couples is likely to increase. These effects are strongest among the older age groups, as the female/male ratios are the highest in the > 80 years old groups (Jacobzone 1999).

Table 2.9: Female/Male population ratios in UN projections

France	**2000**	**2010**	**2020**	**Germany**	**2000**	**2010**	**2020**
65-69	1.17	1.12	1.14	65-69	1.14	1.13	1.13
70-74	1.30	1.24	1.20	70-74	1.36	1.24	1.25
75-79	1.50	1.42	1.35	75-79	2.07	1.44	1.43
over 80	2.16	2.02	1.97	over 80	2.77	2.42	2.07
Total over 65	1.47	1.44	1.38	Total over 65	1.61	1.43	1.42
UK	**2000**	**2010**	**2020**	**Sweden**	**2000**	**2010**	**2020**
65-69	1.09	1.08	1.10	65-69	1.11	1.03	1.02
70-74	1.23	1.17	1.19	70-74	1.21	1.13	1.09
75-79	1.40	1.35	1.34	75-79	1.35	1.30	1.18
over 80	2.12	2.02	1.99	over 80	1.88	1.84	1.72
Total over 65	1.39	1.35	1.34	Total over 65	1.36	1.28	1.22
Netherlands	**2000**	**2010**	**2020**				
65-69	1.12	1.05	1.05				
70-74	1.27	1.17	1.13				
75-79	1.53	1.40	1.30				
over 80	2.22	2.12	1.99				
Total over 65	1.44	1.35	1.28				

Source: Jacobzone, p.32

From a brief analysis of these projections two groups of countries can be identified:

- a moderate demographic increase of older populations: Germany, Sweden and the United Kingdom
- as well as a reasonably strong demographic increase of older populations in France and the Netherlands. This group presents a strong increase for the over 65 men populations and to a lesser extent for women. The increase of the over 80 group is comparable to the first group of countries (Jacobzone, ibid. p.10).

2.1.5 Life expectancy

The United Nations base their projections of life expectancy on the assumption that death rates at advanced ages cannot be reduced substantially and that a life expectancy of around 80 to 85 years is the highest that can be achieved. The implicit life expectancy gains in the projections are a little less than a year per decade on average for women (.94 year) and a little more than a year for men (1.02). Until recently, the common hypothesis about life expectancy has been that, if individuals reach the age of 80, their life expectancy

beyond that is not much more than about 5 years, thus justifying this implicit convergence scenario. In fact, compared to recent observed trends, life expectancy gains could have been expected for most countries to have been around 1.2-2 months a year for men and 1.6-2 months a year for women, which is slightly more (Jacobzone ibid. p.9). See table **??**[2] for details:

Table 2.10: Life expectancy gains implicit in UN demographic projections

Life expectancy	**Men**				**Women**			
at birth	**1995**	**2000**	**2010**	**2020**	**1995**	**2000**	**2010**	**2020**
France	74.6	75.4	76.4	77.4	82.9	83.3	84.1	84.9
Germany	73.4	74.2	75.5	76.5	79.9	80.7	81.7	82.7
Netherlands	75.0	75.8	76.8	77.8	80.6	81.2	82.1	83.1
Sweden	76.2	77.1	78.4	79.4	80.8	81.6	82.9	83.9
United Kingdom	74.5	75.3	76.3	77.3	79.8	80.6	81.5	82.6

2.1.6 Residence patterns (household structure, proximity of the carer)

The fact that an older and/ or disabled person or someone in need of care lives in a single private home does not necessarily mean that he or she must do without support from the family or others. Table 2.10 below shows that about 62 % of the people in need of care live in the same household as their caregivers. About 8 % of family carers live in the same house or very nearby, about 14 % live less than 10 minutes away, about 8 % live more than 10 minutes away whereas the remaining 8 % of people in need of care don't receive any regular family care-giving or support.

Elderly in need of care who live in a private home with several people are cared for in most cases by a family carer living in the same household or less than 10 minutes away.

[2]Life expectancy at age 65 is not published. Life expectancy at birth still represents a good proxy for the variations, as any further decline of early mortality could have only but a slight impact for the countries being considered. Source: Jacobzone 1999, p. 31

Table 2.11: Place of residence related to the distance of family caregiver to the older person in need of care (in %)

Family carer's place of residence	**People in need of care in total**	**People in need of care and living alone (31 %)**
Living in the same household	62	0
Same house	8	20
Up to 10 minutes away	14	37
Up to 30 minutes	5	14
More than 30 minutes away	3	7
No regular care giving or support	8	21

Source: Infratest Sozialforschung, 2003 (missing to 100 = no data) in Meyer 2004, p. 26

The situation of older people living alone is somewhat different: Only 57 % of them have a family carer available who lives only up to 10 minutes away, whereas 14 % of them rely on family carers who live up to 30 Minutes away, 7 % can only be reached in more than 30 Minutes and 21 % do not receive any family care-giving or support whatsoever (Meyer, 2004). This causes important implications for the application of tele-care technologies!

2.1.7 Intergenerational relationships

The rise in life-expectancy has led to a situation in which care-giving and support for the very old in the family is no longer an exception but has rather become a situation which is to be expected in the course of the family-cycle. Family care-giving is extensively provided within the same generation: about 60 % of the main carers are 55 years and older. The closer family relations determine who takes on the main carer's role and it is evident that the most important helpers are still the spouses of the people in need of care.

This means that many helpers find themselves on the threshold of old age or beyond it. Even the helpers belonging to the subsequent generation are people who are getting older, most commonly women looking after the parental generation. As the people in need of care age the support shifts from the spouses to the generation of their children. The amount of support shifts in inverse proportion so that the amount of support given by spouses decreases to the same extent as the amount of support given by the younger generation increases. The change occurs in a relatively continuous manner across the generations

According to the position of the person in need of care within the family it is either the male / female partner / spouse, the daughter, the mother, the son, other next kin, the

neighbours or acquaintance, the daughter in law, the father or a grandchild who takes on the role of the main carer (Meyer 2004, 2006). See table 2.11:

Table 2.12: Main carers of individuals in need of care in private homes (%)

Relationship	**Proportion**
male / female partner / spouse	28
daughter	26
mother	12
son	10
other relatives	7
neighbours / friends	7
daughter in law	6
father	2
grandchild	2

Source: Meyer 2004, p. 25

Chapter 3

Medical aspects: selected chronic diseases: state of research and experiences with telematics and/or telecare solutions

The home care sector is the most extensive form of care service delivery to older people in Europe. It is estimated that only about 5 % of the European older population live in institutional settings (Alber et al. 1999 cit. in Senior Watch, 2002, p.1). In view of the demographic developments described above, there is a market potential for home care-related ICT applications and thus can be expected to grow considerably in the future.

This chapter of the report will include:

- a definition of terms used in this report
- commentary on the state of distribution of telematics in selected countries
- this is followed by a short description of selected chronic diseases related to telematics and /or tele-care applications and
- a review of the ethical perspectives of the use of telematics for people with dementia
- and finally will summarize with a discussion on socio-economic benefits and the consequences for national strategies and the broad range of different target groups.

3.1 Introduction

For decades, experts have repeatedly returned to debate the viability of telemonitoring or the home-telecare of vital parameters. However, because of its apparent lack of economic advantages to public health services it has not yet established itself as mainstream or standard practice.

On the basis of innovative wireless communication technologies [such as Bluetooth or Zigbee], of the enormous technological progress in mobile communication [via GSM, GPRS, as well as UMTS] and of various far-reaching medical changes within disease management programs, very promising new potential for telemonitoring has quite recently been presented (Bolz et al. 2005). This is the application of telecare viewed from a medical and more technical perspective.

Another way of looking at home-telecare is in its role as a supportive or assistive complement to the care for the elderly in that technology may also be an important factor to enable them to remain independent for longer.

Within the 6th European Framework Programme for Research and Development (FP6), priority has also been given to investigate and promote technologies applied to population ageing.

Telematics in Geriatrics:

Attention, conversation and counselling play a major role in the care of the elderly and a number of research studies give evidence for the importance of communication being a criteria of quality of life and health in old age (Kruse, Nikolaus 1992, Gott 1995, empirica 1995).

Isolation and the depression that often results from it degrade the quality of life as well as a person's general health status. Socially isolated people are further at risk in the face of any dramatic life events. That is one reason why professional communication should not be dismissed out of hand as an extravagance. Communication can contribute to improve the acceptance of far reaching supportive and assistive services in order to allow the person to stay in his/her own home.

Based on these understandings, social support services have developed the concept of home-tele-care or telemonitoring that include so-called videophones. These home-teleservices intend to provide regular communication and high-quality information/ counselling systems for the elderly.

The first German pilot project of home-teleservices has been conducted in Frankfurt/Main in the Westhausen district where 17 households were equipped with monitors and a video camera. These were connected to Frankfurt's Department for the help of the elderly and handicapped (Erkert 1999, p.6).

Telemonitoring and Smart Home technologies:

Telemonitoring and Smart Home technologies provide many advantages. They can contribute to:

- a high-quality level of care and support,
- improving the patients' independence and autonomy
- more efficiency in the health sector.

It is essential for the dissemination of these technologies that they are accepted by all users – care providers/ managers and patients. The Berlin Institute for Social Research –BIS– has been involved in many research activities in order to analyze the user acceptance of innovative technologies (Böhm et al. 2003) and, because of their relevance, focusing on the elderly.

Until now there was little data on the topic of user acceptance. The outcomes of the recent survey (N= 307) 'Smart Home – Smart Ageing' Akzeptanz und Anforderungen der Generation 50+' (acceptance and demands of the 50+ generation) undertaken by the –BIS– show the following:

In the context of 'health' being seen as an increasingly important issue as people age, the study investigated the advantages of and reservations with telemonitoring and Smart Homes. The data show that these innovative technologies are widely accepted by the 50+ generation; a summary of the detailed findings being as follows:

Positive:

- Interesting for people suffering from chronic diseases: 96,2 % of all respondents
- Increased safety: 83,0 %
- Time-saving for patients: 73,3 %
- Increase of independency in old age: 70,8 %
- Support of mobility: 70,4 %
- Cost reducing: 40,9 %

Negative:

- Unreliable: 67,8 %
- 'is complicated': 48,1 %
- Being afraid of these technologies: 19,5 %
- Unnecessary: 11,7 % (ibid, p.3294).

3.2 Definition of Terms

Before entering into the detailed commentary, it is necessary to define and clarify the meaning of some medical [especially gerontological] and also technical terms used in this report:

3.2.1 Disability

Research involving international comparisons of population health has produced several types of indicators involving multiple definitions of disability. Usually a distinction is made between:

- 'Severe disability', which includes those individuals with at least one (1) ADL restriction (or more). This is almost invariably associated with the need for help with personal care, either at home or in an institution.
- 'Moderate disability', which includes those individuals experiencing no ADL restriction but IADL limitations. This does not usually lead to institutionalisation.
- 'Little or no disability', which includes individuals with no major functional limitations (either ADL or IADL).

The key assumptions are that disability as defined above is both:

- linked with health status in a measurable way, as an 'outcome' of both past life and health care patient history
- and an objective reason to seek help with personal care, in either form (ADL or IADL).

3.2.2 ICT 'Information and Communication Technology'

ICT – 'Information and Communication Technology' covers a rapidly developing range of telecommunications and computer technologies. Services delivered by electronic means are sometimes referred to as 'enabled' services, giving rise to terms 'e-commerce' and 'e-health' and health services provided via ICT.

