



# Living independently

Supporting the transitions between receiving medical care and resuming a healthy lifestyle

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## Abstract

In first-world societies, the healthcare industry faces considerable pressure from a number of sources. Societal developments like the ageing population, the changing structure of the family and lifestyle behavior place a considerable strain on existing healthcare resources. Funding in this domain is therefore a crucial and ongoing issue. Events like losing a loved one, retirement or the need for long-term medication also impact people's life drastically and need to be addressed.

On closer examination, there is a mismatch between the current system of care and our lifestyles. These days, healthcare is problem-focused and often crisis-driven. When an event occurs support is available. However, there is little attention to the way people live and build health routines and habits. It makes sense to integrate lifestyle-driven, long-term care into the lives of those who are suffering or recovering from an illness or at risk of a disease by their lifestyle.

The proposition in this paper is to enable people with health issues to stay independent or increase their radius of independence. By helping people to see their illness or condition as a starting point for a different phase of life, it is possible to increase their self-esteem while at the same time significantly reducing the burden on the existing healthcare system. The best place for the (re-)discovery of new abilities is in the home, well away from doctors and medical equipment.

This paper provides a number of insights that can be used as a basis for developing solutions aimed at facilitating independent living. In the first chapter we analyze major changes taking place in society, such as the growing number of elderly people, the emphasis on convenience and the frequent disruptions that affect the conventional family structure. We also look at obstacles to living independently, for instance loneliness, alcohol abuse and depression. Chapter 2 sketches a picture of the healthcare industry landscape, looking at burning issues like funding, demand and resources. In chapter 3 we define the major characteristics of existing healthcare systems, in order to create the right context for chapter 4, which shows how independent living can be supported during transitional periods in people's lives.



Figure 1: Supportive care

## Introduction

Societies are growing more complex and the cost of care systems escalating. Therefore, it is becoming increasingly more relevant to find a way to continue living a balanced life and staying healthy. This paper explores developments related to health, wellbeing and independent living in Western societies such as Europe and the USA. It should be noted that whatever applies in these societies is becoming relevant to the industrializing countries of Eastern Europe, China and India as well; therefore also these are touched upon.

With a large part of society living longer due to improved life standards, healthcare systems can no longer meet increased demands for care, and especially chronic care. Hospital may no longer be the place to treat non-critical conditions, i.e. chronic diseases that need care on a daily basis.

Care in Western societies often means cure, rather than education and prevention. However, more attention is now being paid to improving people's lifestyles by avoiding stress, getting better sleep, doing exercise and eating healthy food. When people fall ill, lifestyle changes should be called for.

A supporting environment, with professional and personal care, should be put in place to support this transitional phase and get people back on track. But how can we change people's existing environments into supporting care environments without disrupting their quality of life?

# 1 Changes in society

## 1.1 The 'graying' of society

In societies worldwide, the number of elderly people is increasing rapidly. In the EU today, 21% of the population is over 65. By 2050, this figure will rise to 34%. Also, as females tend to live longer than males, 75% of elderly people above the age of 85 are women, a difference in life expectation between the sexes that will only increase in the coming decades. [1]

In short, the world is facing a major increase in terms of elderly people. This upward trend is caused by a combination of low fertility levels in recent decades and the looming retirement of the 'baby boomers': the generation born in the immediate post-World War II years. After the war, overall health improved across Europe and the USA thanks to the spread of antibiotics and the use of immunization, while all Western countries had overcome infectious mortality by 1960, especially among children. This resulted in life expectancy double that of 1800.