The focus of this expertise is on another application of ICT –'**Telecare'** which is defined as:

'care provided remotely by means of information and communication technology (ICT) to people in their own homes' (Curry, R.G. et al. 2003).

Much attention is paid to Home-Telecare because this application makes it possible to monitor patients in their own domestic environment. Great professional interest is attracted by the increase of chronic diseases [eg diabetes, congestive heart failure, chronic obstructive airway diseases, dementia and others] because the medical care and treatment of these diseases and their greater incidence increasingly place untenable demands on national health systems.

Whilst Home-Telecare is considered a better medical and therapeutic treatment, the restricted economic and budgetary environment in which it operates creates operating tensions.

These technological developments seek alternative approaches to standard, current health care procedures and structures.

Distinguishing between telecare and telemedicine:

A distinction has to be made between **telecare** and **telemedicine**. There is a degree of overlap between telecare (care provided at a distance using ICT, generally to people in their own homes) and telemedicine (the practice of medicine at a distance using ICT).

Care-related applications are those that involve access to or delivery of care services, at a distance, such as social services, social alarm and monitoring services and health care (Senior Watch 2002). Accessibility-related applications and requirements are those that relate to needs resulting from functional changes due to disability and / or age, for example changes in vision, hearing, mobility and so on (ibid. p.1).

The term telemedicine is synonymous with several –and partly heterogeneous – medical applications. Nearly all have the same thing in common, namely patient-centred medical data that can be exchanged over more or less longer distances. Geographical distances do not impose any limitations on the use of these technologies.

Economic pressures on national health sectors are not the only reason why telemedical technologies attract a great deal of attention.

Telemedicine promises a helpful complement to ensure and also to improve the quality of medical care and treatment at the same time as reducing costs. However, to date, no telemedical project that validates the cost benefits (Pfeifer 2004, p.107) has been published.

Before critically discussing the cost benefits the medical value should be evaluated at first hand in order to assess whether the same medical outcomes would have been achieved without the use of telemedical devices.

Telecare in terms of the care and support services provided in the home by means of technology can include:

- health care,

- social care or housing-related support
- reduction in social isolation
- provision of information and reminders
- support treatment, rehabilitation and intermediate care.

Telecare aims to enable older or/and disabled people to remain in their own homes by providing increased safety and reassurance to them and their carers.

Telecare technology should be seen as part of a wide range of equipment used to support independent living, commonly known as '**assistive technology**'. This is defined as:

'equipment or systems that can assist people who have difficulties, due to age or disability, in carrying out everyday activities' (ibid. p.1).

Assistive technology is coming to be the preferred term for all such devices rather than 'disability equipment' or 'technical aids'. It covers simple items such as:

- walking sticks, bath seats and grab rails, as well as more sophisticated ones such as:
  - electro-mechanical equipment [e.g. powered wheel chairs],
  - electronic aids: e.g. digital hearing aids and environmental controls [eg passive devices to detect falls, wandering and other hazards such as fire or gas] that can trigger a human response or shutdown of equipment,
  - equipment used by carers such as lifting aids.

Another term used in the context of electronic resources is **'Smart Homes'**:

'homes in which ICT has been installed to help control a variety of functions and provide communication with the outside world' (ibid. p. 1).

Core functions of generic smart home systems are:

- Control (in and outside the home) of the system
- Emergency help
- Temperature monitoring
- Water and energy use monitoring
- Automatic lighting
- Door surveillance
- Cooker safety
- Water temperature control

- Window, blind and/or curtain control
- Property safety/ security
- Online links

Additional functions associated with provision for older people are:

- Memory joggers and diary facility
- Lifestyle monitoring
- Medical monitoring
- Dementia care.

Telecare services and 'Smart Homes' share a common technological base in information technology and telecommunications, since both product (smart home) and application (telecare) call on similar technology.

For this reason, it has been suggested by Tang and Venables (2000) that providers of telecare should be aware of developments in smart homes, and builders of smart homes should be aware of the possibilities for telecare (Curry et al. 2002, p.19).

3.2.3 The use of telematics in selected countries

This section shows some selected examples of the use and dissemination of telematics based on the data that were available for this initial overview. In relation to (tele) care related policy, there is a considerable amount of positive activity in the ICT area and in general health care policies that address ICT (IST). Although several countries (F, G, EL, IRL, I, L & P) do not explicitly define policy initiatives or policies anywhere that mention the use of ICTs as empowering tools for family carers, some countries without any policy (A, DK, F, NL & ES) report significant potential interest and activity in this area (Senior Watch, p.30).

In Spain 'Telematics' is an expanding service that, so far, only plays a marginal role in the national health care system. This service provides care by means of using new communication technologies. Currently it only provides care to 80,000 people across the whole country, less than 0.8% of the older population (Costa-Font, Patxot 2003, p.51).

The National Health Service –NHS– in Great Britain provides electronic assistive equipment for use in the home by people suffering from such severe physical disabilities that their needs cannot be met by conventional home adaptations. The assessment of needs at the person's home will lead to the specification of a system which is known as an environmental control system (ECS). This system provides a range of functions that

afford the user safety and security in the home as well as enhancing their independence and participation in society.

The system will typically be operated either by means of a single switch and a scanning selection unit or by a sensitive programmable keypad or by voice control. The types of function include for example:

- Home security and control of visitor access (this is important for people who experienced cases of domestic violence)
- Door opening and closing for the wheel-chair user
- Personal alarm functions both within the home and further afield including access to social and community alarm systems
- Use of hands-free and remote-control telephone
- Control of electric riser/recliner chairs and electric profiling beds
- Control of the ambient environment – such as lighting, heating, curtains and windows
- Operation of home entertainment equipment including digital interactive systems and
- access to information and communication technology such as electronic mail and the WWW.

In England there are currently some 4,000 users of environmental control systems and approximately 1,000 new systems are installed each year (Curry et al. 2002, p.8). One of the recent Audit Commission Reports (2004) specifically focused on the role of technologies in supporting older people and their family carers. This recognised a considerable potential for Assisted Technology (AT) e.g. it has a huge potential to enable people to remain in their own homes.

In the Netherlands the local authorities have developed houses in which residents can live their whole life with alarm systems, ICT-technologies etc. In other cases, some professional home care organisations are offering computer technologies to the elderly and their caregivers to get care advice from nurses by using a webcam and Internet (Visser-Jansen, Knipscheer, 2004).

Finland is leading the field in this area. So-called gerontechnologies (technologies for older people) are widely used e.g. locomotion devices in / out of the houses, eating, sleeping, security [timers for lights, locomotion recognition, security telephone or doorbell alarm].

For family carers night alarms are available as an alert if an elderly person gets out of bed during the night (Mestheneos, Triantafillou, 2004, p. 144).

In Germany Gerontechnologies (see Finland above) are widely used but no special telecare or telematics exists as a common application except in the case of pilot studies into selected chronic diseases. Local authorities or charitable centres as well as the gerontechnology industry provides free exhibitions mostly in larger towns to counsel interested people in how to adapt their homes. This covers, beside barrier-free furnishing and sanitary adaptation, emergency-calls and security telephones suitable for functional handicaps.

In Ireland 70 community based projects supported the community application of IT – Caring for Carers initiated an IT project with Mid Western Health Board, CI Center Ennis and Ennis Age Town. The target group amounted to 1500 people bur-t was not yet mainstreamed. All in all, IT is poorly developed and under-legislated (ibid. p.146).

3.3 Target groups for technical support

In view of national health systems' limited financial resources, telemedicine offers possibilities to supplement the mainstream forms of patient care and supervision and place even greater emphasis on the patient and their medical care. Telemedicine adds to but does not replace traditional home visits by nurses nor medical consultations. It is clearly structured, easily replicated and based on modern technology for communication between patients, doctors and nurses.

In these terms, 'flying visits' (Pfeifer et al. 2004) can be made to the patient much more frequently than would otherwise have been possible financially or practically. Telemedicine can also help ensure the 'appointment' time is convenient for the patient. Regarding the so-called Diagnosis Related Groups (DRGs) as well as Integrated Care Systems and Disease Management Programs (DMPs) telematics and telemedicine devices are emerging as a complementary 'environment', incorporating comprehensive medical as well as administrative documentation on which a 'Business Case' can be developed.

Improvements in high quality medical care and treatment as well as cost saving are essential aims with DMPs. Shortening of hospital stays and prevention of complications can achieve these. The emergence of Online-Disease Management initiatives also resulted from growing patient awareness and familiarity with the systems that further empower the patient.

3.3.1 Handicapped and / or incapacitated people with limited mobility

Telecare and / or telematics have the potential to improve the quality of life for the elderly suffering from physical or mental impairments as well as for their care giving relatives.

Videophones, Internet resources and multimedia computers can be used for networking both groups together with social workers, nurse practitioners, physicians and therapeutic staff in service centres. This can be viewed as a unique opportunity to establish and maintain instant and personalized access to various medical services in a situation where increasing needs are directly set against decreasing resources.

The 'TeleReha' study was conducted at the Berlin Geriatric Centre among mobility-impaired people, care giving relatives and geriatric professionals. In this study networking was established using ISDN technology with videophones or PC-based videoconferencing systems. The results are summarised as follows:

- Participants regarded telecommunication devices as a valuable resource for their information and communication needs.
- The use of telecommunication systems was inversely related to physical mobility.
- Having access to professional services and counselling was rated highly important as was the opportunity to establish reliable contacts with non-professionals.
- The researchers suggest that geriatric patients and relatives and professionals caring for them can use telematics efficiently.
- However, evidence for a medically and economically effective use is still scarce. The considerable potential for telematics applications are still largely unrecognized by geriatricians (Mix et al. 2000).

Further, more environmental control systems and voice communication aids may meet the needs of people with complex physical disabilities or handicaps. These systems could be integrated with special wheelchair controls so that a single movement can be used to control all these functions without carer intervention. For example within the British National Health Service –NHS– there is a move towards integrating specialist Electronic Assistive Technology Services into centres at the tertiary level for other specialist assistive technology services such as prosthetics and orthotics.

The British Society of Rehabilitation Medicine (2000) published a report on electronic assistive technology in 2000 and a qualitative study evaluating the experience of adults in acquiring and using environmental control systems. It also contains a good deal of background information about provision in this field (Stead 2002).

3.3.2 Chronic obstructive pulmonary disease

Chronic obstructive pulmonary diseases –COPD– and asthma are the most common pulmonary diseases. COPD is a slowly developing progressive condition, which is irreversible. In Western societies about 5-7 % of the adult population suffer from a COPD. Other statistics take 12-15 % as a starting point (Pauwels et al. 2001 and Mannino 2002 cit. in Pfeifer

at al. 2004). It is assumed an incidence for asthma of 5-8% among pre-school children and that this trend is increasing. COPD are very suitable for telemedical care, because on the one hand the symptoms [e.g. dyspnoea, cough and expectoration] are obvious and easy to recognise and on the other hand it is easy to quantify the assessment of the relevant obstruction by measuring the pulmonary function.

Periods of acute recurrence:

- degrade the quality of life,
- lead to frequent absenteeism from the workplace or school,
- cause high costs of medical treatment and
- will accelerate the progress of the disease.

Early recognition, diagnosis and medial treatment as well as the identification of patients with frequent recurrences, present one of the most evident targets for this treatment.

The treatment of COPD will be successful in the long-term, only if the management of the acute recurrence will be optimized to avoid recurrences or at least to reduce their frequency. This objective will only be achieved as things stand today by regular, time-consuming patient monitoring either by frequent doctoral visits or by obligatory primary care treatment and home visits by the general practitioner.

Patient measuring their own relevant parameters has been practised for many years in relation to chronic diseases to ensure optimal monitoring of medical treatment and a quicker medical reaction if required: e.g. control of blood pressure, blood sugar weight or peak-flow-control of asthma patients. Outpatient telemonitoring is a consistent further development of patient management, because it is instantly checkable by medical staff.

Several studies with telematic based medical treatment of patients were conducted, beginning from regular telephone contacts to Internet based communication – these included cases of automatic transfer of both pulmonary function measures and oxygen saturation measures. However, except for very few controlled studies, there have only been some smaller studies primarily evaluating the application of technical devices or systems (Pinnock et al. 2003, Kokubu et al. 2000).

In the UK a pilot project represented a first attempt at providing home telecare to patients who experienced an acute recurrence of their chronic illness and who would otherwise have merited emergency hospital admission. It was carried out in 1999 (Mair et al. 1999). Home telecare was examined as an alternative to hospital admission in the cases of recurrences of chronic obstructive pulmonary disease. N=6 patients had videophones installed in their homes to obtain nursing support from a nurse located at a distant base station.

The experiences showed that home telecare, via interactive video, was limited to providing ongoing support for individuals with relatively stable chronic diseases.

A 3-months-study with (N=54) COPD patients evaluated the efficiency of a home-monitoring programme. The control unit consisted of a pulse oxymeter to measure the oxygen saturation and a pair of scales. The measurements were transferred via telephone to the medical centre. Daily telephone contacts between doctor and patients gathered the data from an Internet based questionnaire. A total of 36 occurrences were picked up, and 81 % of them were treated in outpatient facilities.

Compared to the figures one year before the rate of hospital treatment (theoretically) decreased by 50 %! However this was not a controlled nor randomized study and the data are not evidence based. Another telemedicine study (Kobuku 2000) among a small group of asthma patients showed a reduction of hospital readmission of about 83 % compared to the control group.

A significantly positive effect has been seen in the better control of medical treatment (drug intake) and in the early recognition of the occurrence.

First experiences in Germany were from a tele-monitoring study in COPD with N=45 patients suffering from asthma. The data show that the patients acceptance of these devices were very positive and this has led to another larger study with N=900 patients financed by a general health insurance –AOK– in Bavaria. The study will also assess the suitability and effectiveness of the application of telemedicine at home among different patient types. The study is not yet completed but the initial results are very encouraging and the authors recommend not only the application of telemedicine at home in cases of COPD but also in other chronic diseases (Pfeifer et al. ibid. p.110).

3.3.3 Congestive Heart Failure

Progression of chronic heart failure depends on various additional pathophysiologic factors like blood hypertension, arrhythmias and congestion. Early detection of any alteration using telemonitoring of multiple vital parameters may avoid severe decompensation requiring hospital admission. By bridging the physical gap between the doctor and the patient, certain tasks can be accomplished. The recordings are interpreted by specialists in a telemedical centre in order to initiate therapeutic measures if the need arises. Tebbe and Korb (2003), using telephonic transmission of 12-lead ECG recordings, after the analysis of the initial experience, reported a high rate (70 %) of classic pulmonary disorders with an amazingly high incidence of new diagnoses (25 %). The time that can be gained by telemonitoring is especially noteworthy but future studies must determine whether it will also be possible to reduce costs in addition to improving patient care (ibid. p. 199).

The growing incidence of chronic heart failure is another strong argument for the application of telemonitoring devices.

Worldwide there are more than 22 million people and about 4 million in the European Union suffering from heart failure and they pose rising health related and economic problems. The high cost of caring for patients with congestive heart failure (CHF) results primarily from frequent hospital readmissions or condition recurrences. In Europe and the US heart failure accounts for more than 2 million hospital admissions. Despite good medical treatment and cardiac resynchronisation therapy –CRT– many patients experience emergencies, which lead to death or hospitalization. Telecare is a feasible technology that may assist the delivery of care to and the optimisation of therapy for patients with heart failure (Jung 2005).

Meanwhile several cardiac disorders and high-risk patients [e.g. after acute myocardial infarction] are supervised via so-called event-monitoring at home. Viewed from a preventive medical perspective this will be of interest in patients with conspicuous data in so-called medical screening results and are recommended as a continuous follow-up for medical safety reasons (Bolz et al. 2005, p.136).

Oeff et al. (2005) have carried out a telemonitoring study with N=24 patients suffering from heart failure. Twice a day the vital parameters were measured (weight, blood pressure, heart rate and rhythm, oxygen saturation, respiration rate). Patients were introduced to the use of the technical application by a specialized medical technician.

Performing over 10.500 measurements during 5751 patient days, critical events were diagnosed for 55 events concerning:

- relative weight gain,
- blood pressure,
- decrease in oxygen saturation,
- new onset of atrial fibrillation with tachyarrhythmia.

Of these, 45 events were controlled on an outpatient basis by changing medication or by applying external cardio version [ie electric shock] to revert the heart rate to its normal rhythm. Only 10 patients required re-admission. Thus, the number of admission to the hospital could be reduced by 62 % and the days spent in hospital by 69 %.

Non-invasive telemonitoring of multiple vital parameters combined with patients' statements on their health condition and outpatient treatment on the basis of these findings is found to be an effective and reliable approach to avoid hospital readmission for patients with chronic heart failure (ibid. p.150).

The objective of another one-year randomized trial aimed to compare the effectiveness of three hospital discharge models for reducing CHF-related readmission charges. The trial

consisted of:

1. Home telecare being delivered via a 2-way video conference device, which included an integrated electronic stethoscope
2. Nurse telephone calls; and
3. Standard outpatient care.

The results show that the mean CHF-related readmission charges were 86 % lower in the telecare group ($ 5850, SD 21,094) and 84 % lower in the telephone group ($ 7320, SD 24,440) than in the usual care group ($ 44,479, SD 121,214).

Both intervention groups had significantly fewer CHF-related emergency department visits and consequent costs against the service than the group undergoing standard treatment.

The researchers conclude that substantial reductions in hospital readmissions, emergency visits, and cost of care for patients with CHF might be achieved by widespread deployment of distance technologies to provide post - hospitalization monitoring (Jerant, 2001).

The world's first full-scale clinical randomized controlled trial -RCT- with high-risk patients the TEN-HMS (Home Care management system) study (Cleland et al. 2005), was carried out between mid 2000 and end of 2002 among a sample of N= 426 patients in the Netherlands and the UK. The aim of the study was to test:

- whether telehealth home-monitoring can improve medical outcomes for heart failure as well as
- patient quality of life and
- the efficiency of healthcare processes.

The feasibility as well as the usability and reliability of the technical equipment was examined (Louis et al. 2003; de Lusignan et al. 2001). 12 university and regional hospitals as well as local specialists and GPs (general practitioners) took part in the study (Robinson et al. o.J.).

The data obtained show that heart failure patients supported by telecare, either via monthly telephone calls and/ or telemonitoring, have a substantially and significantly lower mortality rate compared to the usual medical care group (best medical practice based on a patient management plan by the GP). Overall, the total days in hospital were considerably and consistently lower for the telemonitoring group, although this was not statistically significant.

The data analysis indicates that the cost savings of the overall reduction in hospital bed-days offsets the increased cost of telemonitoring compared to nurse telephone monitoring.

About 90 % of telemonitored patients were very enthusiastic about this kind of support that they felt much safer regarding their health management (ibid. p.4).

The authors point out that the initial results of the worldwide unique study (TEN-HMS project) provide strong arguments for the introduction of telecare.

Considering the significantly improved survival rate with a significant improvement in *days alive and out of hospital* for high risk patients, it becomes an ethical imperative to improve the organisation of national health care systems for patients with heart failure (ibid. p.5).

3.3.4 Implantable cardiac defibrillators –ICD–

In recent years the use of implantable cardiac defibrillators –ICD– has grown substantially after the results of primary and secondary prevention trials have shown significant improvements in mortality (reduction in fatalities) and morbidity (reduction in the extent of the condition).

Similarly, a large number of prospective and randomised studies into the prevention of sudden cardiac death have established the primary and prophylactic ICD indication for a broad number of patients (Jung, Birkemeyer 2005, p.184). Furthermore the introduction of cardiac resynchronisation therapy spread the application of electronic stimulation significantly. Because of the successful evidence of the decline of mortality rates the number of ICD implantations show a double-digit increase per year (ibid.).

However, the increasing number of patients in need of ICD creates significant logistic problems for the treatment centres, particularly when the number of follow-up visits is taken into account. New methods of telecardiology will possibly help to ensure a high quality standard of care without endangering the medical treatment. They are currently being introduced into clinical practice.

The most promising concept of a home-monitoring system will automatically transfer the data related to treatment, ICD and cardiac resynchronisation therapy –CRT– in a daily routine without any patient involvement. The interaction between the patient and medical doctor is independent of any location restrictions.

The TEN-HMS Study showed in N= 426 patients with heart failure that a system with automatic daily data transfer compared with standard post-medical treatment will significantly reduce the mortality rates. The increase in survival rates through automatic daily data transfer is about 35 % (ibid. p. 185)! The technical control of the system apart, it is of great medical interest to identify all kinds of arrhythmia through home monitoring because this will improve survival rates. Nearly 55 % of clinical routine controls could be saved without affecting the therapeutic safety and appropriateness (ibid. p.188).

Experts and patients call for a system, which integrates the following demands:

- The reliable communication of medical or technical conditions that require quick reactions,
- That it be highly time efficient (no time lost)
- And that only relevant data be monitored (stripped of irrelevant data) (ibid.).

These systems could avoid patients having to travel frequently to hospital.

The success of home monitoring depends on a proper introduction to the handling of the system. This will be an essential prerequisite for successful monitoring as opposed to the patient's age, origin, education or other similar factors.

There is a study available analyzing the cost effectiveness of home monitoring. Cost benefits are shown already, at the lowest level, through the savings generated by reduced travelling to and from hospital (Fauchier et al. 2005).

Telemonitoring for patients with ICD can also reduce the costs caused by readmission rates significantly (Jung, Birkemeyer 2005, p.189).

3.3.5 Diabetes mellitus and insulin therapy

Patients with insulin dependent diabetes require frequent advice if their metabolic control is not optimal.

Biermann et al. (2002) conducted a prospective, randomised trial with N = 43 patients on intensified insulin therapy. The travelling distance to the diabetes centre was 50 minutes each way. The patients had undergone a diabetes education course with lessons in dose variation. Patients were randomly assigned to telecare or conventional care. The telecare patients transmitted their data over a combined modem/interface via telephone to the diabetes centre every 1-3 weeks and a teleconsultation was performed by phone every 2-4 weeks.

A substantial amount of the patients' time could be saved through replacing face-to-face communications by telephone contacts and the streamlining of data transmission.

A cost analysis was carried on setting up an optimal telemanagement scenario and that identified savings ~ 650 per year per patient. Some blood measures dropped significantly: HbA_{1c} from 8.2 to 7.0 % after 8 months of observation.

The authors conclude that telemanagement of insulin-requiring diabetic patients is a cost and time saving procedure for the patients and results in metabolic control were comparable to conventional outpatient management (ibid.)