But does longer life expectancy also mean we can look forward to a healthier life? Research from the US suggests that we are indeed observing an increase in healthy and active life expectancy, although it should be noted that a healthy body does not mean increased resistance to neurological diseases such as Alzheimer's. [2]

## The baby boomers

What makes the baby boom generation different from previous generations is that they are, unlike their predecessors, knowledgeable, tech-enabled, used to fighting for themselves and able to deal with for any shortcomings. They will not be willing to receive care only when advised by professional carers, instead demanding care when they want it. [3]

This demographic concentration of baby boomers will also often retire earlier, remain active and relatively healthy, and frequently have access to disposable income with plenty of time to spend it. If care for the elderly is taken up by private rather than public institutions, there will be a growing gap between people who can and can't afford the cost. Although poverty among the elderly is diminishing as the number of rich elderly people rises, there is still an average of 10% of elderly people living at the bottom of the pyramid (in the Netherlands, 1000 euros per month, or lower). These are often women and foreign-born citizens who did not build up an adequate pension. [4]

The baby boom generation is questioning whether the existing care system will be able to meet their needs and desires sufficiently as they see their parents suffering in day-care centers without enough care and attention. Neither do the current waiting lists and lack of personal attention seem to be an attractive option for their future. [5]



Figure 2: Seniors and relatives keep in touch from a distance

## 1.2 Living in a changing society

### New family structures

For centuries, people lived together in family communities that shared responsibilities. Seniors took care of their children and grandchildren, and children took care of their parents and grandparents. But during the last century, more and more people began to live apart from their communities, partly due to changes in the work place, and partly due to lack of time. This resulted in the growth of a 'care society' in which governments have taken over the responsibilities of the communities by creating hospitals, clinics, day-care houses, retirement homes and childcare. [6]

### Loss of the regular family

Over the past few decades, the number of single households has increased. More people choose to live alone, including the elderly. The nuclear family also began to experience disruption mid 1960 when divorce rates increased and, as a consequence, more families became fragmented. In response to this, couples are delaying marriage for longer and expressing greater reluctance to start a family. Children are a product of choice more than ever before. [7]

But when nuclear families break apart, children are often left with the emotional and economic baggage caused by the disruption. While they may become more resilient, mature and independent in the process, most agree that this is not without cost: children from single-parent families often suffer from a decline in their standard of living and increased emotional and behavioral problems. Moreover, recent research has also shown that the quality of parenting and the degree of parental involvement and effort, as well as the ability to cope with stress, are more important than whether a family is headed by one or two parents. [7]

Contrary to popular assumptions about working mothers and their declining effectiveness as parents, a study based on national survey data concluded otherwise. Children are less negatively influenced in families where both parents work than in families headed by parents with poor education and low levels of income because mothers are not in the labor force. [7]

Among seniors, the family structure is strongly influenced by the increased portion of older married couples whose children have flown the nest. Today, approximately 30% of people over 55 are single, a percentage that will increase as the divorce rate goes up. It is expected that in the future, the elderly will live alone more often, with relatives keeping in touch regularly from a distance. [2]

### Seniors fear life after a hip fracture

Elderly women worry more about breaking their hips than about cancer or having a heart attack. A loss of ability to live independently in the community had a “significant detrimental effect” on the quality of life of elderly women. In addition, seniors are at risk to becoming prisoners in their own homes because of a completely unrealistic fear of the street. [5]

### Knowledge society

The transition from the Industrial Age to the Knowledge Age has enabled large groups of people to access information and to make their own choices. People no longer automatically rely on the advice of official carers such as doctors and medical specialists, or governments and lawyers. As knowledge has become widespread and easy accessible, patients now entering the doctor’s clinic with a specific complaint are often very well-equipped with details of their condition. [8]

But the negative side of this knowledge society is that there is an overload of information and options. Where can people find the right information to make sound choices? The Internet offers many so-called experts, such as the [netdoctor.co.uk](http://netdoctor.co.uk) and free diet tips from [annecollins.com](http://annecollins.com), that give advice on health, diseases, cures and care. But how can people filter out what they cannot trust? This applies especially to the elderly with insufficient education on how to navigate through the information and options. [6]

### Convenience society

Western societies are now globalized and their populations live in a 24-hour economy: everything is available anywhere, at any time. But while different lifestyles options are available, not all choices are healthy, and many people elect to live the ultimate unhealthy life: eating poorly, snacking, smoking, taking the car instead of walking, not moving more than ten minutes a day but sitting passively behind the computer or television, and not even taking the time to sleep properly.