3.3.6 The 'Virtual blood hypertension hospital'

In Germany the prevalence of patients with blood hypertension is about 20 % (∼15 million). Only 4 million of them are in medical treatment, of these only 1,5 million perform a good management of their blood pressure measures with systematic medical treatment (140/90 mmHg). To treat only 10% of these patients with arterial hypertension in an adequate way demands substantial economic resources in medical and pharmacological care.

This is why patients with blood hypertension are also a potential group for using telemedicine at home. Two main factors for a better control by telemedicine are being discussed:

- Better and intensified adaptation of the medical treatment bases for the regular and structured analysis of the blood-pressure measures,
- Better medical compliance with regular medication use.

Trials focussing telemedicine in the management of arterial blood hypertension at home show a high acceptance by both patients and their general practitioners.

Up to now only a few randomized, controlled and prospective trials have been undertaken, but the outcomes show a better hypertension regimen than among patients receiving classical treatment. These positive outcomes need to be corroborated through more trials that particular focus high-risk patients with hypertension and physical disorders caused by long-term hypertension (Mengden et al. 2001).

3.3.7 Innovative technologies: older people with Dementia and their family carers

The majority of older people want to stay in their own homes and people with cognitive impairments [e.g. dementia] are no exception. However the symptoms of dementia that affect memory, orientation, planning and monitoring, question their ability to remain living at home.

Investigations showed that the family caregivers of people suffering from dementia, who spend large amounts of time looking after people in need of care, reported physical complaints such as exhaustion, pain in arms and legs, heart trouble and more severe stomach pain than in the general population. These symptoms are found to be more pronounced in carers of cognitively impaired people than with carers looking after the elderly who are largely unimpaired in their cognitive performance (Gráßel, 1998).

The investigations of Schacke and Zank on mental stress factors in carers of demented people showed that the main factors impairing their quality of life were role conflicts and the feeling of not being able to provide adequate care. This mental stress can in turn have

a negative effect on the quality of the relationship between them and the people being cared for (Schacke, Zank, 1998).

Recent representative research data confirm these investigations and revealed that 42 % of all family carers felt they were rather over-stretched and 41 % of all family carers felt extremely physically and mentally burdened; only 7 % did not feel this (Infratest Sozialforschung, 2003).

Technology has also the potential to offer benefits to people with both physical and cognitive impairments and telematics and telecare is a recently recognized, if very complex field. It ranges from user aspects – simple use – to ethical questions relating to the boundaries of the use of technology.

Four fields of action can be identified:

- The development of active and passive security technologies
- Support of family carers of people with dementia through ICT
- Development of assistive technologies for demented people themselves: multimedia occupational programmes, virtual partners for conversation, structuring the activities of daily living as well as
- The use of telemedicine for demented people in need of care.

People with a diagnosis of dementia experience progressive cognitive impairments that typically start with working memory problems but can encompass speech production, planning the daily activities, monitoring and visuospatial difficulties as the condition advances (Astell, 2005). This makes a person with dementia extremely dependent on others in a physical and psychological sense. Some recent initiatives like the ASTRID Project, ENABLE project and Alzheimer's Association's Everyday Technologies for Alzheimer Care (ETAC) highlight the possibilities offered by technology to address the needs of people with dementia. The activities focus on three key areas:

- safety
- security
- and social interaction

Safety needs:

The most controversial application of technology in dementia care is in the use of tracking and surveillance equipment.

These technologies are increasingly advocated and adopted as a way of safeguarding people with dementia. One example is the GPS –the global positioning system– which is advertised as personal locators and tracking devices for people with dementia and other

cognitive impairments. Additionally electronic tagging is also used in dementia care facilities as an alternative to locked doors and medication to prevent keep people getting lost (Bail 2003).

Tagging is controversial, not because of the technology, but due to its association with incarceration and control. In respect of people with dementia questions are raised related to their personal autonomy, their human and civil rights.

Advocates of tagging argue that it reduces caregivers stress and increase the freedom of people with dementia to go where they wish. Critics argue that these technology led interventions only focus two aspects of dementia, disorientation and confusion, and do not meet the needs of the whole person.

The use therefore requires careful cost-benefit analysis not only for caregivers but also for how it meets the needs of the person with dementia.

Security needs:

Several major initiatives have focused on developing technologies to respond to specific problems relating to everyday activities with the aim of helping people enjoy the security of their own homes for as long as possible.

The ASTRID project produced a guide to technology currently available for people with dementia.

The ENABLE project set out to ask people with dementia in five countries to evaluate a range of devices. Five items were tested:

- day and night calendar
- do-it-yourself picture gramophone
- locator for lost objects
- automatic bedroom light and
- programmable telephone with photographs instead of numbers.

The outcome was a set of evaluations of the target devices and recommendations including implementation of assistive technology (AT) as early as possible after diagnosis and recognition of the need for AT to be incorporated into an individual's care package (Gilleard 2004).

The UK part of the ENABLE project has been conducted by the Gloucester Smart House (Bath Institute of Medical Engineering), a specially equipped house for testing out AT innovations.

The Dementia Voice project investigated low-key interventions in their own homes for people with dementia: door alarms, medication reminders and memory joggers.

The evaluation suggested that people with dementia and their carers were able to adopt these devices and found them helpful (Cash 2004).

Psychosocial needs:

Dementia and memory problems affect people's ability to participate in social interaction and they find it increasingly difficult to follow conversations and other social activities.

Computer technology can circumvent the handicap of short-term memory problems. In these areas of technological development reside most examples of aids that are specifically designed for people with dementia. Two examples are the projects CIRCA and Story Table.

CIRCA is an interactive multimedia system, using a touch screen interface and hypermedia links to promote the communication between caregivers and people with dementia. The touch screen enables people with dementia to actively direct the conversation without having to rely on caregivers. They can make choices and decide on topics of conversation. Caregivers are given respite from the need to keep the conversation going.

Story Table was developed to stimulate the memory of people with dementia by capturing an oral history through recording their stories and thereby increasing interaction and communication.

However, it should be remembered, even in the context of these good and well-meaning ideas, that the use of technology for security, safety, comfort and possible surveillance of people with dementia raises a further number of ethical issues (Poulson et al. 2002).

3.3.8 Telecare devices and ethical issues

Ethical considerations have been reported as being a major barrier to the delivery of telecare and guidelines have been developed to address these concerns.

Technology can benefit people with dementia as much, if not more so than people without cognitive impairments. Several projects illustrate the creative use of available technologies to support people in their own homes and to facilitate their independence.

However, applying technology particularly to meet the needs of people with dementia is not always positive and is not always viewed uncritically. The examples of electronic tagging and other surveillance technology illustrate that addressing the needs of people with dementia is both a complex and sensitive process (Astell 2005).

At the heart of these issues is the principal of 'informed consent'. This requires that:

- Information be provided to the person about each possible option and its consequences

- Consent is voluntary, and
- The person has the competence to understand the various options (Poulson et al. 2002, p.15).

Some researchers active in the field of telecare and smart homes have identified some real and potential problems in the application of these systems:

- System inoperability and compatibility
- Confidentiality (unsolicited remote analysis of personal activities is not always acceptable; the transfer of personal information to third parties),
- Perceived danger of substitution of more personal forms of care and support ie screens or machines replacing personal contact,
- Perceived danger of smart technologies removing choice and control from the user
- The lack of homes with installed smart technologies, the fact that they need to respond to the differing needs of residents and the lack of systematic evaluations of their impact means that there is some scepticism regarding their merits (Curry et al. 2002, pp 19-20).
- Technical, organisational and legal prerequisites
- Informed consent of the person with dementia
- Adopted devices meeting the special needs of the person
- Evaluating the outcomes
- Training and education of carers
- Integration in a comprehensive care-management regime (Mollenkopf et al. 2005).

These aspects have to be taken into account when applying technologies to meet the demands of dementia sufferers.

3.3.9 Indicators and user acceptance for ICT use

Electrical engineers, decision makers and ICT provider should be aware of the interrelationships between four indicators and the user acceptance for ICT and/or Smart Homes because this will help to identify and counsel relevant target groups:

1. Daily culture related to daily routines: The use of technologies has become part of the daily routine and is not deemed to be 'special'. Therefore whatever the application, it has to take people's daily routines into acount. Analysing this could help to identify the target groups with a high acceptance of ICT and could help find out potential problems

to be addressed and any subjective and objective demands on the ICT solutions. The 'market success' of home-telematic devices depends on the possibility of 'integrating these technologies into people's daily routines'.

2. Type of household / household composition: The use of technology is not only linked with people but depends on the communication structures within the household and among its members. The use of technology can only be understood in the context of the way of life and living conditions it is serving.

3. Lifestyle: On the one hand the use of technology is dependent on people's lifestyle and its relevance to certain groups in society. On the other hand lifestyle is influenced by personal values that will consequently lead to certain daily practices and individual consumer behaviour. In particular the emotional as well as the rational reasons for acquisition correspond strongly with lifestyle-indicators.

4. Technological biography: The use of technology is dependent on an individual's 'technological biography'. Acceptance corresponds with patterns of behaviour and perception and this will have evolved over a lifelong process. Important factors for technology acceptance are:

- The process of socialising at one's parents' house.
- The profession (vocational education, choice of career).
- Financial resources, the family network and other members in household.
- Social and cultural environment: social relationships, friends, cultural and regional aspects.
- A high user acceptance of ICT can be found in the following groups:
  - 'DINKS' (dual career families),
  - men,
  - people with higher educational levels,
  - people with high technology acceptance
  - and middle-range+ income groups(BIS).

3.4 Discussion and recommendations /the lack of socio-economic studies focusing on the cost-benefits

Due to the limited financial resources of national health systems/ services and to the dramatic demographic changes our society undergoes, much attention is paid to Home-

Telecare and / or Home-Telemedicine.

These technologies offer possibilities to supplement the known forms of patient care and supervision in their own domestic environment, placing equal emphasis on patient well being as on medical care.

This great interest is derived from both the increase of chronic diseases [e.g. diabetes, congestive heart failure, chronic obstructive airway diseases and others] as well as, as a result of increasing life-expectancy, many of the growing number of older people living alone, at risk of requiring care and / or of suffering from cognitive impairments e.g. dementia.

Effective integration of ICT applications could improve the quality of life of all citizens and enable safer independent living. The benefits of such integration can be measured in terms of the extent to which people are able to live more independently and the extent to which they may be empowered and socially included through the availability and use of such technologies (Curry et al. 2002, p. 20). ICT and telecare models and applications may reduce resource utilisation in national health care sectors, particularly in the case of elderly patients suffering from chronic diseases such as mentioned above.

The medical care and treatment of these diseases increasingly place economic burdens on these health systems because they comprise some of the most common diseases in modern societies. There is a clear aim in many national health policies: the costs in health provision have to be reduced without degrading the overall health provision in society. The balance and challenge is to square better medical and therapeutic treatment with the reality of national financial restrictions at the same time as limiting the budgetary tensions that could well occur.

Telecare systems can create social and economic benefits including *'reduced travelling leading to cost and time savings, improved efficiency of medical resources, speed of access to care, early detection avoiding emergency visits and hospitalisation, (....), expanded geographical coverage, improved patient and family involvement in their own care, continuity of patient care and involvement of after care'* (Moore, p. 79, o.J.).

But there are only limited trials of telecare services and they have generally been evaluated with a focus on their individual clinical outcomes rather than their beneficial impacts on the health system and on the socio-economic benefits.

Acceptance of telecare devices by the healthcare practitioners and better-informed users are essential to induce a sufficient market demand.

It would appear that there are two groups of potential ICT-users:

- People, possibly the ageing population, who want to live more independently and suffer from one (or several) of the chronic disease(s) mentioned above.

- Older people at risk for suffering from cognitive impairments and their family carers.

The research outcomes being discussed for both groups from a cost-benefit point of view are detailed below.

1. Home telecare applications and economic benefits for society

Telecare, the delivery of health and social care to individuals within their own home or in the wider community, with the support of ICT-systems, has been advocated as an approach to reduce the rise in the number of elderly placed in institutional care and to contain health service costs.

These technologies are widely accepted by the 50+ generation as they address the subject of personal health that is ever-increasingly a high priority as people age.

The Senior Watch report points out that despite considerable potential demand, the actual market for care-related applications is still in its infancy (ibid. p.29) and that vulnerable people living in the community are at higher risk than others of experiencing situations where immediate health care intervention is required.

It is estimated that only about 5 % of the European older population live in institutions like nursing homes (because of the high costs) and family members care for the vast majority of them at home. Further, about two thirds of older people with cognitive impairments are cared at home by family members. Many family carers, often together with the person they care for, are confined indoors because they have to be available around the clock. Consequently, they can rarely take part in social activities outside the home, they do not have the opportunity to relax by taking part in leisure activities or talking to friends. They become more and more socially isolated.

To date there are few data about the socio-economic benefits of assistive technologies and /or home telecare; the focus tends to be placed on the impact on the individuals' quality of life and on their individual social benefits ie how integrated they are in their society, what they can contribute to it and what the get out of it

Because of the limited data available no adequate recommendations can be given in order to estimate the economic cost-benefits as well as the long-term consequences of telecare. This *'can only be understood if the time dimension is taken into account. Cost benefit studies of proposed care innovations in which the effect of implemented changes is compared with the current system of service delivery therefore have to be complemented with dynamic considerations of the process of change. On a restricted time horizon, telecare will possibly be financially more viable when benefits in the health sector (as opposed in the social care sector) are included; telecare might help reduce hospital admissions and save money in the shorter term' (Bayer et. al. 2005, p.19).*

2. Home telemedicine applications and economic benefits for society

From this group society mostly will derive cost savings in terms that could be quantified by comparing them to 'traditional' medical and nursing treatment.

On the basis of innovative wireless communication technologies, the enormous technological progress in mobile communication and various far-reaching medical changes within disease management programs, very promising new potential for telemonitoring has recently been presented (Bolz et al. 2005).

Only few telemedical research projects among patients with chronic diseases [e.g. chronic heart failure, diabetes mellitus, chronic obstructive pulmonary disease or blood hypertension], focus on cost-benefits. The perspective for the application of telecare is mostly viewed in medical and more technical terms. Because of its lack of (short-term) economic advantages, telemedicine is not yet perceived as being a mainstream solution. This may be because there is no published telemedical project yet which comprehensively evaluates the cost benefits (Pfeifer 2004, p.107).

The estimated societal cost-benefits could be estimated and quantified in terms of:

- the decrease in hospital re-admission rates,
- reduction in emergency visits,
- advantages in survival rates,
- a decrease in medical treatment costs and, travelling costs to medical and / or nursing facilities.

Additionally, from a more subjective point of view, the value to society of the increase in quality of life could be assessed.

Some research examples are now discussed:

Diabetes and insulin therapy: Biermann et al. (2002) reported that a substantial amount of patient time could be saved through replacing personal/ face-to-face communications by telephone contacts and through a reduction in data transmission by setting up an optimal tele management scenario. A cost analysis was carried out yielding savings ~ 650 per year per patient.

Chronic heart failure –CHF–: The growing incidence of chronic heart failure is a strong argument for the application of telemonitoring devices: Worldwide there are more than 22 million people and about 4 million in the European Union suffering from heart failure; they create significant and rising health related and economic demands on national health service financial resources. The high cost of caring for patients with congestive heart failure comes primarily from frequent hospital readmissions or recurring episodes. In Europe and the US heart failure is responsible for more than 2 million hospital admis-

sions. Despite a good medical treatment and **c**ardiac **r**esynchronisation **t**herapy -CRT – many patients experience emergency events that are either fatal or require hospitalization. Telemonitoring for patients with ICD can reduce the costs caused by readmission rates significantly (Jung, Birkemeyer 2005, p.189).

Analyzing the effectiveness of three hospital discharge models for reducing CHF-related readmission charges Jerant (2001) reported the following: the mean CHF-related readmission charges to hospital were 86 % lower in the telecare group ($ 5850, SD 21,094) and 84 % lower in the telephone group ($ 7320, SD 24,440) than in the usual care group ($ 44,479, SD 121,214).

The data showed significantly fewer CHF-related emergency department visits and charges than the usual care group. The researchers conclude that substantial reductions in hospital readmissions, emergency visits, and cost of care for patients with CHF might be achieved by widespread deployment of distance technologies to provide post - hospitalization monitoring!

These systems could reduce the need for patients to travel as frequently to hospital. Cost benefits are shown already by means of saving the costs of travelling to/from hospital (Fauchier et al. 2005).

Chronic obstructive pulmonary diseases –COPD– and **asthma** are the most common pulmonary diseases; typically a slowly developing progressive condition, which is irreversible. In Western societies about 5-7 % of the adult population suffer from a COPD, other statistics take 12-15 % as a starting point (Pauwels et al. 2001 and Mannino 2002 cit. in Pfeifer at al. 2004).

It is assumed an incidence for asthma of 5-8% among pre-school children and that the trend is increasing. COPD are very suitable for telemedical care, because the symptoms are obvious and easy to recognize and can be straightforwardly reviewed to assess the relevant obstruction. Periods of acute recurrence:

- degrade the quality of life,
- lead to frequent absenteeism from the workplace or school,
- cause high costs of medical treatment
- and will accelerate the condition's progress.

Early recognition, diagnosis and medial treatment as well as the identification of patients with frequent recurrence present one of the most evident aims of treatment. A 3-months-study with COPD patients evaluated the efficiency of a home-monitoring programme.

A total of 36 reoccurrences were tracked; 81 % of them were treated in outpatient facilities. Compared to the figures one year before the rate of hospital treatment (theoretically)

decreased by 50 %! Another telemedicine study (Kobuku 2000) showed a reduction of hospital readmission about 83 %.

Blood hypertension: In Germany the incidence of patients with blood hypertension is about 20 % (∼15 million). Only 4 million of them are in medical treatment and of these only 1.5 million manage of their blood pressure measures well with systematic medical treatment (140/90 mmHg). To treat only 10% of these patients adequately with arterial hypertension demands enormous economic resources in medical and pharmacological care. This further identifies patients with blood hypertension as a serious potential group for using telemedicine at home.

Because of the small sample sizes and lack of trial/study controls, more carefully designed follow-up trials are needed to determine cost efficiency for different chronic diseases. Notwithstanding that, the researchers are convinced that home telemedical devices show a great potential to save costs for society and now and in the long term; however, additional research is needed to provide at least the necessary quantified arguments to support this hypothesis.

The relative value of the interpersonal contact versus the technological components of electronic care delivery also needs to be taken into consideration.

Bayer et al. 2005 presented in their paper a dynamic model to understand the systematic impact of telecare implementation over time. Their presentation might also act as a warning not to create over optimistic expectations for the impact of telecare in the short term. This paper emphasises that the benefits of telecare implementation will only become fully effective i**n the medium term** (Bayer et al. 2005), quantification of which is still to be carried out.

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Chapter 4

Practical approaches and technical solutions in distance care

4.1 Practical Approaches

This section provides an overview of existing projects that concern home care, rehabilitation and self determined living. They are likely to be rolled out for mass application. To emphasise and provide clear comparisons between the most important features of these topics, we concentrate on those projects that offer the most advanced and best practices.

The projects listed below are the most suitable and important examples covering all the facets of the issues. In every subsection, an illustrative project is described along with its characteristic features. Experts monitor some projects and these results are included in the particular project description and it's abstract.

The role of home care differs in every section. It may be used to allow patients who suffer from chronic or terminal illness to still live at home; or home care can help shift (geriatric) rehabilitation from medical treatment centres to more ambulant rehabilitation/ palliative care.

Most projects do have a social background. In one case (subsection 4.1.3) home care is even a part of a business plan; in another case (subsection 4.1.4) it is part of a very specific, but well accepted philosophy of living.

To allow for common comparisons, all projects are classified using the same keywords.

- 'Objectives' means the underlying intention of the project
- 'Intention' means how the objectives should be realised.
- The relevance for 'Casa Futura' is summarized under 'Results' at the end of each project description.

4.1.1 Home care

The following project describes the home care for fatally ill patients; a project for chronically ill patients is described under subsection 4.2.1 where the financial benefits of telemedicine play the main role.

Presuming that the patient will most probably die, home care is frequently used to afford the patient the calmness and security familiar surrounding for their final days. It merits noting that the majority of fatally ill people strongly seek to spend their last days at home.

Additional costs are mainly caused by efforts to coordinate and transfer care from hospital to the invalid's domicile: for a further investigation into this issue, detailed medical documentation is still needed. After case studies had been terminated, additional costs had to be financed by donations.

Tübinger Projekt: Häusliche Betreuung Schwerkranker ***(Project in Tübingen: home care of terminally ill patients)***	
Contact	www.medizin.uni-tuebingen.de/itz/itztupro.html Lutz Georgi Paul-Lechler-Str. 24 72076 Tübingen Germany Tel: +49 7071 / 206 – 111
Term	Over 10 years of experience
Subject	Home care, critical tumour disease, dying at home
Proceedings	S. Breckel: Der Umgang mit einer Tumorerkrankung und daraus resultierende Probleme und Bedürfnisse zur Betreuung, Aufklärung und Symptomkontrolle aus der Sicht von Angehörigen. WiKu, Stuttgart 2003, ISBN 3-936749-90-6, Preis: 28,85 , 192 Seiten Dr. T. Schlunk, T. Staab: Das Tübinger Projekt Häusliche Betreuung Schwerkranker: Akzeptanz eines ambulanten Palliativdienstes bei Hausärzten. Z Palliativmed 2002; 3: S.100-104 © Georg Thieme Verlag Stuttgart · New York · ISSN 1615-2921 Prof. Dr. W. Aulitzky, Dr. T. Schlunk, Dr. R. Stumm, H. Seiter, B. Wohland-Braun: DVD-Video & Broschüre: Schmerztherapie bei unheilbar Kranken - zu Hause. Palliative Praxis 1 . STUMM-FILM Dr. Rolf Stumm Medien GmbH, Ludwigsburg 2006. 3 Video-Module, insgesamt 38:30 Min. Broschüre: 52 Seiten. ISBN-10: 3-939521-00-0; ISBN-13: 978-3-939521-00-6. Preis: 49,50 .

Objectives: To increase the number of people spending their last days at home

Intention

An all-embracing home care for the terminally ill

- Provision of home care
- To increase the quality of pain therapy and to relieve symptoms of a disease in a domestic environment
- To increase the cooperation between medical centre and home visit medical care

Description

Medical attendance for

- The fatally ill
- Patients requiring acute high-maintenance in order to avoid hospitalisation

- Patients requiring chronic high-maintenance as an exception

The service is divided in 'bridge-care' (Brückenpflege), 'time-consuming care' (zeitintensive Pflege) and 'consultation-service by clinician' (ärztlicher Konsiliardienst). For patients the service seems to be one-stop: the service attendant is an individual, the consulting-service is accessible 24 hours per day and an ambulatory treatment of symptoms can be provided if necessary.