Making the wrong choices will result in poor health among older and younger people. They will become susceptible to both acute and chronic lifestyle-related diseases such as obesity, excessive weight, depression, allergies, high cholesterol, type 2 diabetes, cardiovascular conditions and cancer. On the long-term, these lifestyle diseases represent a threat to society on both a demographic as well as on an economic level. When these debilitating health conditions and diseases become chronic, they are extremely expensive to treat in hospitals and day-care centers.

### Complexity and fear

Entering a new life stage often brings uncertainties and fear of the unknown. Our reference points slowly change as we are forced to look at life from a different perspective: a changed living environment, the loss of durable relationships, reduced capabilities and diminishing health conditions, and the inability to participate in daily activities.

### New emerging markets

The world's population still is growing, and is projected to reach 9.3 billion by 2050, compared with 6.3 billion today [10]. Almost 99% of this increase is predicted to be in poor and developing countries however. Currently, India is already the second biggest nation in the world with 1.08 billion people, following the number one China with 1.44 billion people. Given that China and India are the world's largest nations, Asia is estimated to account for almost two thirds of the world's population aged over 60 by the year 2050. This is mainly due to highly increased life expectancy and falling birth rates. There are strong indications that by 2020, China's Gross national Product (GNP) will have exceeded that of individual Western economic powers except for the United States. India's GNP will have overtaken, or be on the threshold of overtaking, that of European economies. [11] [39]

Many seniors in new emerging countries are forced to carry on working for as long as possible. Others are faced with health problems and therefore become dependent on relatives. In India, older people are still cared for by their families. Living in an old people's home is neither popular nor feasible. More importantly, Indian culture, like many other Asian cultures, emphasizes filial piety. Parents should be honored and it is considered a son's duty to respect and care for his parents.

However, while generations of older Indians have found shelter in the extended family system during crises, be these social, economical or psychological, the traditional family is fast disappearing, even in rural areas. With urbanization, families are becoming more nuclear, smaller and not always capable of caring for older relatives. Currently, in urban areas, women have also started working outside the home. Since women were the traditional care providers for older people, their participation in the labor force has reduced the number of workers available to care for their relatives. [6] [12] [13]

### 1.3 Lifestyle changes and risks

The new lifestyles that people have adopted are closely related to the societal changes described in the previous section. The choices we make in our lives, our lifestyle decisions, are influenced by our immediate surroundings such as family, friends and communities but also by the Internet and television.

Over the previous decade, there has been a visible rise in new types of lifestyle-related disease: consistent unhealthy behavior that can allow long-term diseases such as depression and diabetes to develop. These lifestyle diseases have four major risk factors: sleep, stress, activity and nutrition, all of which can affect people's health and wellbeing\*.

\*These topics are explored in the two other research papers Tuning your body [14] and Living in balance [15]

#### India and China

The Indian and Chinese middle classes can now afford to adopt new lifestyles, which are not necessarily healthier. Just as in Western societies, increased life expectancy in India and China is giving rise to similar health problems: an increase in cardiovascular diseases and diabetes. India and China are both moving towards the Knowledge Society and have a relatively large degree of competence among their labor force. Financial security is still low: families depend hugely on their young starters' new careers. Stress levels are high among these younger people because performance and work pressures lead to long days.

As in Western convenience societies, new types of food have been introduced in Asia: fast food – with more carbohydrates, high cholesterol fats and sugar – account for a drastic growth in type II diabetes. India and China are known as the diabetes capitals of the world. [16] [43]

### 1.3.1 Obstacles for living independently

People face different kinds of obstacles in life and these can cause them to move into different health phases.