Bridge-care

The main focus is on medical care for patients with tumours. This includes the establishment of a close contact between:

- clinic and home,
- the organisation of clinical discharge,
- regular home visits,
- psychological support for patients and their relatives,
- the monitoring of pain therapy or any other disease-specific therapy,
- the adjustment of care, the coordination of services and eventually a close cooperation between clinician and family doctor.

A 24 h on-call duty is also provided where necessary.

Time-consuming care

This covers the intensive medical care for patients with special care needs such as numerous and flexible services. Time-consuming care incorporates:

- night watch,
- total parenteral (other than oral) nutrition,
- consultation,
- care and escort-service for AIDS-patients,
- terminal care and 24 h on-call duty

Consultation-service by clinician

The project integrates the consultation-service of a clinician. The clinician is usually a specialist for pain therapy at home and the control of disease-specific symptoms. He also operates as a consultant for the family doctor. He provides medical attendance once referred by the family doctor, facilitates the renting of medication pumps and offers further case-specific training/support.

Interfaces: Clinic – family doctor

Results: This approach is best known as being utilized for the home care of the terminally ill. The satisfaction of relatives and family doctors with the service was demonstrated by scientific/ independent monitoring (see above).

Costs: 50 % are financed by charitable donations, 50 % were financed as usual by health insurances.

Benefits: Patient and family doctor satisfaction is summarised by the fact that medical care during last days of a patient's life was improved.

Relevance for the home of the future

- The main feature of the project is communication between patient, clinician and family doctor (usually by phone: 24 h on-call duty, consultation-service).

4.1.2 Rehabilitation

The main issue in this section is the getting back the skills needed to carry on an independent life at home. Rehabilitation at home and recovery is significantly helped by the security of living in familiar surrounding. Additional costs (roughly 50 % of the average expenses [see costs]) have to be taken into account in order to coordinate and manage rehabilitation at home.

Most notably in this project had been the integration of care in urban developments. The integrated approach satisfies all participants (patients, relatives, health care professionals) and could play an important role in the future. For instance, there is a growing question of what will happen to the apartments or houses of elderly people, if they retire to homes for the aged. Even now, many apartments and houses are deserted (especially in rural areas) due to the current demographic trend and the consequent migration to homes for the aged.

Beratungsstelle Wohnen, Stadtteilarbeit Milbertshofen e.V. is a highly committed project management organisation. With the paper ,,Kleine Technik – Große Wirkung“ (Buchwalder et al, 2001), they published a helpful tool for finding useful technical solutions related to the work with elderly or handicapped people.

Beratungsstelle Wohnen, Stadtteilarbeit Milbertshofen e.V. ***(Helpdesk for living at home, social association, Milbertshofen (district of Munich)***	
Contact	www.cms-tec.de/ Beratungsstelle Wohnen Korbinianplatz 15a 80807 München Germany Tel: +49 89 357043 0 be-wohnen@verein-stadtteilarbeit.de
Term	Since 1988
Subject	Helpdesk living at home with handicap
Proceedings	See www.cms-tec.de/

Objectives: Handicapped people often have to move to new residences. The objective of the project is to enhance their independence and safety in their original home and ensure they can continue living in familiar surrounding.

Intention

Helpdesk to adjust the dwellings to enable an independent life at home:

- To initiate replacements
- To increase the comfort and safety by technical solutions
- To support home care

Description

The 'Beratungsstelle Wohnen' is part of the association 'Stadtteilarbeit e.V.' in a northern district of Munich. In cooperation with 'Caritas' (German Caritas Association www.caritas.de/2520.html a pilot project (Betreutes Wohnen zu Hause – assisted living at home) had been carried out: Elderly or handicapped people should be able to stay at home for as long as they like or is practicable. An appropriate support had been provided by several services, which in turn guaranteed independent living. Application areas are:

- Helpdesk for assisted living and the adjustment of accommodations (Information platform: www.wohnlotse-muenchen.de)
- Domestic Rehabilitation (sustaining mobility)
- Project execution organisation: "Fachstelle Wohnberatung in Bayern" (Helpdesk not only in Munich, but in the entire Free State of Bavaria)

- Home care (assisted living at home); since April 2006, citizens of Munich can enlist for several services (individual care)

Interfaces: Municipality – government (Bavaria, www.wohnberatung-bayern.de) – welfare service

Results: In Munich, living at home is possible for elderly and handicapped people. It is not necessary to confine senior citizens to old peoples' homes. They are able to live in their familiar surroundings.

Costs: Donations, additional allowances (municipality), health insurance

Benefits: A positive urban development

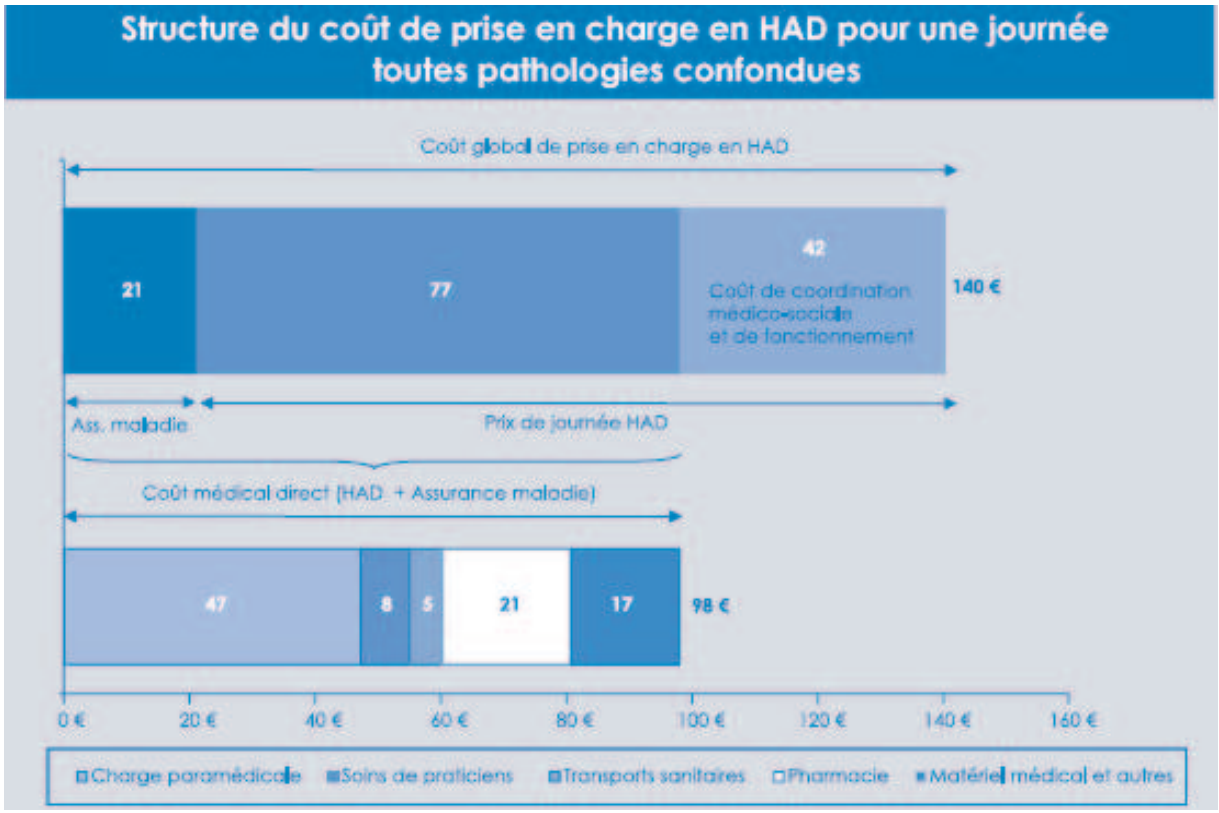
Relevance for the home of the future

- Validation of technologies for assisted living.
- Elderly people wish to stay in their familiar environment (familiar surroundings) - assisted living at home is an appropriate approach for the fulfilment of this requirement.

L'hospitalisation à domicile (HAD, France)

In France the hospitalisation at home (L'Hospitalisation à domicile, HAD) is a proven concept well integrated in the health sector. HAD dates back to 1956 and was relaunched in 1970. Since 1991/1991 it has been accepted as an alternative to traditional hospitalisation.

Studies show that, the average duration of HAD is 40 – 50 days and the costs are 140 per day (Polton et al.). These include 98 medical costs and 42 administrative costs (see figure).



Lit: Polton et al.

Relevance for the home of the future

- The reduction of administrative costs using of telemedicine which amount to 1/3 of the total costs.

4.1.3 Self-determined living of the elderly at home

PDV24 KG is a business service operating throughout Europe. Central to this service is a '24 h service centre' and its databased organisation. The team is made up of communications and modern media specialists in order to take advantage of new communication technologies.

A lot of care-employees come from Eastern Europe. They usually stay for 3 months in an elderly person's home. German employees only stay about 4 weeks. There should be a separate room in or next to the pensioner's apartment providing some privacy for the employee.

This service is relatively expensive. Another service starts with 900 - 1.000 EUR per month (price of *PDV24 KG was not available).*

PDV24 KG Pflegekonzept	
Contact	www.pdv24.de/html/pflegekonzept.html PDV24 KG Im Aliter 1 53562 Rothe-Kreuz Germany Tel: +49 2644 - 8009728 info@pdv24.de
Term	Continuous
Subject	Homecare, Rehabilitation at home, self-determined living
Proceedings	

Objectives: Business – this a commercial enterprise offering quality care.

Intention: No pilot project

Description

PDV24 KG is a care service covering a range of services from keeping house to 24h full care-service. It can be booked Europe-wide. The trained assistant lives with the person receiving the care. The service offers four distinct care levels:

- House keeping (cooking, sponging, ...)
- Basic-care (personal hygiene, conversation, game-playing, ...)
- Professional and medical care by a qualified nurse(catheter, syringe, ...)
- 24h full care-service by 2 assistants

Regular quality control and the use of databases for the organization of care-service are the main features of the service. Most employees come from Eastern Europe.

Interfaces: No special interfaces but ITC is required at the home in question for communication.

Results: No pilot project

Costs: About 70 % of the costs must be financed individually

Benefits: Senior citizens are free to stay at home

Relevance for the home of the future

- The service team includes communications and modern media specialists.
- Illustration how e-mail and Internet are the two main platforms for the communication between the service centre, employees and customers.

4.1.4 Models of multi-generational living at home

A large number of German projects focussing on multi-generational living are listed in a database on www.generationendialog.de. This multi-generational living can be realized in various ways. This section presents three of them:

- A special colony for the living together (*Die Brücke*)
- Apartments specifically equipped for pensioners living in their accustomed social environment (apartment buildings with mixed structure, *AwiG ALT-WERDEN in Gemeinschaft e.V.*)
- One house for all generations: day-care centre, educational establishment, nursing home (*Anna-Haag-Haus*)

Other projects are mostly similar to one of the projects listed above.

In the first project 'Die Brücke', the aspect of living with all generation is embedded in a philosophy of life, which also includes ecological considerations (biomass energy-supply, car-sharing). In the country of Baden-Württemberg (Heidenheim is located in the administrative district of Stuttgart), many buildings have been constructed by development companies (germ: Erschließungsunternehmen, Bauträger) and the idea of such a community is fairly commonplace.

The second project 'AwiG ALT-WERDEN in Gemeinschaft e.V.' is a socially oriented consulting service and the apartments for elderly people are located in apartment buildings that simply provide a common social structure. Unfortunately, there are no controls to guarantee this mixed socio-economic spread in such an apartment building.

The last project 'Anna-Haag-Haus - 3 Generationen unter einem Dach' – three generations under one roof – is an interesting and suitable approach for this topic. But it does not really address the "living at home" objective. In fact, the project merges the features of a nursing home with those of other establishments.

1. 'Die Brücke' (The Bridge)	
Contact	www.dorf-in-der-stadt.de Erika Loew c/o Die Brücke e.V. Neuffenstr. 11 89518 Heidenheim Germany Tel: +49 7321 - 987130 dorfinderstadt@t-online.de
Term	Since 1994
Subject	Living with all generations, Christian way of living, ecologically oriented
Proceedings	

Objectives: Philosophy of life, ideology (Weltanschauung)

Intention: 'Village in a city' – living and residing in an ecologically oriented community made up of all generations.

Description

Die Brücke e.V. is an association to support communal life of young and old people in Heidenheim, which is close to Stuttgart. Living in this community is influenced by a philosophy of life based on Christian thought (responsibility for fellow human beings, anthroposophy). The buildings are ecologically constructed:

- 40 units are reserved for people over 65 years,
- 30 units for families with children or single parents,
- 30 units for singles
- and 1 unit (10 people) for a social-therapeutic group.

There is also plenty of space for the community to enjoy the following services:

- a surgery,
- a kindergarten with after-school care,
- shops;
- restaurants have been built
- workshops on topics such as agriculture are held

– a real village within a city.

The ecological approach is also present in the energy supply (biomass energy). No cars are allowed in urban areas, car-sharing is possible.

At first, the task was to enlarge neighbourly help as a basis for communal life.

Interfaces: No interfaces, autonomous community

Results: No pilot project

Costs: No special costs

Benefits: Resurgence of neighbourly help and man's responsibility for one's fellow human beings: no national assistance is required.

Relevance for the home of the future

- Demonstration of energy-management and integration of the elderly into the community require corresponding technical installations.
- The combination of biomass energy (local heat) and community living especially is a particularly interesting aspect
- Illustration of the sustainability of the energy supply completes the idea of an independent live.

2. AwiG ALT-WERDEN in Gemeinschaft e.V.	
Contact	Erhard Becke und Sieglinde Wartenberg Hohe Str. 102 01187 Dresden Germany Tel: +49 351 – 4030 577 awigverein@web.de
Term	Since April 1996
Subject	Living with all generations, consultant service
Proceedings	

Objectives: Social aspects

Intention: Provision of apartments for senior citizens in apartment buildings with a common social structure

Description: *AwiG ALT-WERDEN in Gemeinschaft e. V.* is a socially oriented consultant service for people between 50 and 75 years. They organize living space for elderly people in normal apartment buildings in order to strengthen the contacts between generations in everyday life. *AwiG* works together with housing societies to allocate living space for those who qualify. Other tasks are to organise and to work with flat-sharing communities.

Interfaces: No special interfaces

Results: For *AwiG*, contacts between generations in everyday life will lead to mutual assistance of old and young people (on all levels). Living in a flat-share community reduces the efforts of younger relatives to take care of older relatives. To participate in this project, pensioners are required to leave their current familiar environment and to seek a flat-share community, supported by *AwiG*.

Costs: In this instance, home care is a totally private

Benefits: Elderly people can stay in their regular social surrounding

Relevance for the home of the future

- The technical installation in an apartment must be designed to service both a flat-share community and the support of seniors in the same community.

3. Anna-Haag-Haus "3 Generationen unter einem Dach"	
Contact	www.annahaaghaus.de Sozialer Arbeitskreis Anna-Haag-Haus e. V. Frau Tina Syring Gnesener Straße 20/22 70374 Stuttgart Germany Telefon: +49 711 - 9 52 55 – 0 info@annahaaghaus.de
Term	Since 1981
Subject	Care for the elderly
Proceedings	

Objectives: Social aspects in addition to this being a commercial enterprise.

Intention: One house for all generations: day-care centre, educational establishment, nursing home

Description

Anna-Haag-Haus is an institution, which combines several application areas (all generations are represented):

- Nursing home for up to 55 seniors (continuous short-term care)
- Educational establishment in home economics and special needs education for disabled girls and young women
- Educational establishment for adults to increase their job opportunities
- Service centre for home economics to support home care and firms
- Day-care centre for up to 50 children

Under the one roof residents enjoy a range of activities such as common celebrations, trips and games. All these are the main characteristics of the community in the *Anna-Haag-Haus*

Interfaces: No special interfaces

Results: Several encounters between the generations stimulate dialogue between and the understanding for each other. There are no frustrations living in a senior residence that is located directly next door to, say, a day-care centre. Inter-generation prejudices are broken down and replaced with the opening up of new attitudinal vistas.

Costs: No special costs

Benefits: Satisfaction, a nursing home is not a 'côterie' (closed circle).

Relevance for the home of the future

- Illustration of a multi-functional building

4.2 Technical solutions

Data transfer (vital information) and communication between patient, doctor, clinic, care-service and relatives are main roles of technical solutions in current model projects concerning distance care.

In subsection 4.2.1 a pilot project of two health insurance funds analyses and describes the potential for the use of telecare in home care for disease management.

Until now, innovations in measurement of vital information or detecting patient's condition by monitoring his movements at home are not fit for purpose nor ready for market.

Some European organisations are working on a common initiative (Ambient Assisted Living) to install a European fund to develop the next generation of technologies and tools for modelling, design, implementation and operation of hardware/software systems that can be embedded in intelligent devices for everyday life with a view to introduce them into the market. This project is described in subsection 4.2.2.

Smart Home and telecare were combined in the Innovation Center Intelligent House in Duisburg. This combination of ideas is described in subsection 4.2.3.

4.2.1 Disease management

ZERTIVA	
Contact	Techniker Krankenkasse Dr. Christof Szymkowiak Bramfelder Straße 140 22305 Hamburg Telefon: +49 40 6909 0 Telefax: +49 40 6909 2055
Term	Since 2005
Subject	Disease management, chronic heart failure
Proceedings	www.aerzteblatt.de/v4/archiv/artikel.asp?src=heft&id=47899

Objectives

Reduction of medical costs whilst maintaining quality of care

OR

Stabilisation of costs and improving quality of care

Intention: Assumption: Telecare is able to reduce costs of hospitalisation and to reduce mortality rates in patients with chronic heart failures

Description

ZERTIVA is a pilot project of two health insurance funds (www.kkv.de, www.tk-online.de) to calculate cost benefits of telecare by patients suffering from chronic heart failures.

The patients are monitored by periodic measurements and a daily data-request to insure timely medical treatment is given if needed. Increase in weight (storage of water) and variation of blood pressure act as indicators to flag up a deteriorating state of health.

The technical solution combines electronic scale, blood pressure meter and a system to transfer data from the patient's home to the care attendant. Periodic contacts by phone complete the service.

Interfaces: Clinic – family doctor

Results

The average rate of re-admitting to hospital could be reduced, the costs for drugs were similar and for patients the quality of life increased.

In detail:

Hospitalisation

About 1.200 €per person reduction of costs per month

Re-admittance rates to hospital were halved

Drugs

46 €per person increase of costs per month

Patient satisfaction

80 % were satisfied using telecare

90 % could confirm a better understanding of their disease

70 % could confirm a better quality of life

Costs: See results

Benefits: Cost reduction and improvement of patients' satisfaction

Relevance for the home of the future

- Illustration of the use of technical equipment for measurement and telemetry at home

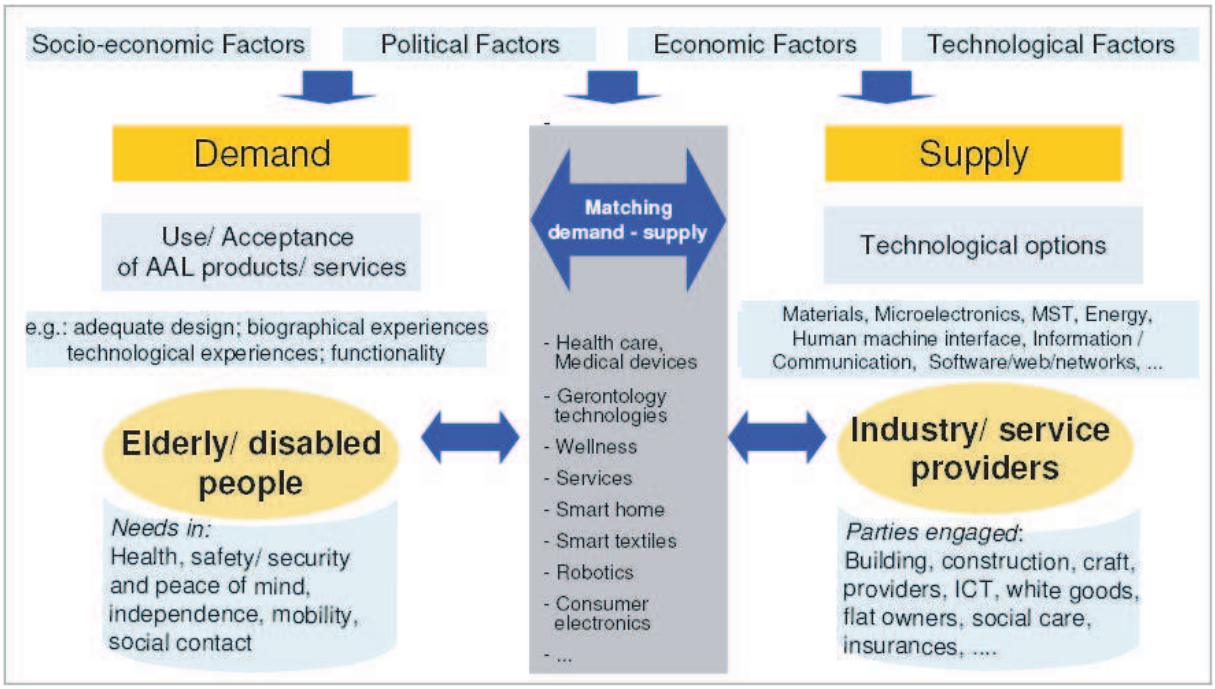
4.2.2 Future innovation & the AAL initiative

The objective of the specific support action "Ambient Assisted Living " is to prepare an Art. 169 initiative in the field of "Small and smart technologies for ambient assisted living". The understanding of "Ambient Assisted Living" is (Dr. Hartmund Strese on workshop Telemedizin, 21. of June 2005 in Frankfurt):

- Ambient Assisted Living aims to prolong the time people can live in a decent way in their own home by increasing their autonomy and self-confidence, by relieving them of monotonous everyday activities/chores, by monitoring and caring for the elderly or infirm, by enhancing their feeling of security and by saving resources,
- AAL169: A new European technology funding programme **"bridging"** technology programmes and markets,
- Heavy reliance is placed on:
  - **information technologies** (embedded systems, micro and nano systems, mobile and wireless systems) as enabling technologies for the project's vision,
  - **User centric technologies** – taking into account accessibility, reliability and interaction needs – as this project considers the elderly (or temporarily disabled) to be central to the project's aims,
- Direct beneficiaries will be successful applicants, i.e. public and private research organisations, SMEs, enterprises and other eligible bodies from AAL169 member states,
- Final beneficiaries will be anyone successfully using the devices and solutions made available on the market.

Initiatives on the basis of article 169 of the EU treaty are subject of a co-decision process of the European Parliament and the Council. If these two bodies will pass a positive judgement on AAL169, the new technology funding programme may start soon after that decision. Realistically, this will be not before early 2007. First calls should be launched in early 2007, AAL169 is targeted as a 7-10 year programme.

The AAL innovation model is shown in the following figure. In the middle of AAL innovation model stands the task **matching demand – supply**.



Contact: www.aal169.org

Members of the AAL initiative are:

Organisation	*Short Name*	*Country*	*Link*
VDI/VDE Innovation + Technik GmbH	VDI/VDE-IT	Germany	VDI|VDE|IT
Interuniversity MicroElectronics Centre	IMEC	Belgium	imec
National Technology Agency	TEKES	Finland	TEKES
Vienna University of Technology	TUW	Austria	TU WIEN
Special Materials for Advanced Technologies II	MSTA	Italy	
Ministry of Economy, Finance and Industry	MINEFI	France	
Federal Ministry of Education and Research	BMBF	Germany	Federal Ministry of Education and Research
Austrian Ministry of Transport, Innovation and Technology	BMVIT	Austria	bmvit
TEMAS AG Technology and Management Services	TEMAS	Switzerland	

In preparation of the AAL initiative, some country reports were published to provide detailed information on various aspects, which are deemed to be of high relevance for "Ambient Assisted Living" in respect of national contexts. In this reports, user needs and demands for AAL-Applications (socio-cultural and socio-economic factors) were emphasised for each country. The reports can be found online under project homepage:

- Austria, www.aal169.org/Published/CRAustria.pdf
- Belgium, www.aal169.org/Published/CRbelgium.pdf
- Finland, www.aal169.org/Published/CRfinland.pdf
- Germany, www.aal169.org/Published/CRgermany.pdf
- Italy, www.aal169.org/Published/CRItaly.pdf
- Switzerland, www.aal169.org/Published/CRSuisse.pdf

Also a European view on AAL is published. This single report[1] highlights the view on ageing societies in Europe in general and clarifies the potential for AAL169 to offer solutions for this phenomenon. Five short case studies[2] have been compiled in order to demonstrate the potential scope of the future AAL169 initiative.

Relevance for the home of the future

- The initiative works on developing technologies for market introduction.
- Illustration that technologies must be accompanied by technical services to support users in installation and their operation.
- Illustration also that this needs a corresponding education/ training requirement of service-staff working in the field.

[1] www.aal169.org/Published/Final%20Version.pdf
[2] www.aal169.org/Published/casestud.pdf

4.2.3 Smart Home and telecare

inHaus-Innovationszentrum, Intelligente Raum- und Gebäudesysteme ***(Innovation Center Intelligent House)***	
Contact	Fraunhofer-Institut für Mikroelektronische Schaltungen und Systeme Herrn Klaus Scherer Finkenstr. 61 47057 Duisburg
Term	
Area	Smart Home
Proceedings	www.inhaus-zentrum.de/en/index.htm

Objectives: Research and testing

Intention: The inHaus-Zentrum gives a platform to develop and to test product-oriented innovations for a networked life.

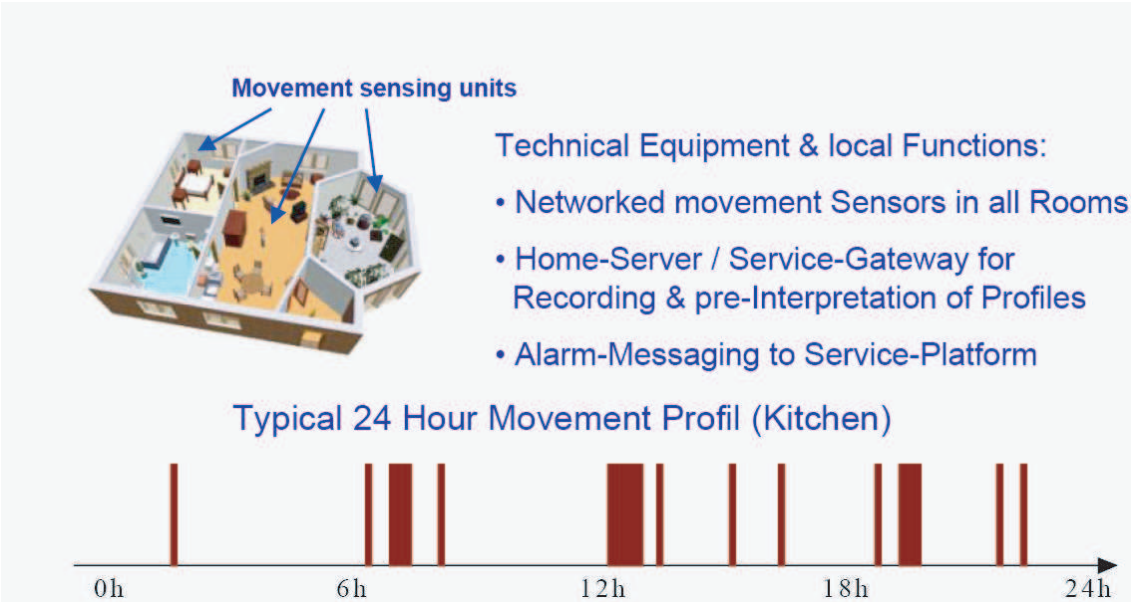
Description: The inHaus is described as a house not only for general demonstration, but a comprehensive centre for integrating research, testing, development, and, in addition, specific demonstration with regard to intelligent living. It comprises a comprehensive and long-term network of (industrial) partners. The inHaus is not merely focussed on technology and products but also involves investigating new ways of market research by conducting acceptance tests in real-life environments. Additionally, the conceptualisation of new marketing strategies for products and services plays an important role. In 2002 an application centre for the cooperative marketing of smart-living products and services supplemented the inHaus innovation centre.

Relevance for the home of the future

- The results of Smart Home combined with telecare combine the idea of a movement and presence monitoring for special patients with personal digital assistance to manage scenarios like chronic disease or pregnancy.

K. Scherer presented the ideas in June 2005 at a workshop in Frankfurt as follows:

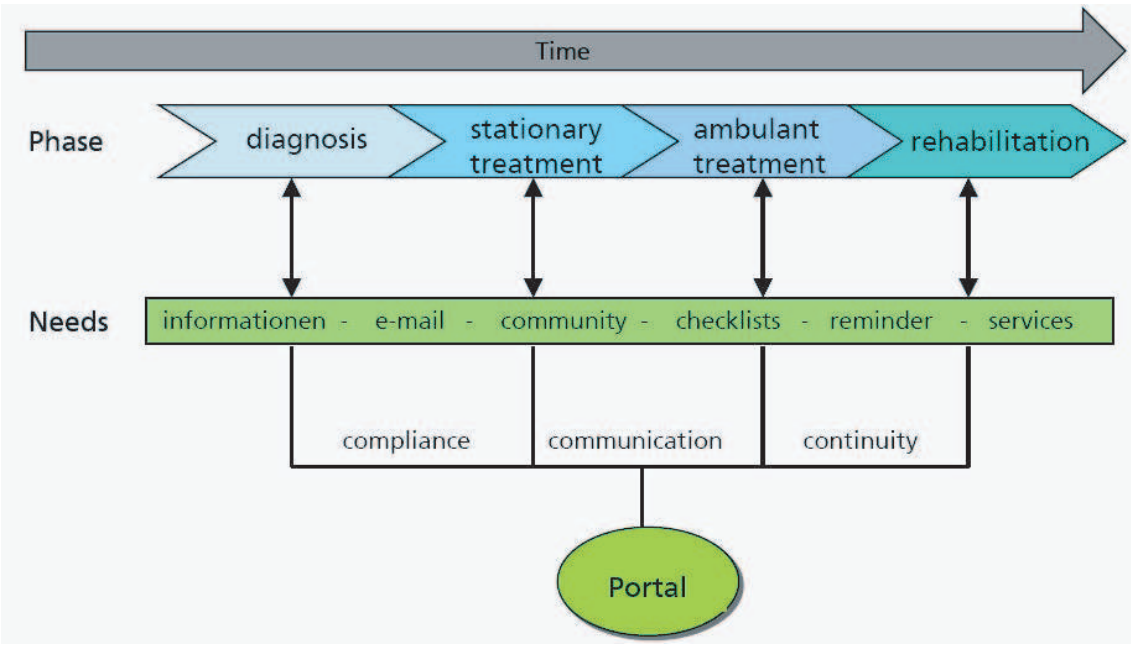
Movement and presence monitoring



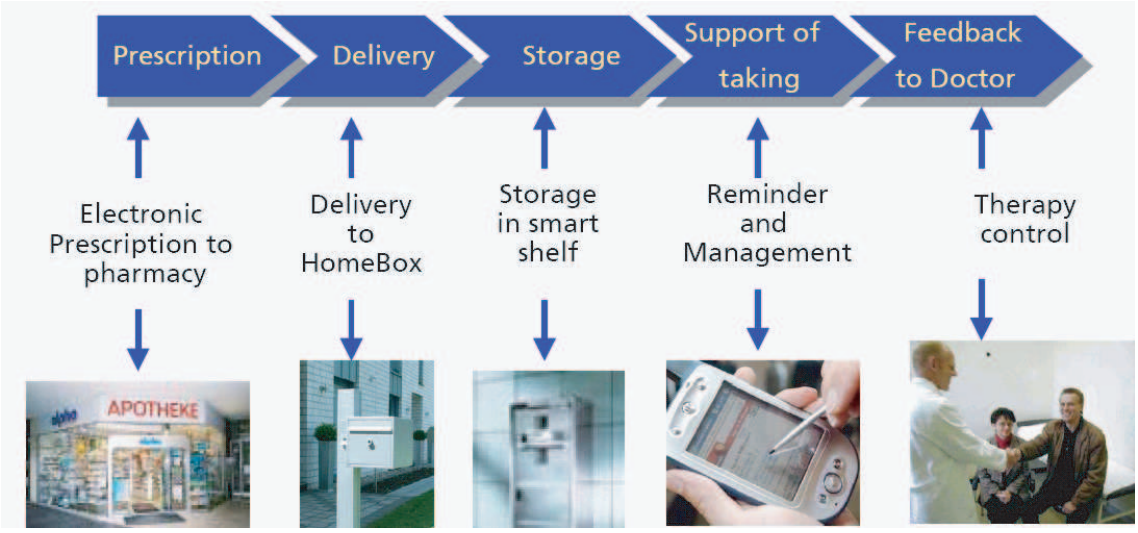
The personal condition of a monitored person is derived from his movement and presence over time.

Personal digital assistance with portal service to manage chronic disease

The digital assistance begins with diagnosis and ends after rehabilitation. As shown in the following figure, different benefits are achievable in each phase.



As an example, the 'process chain' for medicine delivery and application could be as follows:



For patients with chronic diseases, a digital assistance allows

- Situation based learning,
- Interaction with doctors, therapists, other patients,
- Personalised information and services,
- Reminders, notifications,
- Calculators, checklists, controlling,
- Virtual diary.

For these functions, the digital assistance requires a contact to a medically qualified network. In the home environment, this network can be set up based on a home-installation infrastructure with the proviso that this installation is "fit for communication" and resilient enough to deliver a continuously reliable service.

4.3 References

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