There are physical or mental obstacles, such as injury, sickness or chronic illness, as well as social obstacles such as the loss of a spouse or retirement. Both kinds can have implications with regard to what people do, provoking them to rethink their life and habits. Such obstacles can also affect people's ability to live independently in their own familiar environment.

#### Loss of social roles

Over time, people's social roles alter: they change, for example, from a child into an independent youngster and then into a responsible parent. But, as people grow older, they often lose certain social roles during a transition phase such as retirement or children leaving the parental home. This can make them feel useless. As the new 'elderly' baby boomers have been used to fighting for their rights throughout their lives, they now want to make the most of their new found freedom, time and financial independence. They do not want to feel 'pushed aside'. Instead they want to participate and continue contributing to society in their own way and in their own time. [5]

This explains why many senior citizens still prefer to work, either doing voluntary work or running a small business of their own, partly because it is hard for them to find a job. However, mastering the latest digital technologies and taking care of administrative tasks can prove difficult, often blocking a desire to remain active in life and work. One in four new businesses in the Netherlands are started by seniors (55+) who still desire to keep on working. There are numerous services designed to support these new starters. [17]

It is also possible to be active and useful closer to home: by caring for a loved one or a peer. Seniors now often help out their children by taking care of the grandchildren for a couple of days a week or they do voluntary work for other elderly people.

#### Older volunteers providing community services

Research by the University of Guelph indicates that seniors are phenomenal service providers, but that they are hindered by poor government funding and changing clientele. In 2001, researchers collaborated with the Wellington-Dufferin District Health Council in the Waterloo Region and interviewed 19 not-for-profit agency coordinators who depend on older volunteers to provide community services to their clients. He believes that the government doesn't provide sufficient funding to the service sectors, which results in volunteers being asked to rise to the challenges brought on by government policies that have 'downloaded' the responsibilities onto their shoulders. [44]

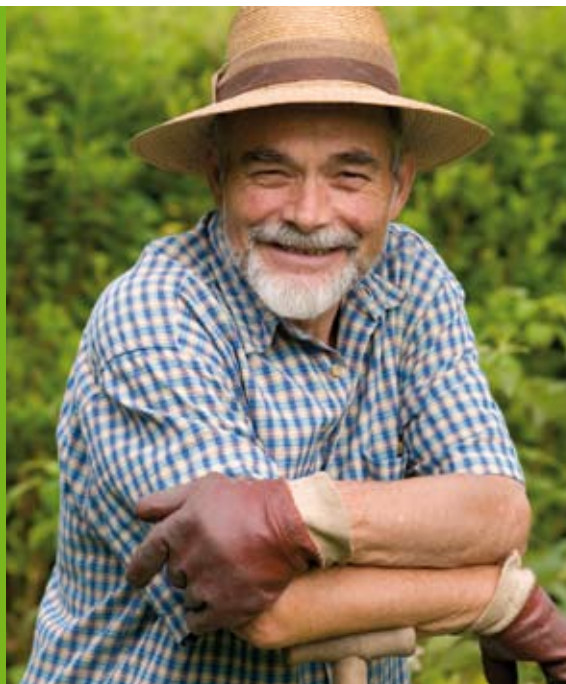


Figure 3: Seniors volunteer in community services



Figure 4: Loneliness among seniors

### Loneliness

The first section of this paper stated that social and economic developments such as individualization and an ageing society have caused an increase in the number of lonely people. This is happening both in developed Western societies as well as in developing societies.

Being suddenly forced to live alone can be very hard. People often cannot take care of themselves because they simply don't know how to, or they lose the motivation to do so. Cooking a meal for one, getting out of bed and dressing when nobody is going to see them and taking enough physical activity are all things that tend to get neglected, even though they are important for good health. During and after a transition, people will need to rethink their whole lives. And they will definitely need support in making simple daily life choices because they will often have no idea how to continue doing things in their new situation.

Lack of social stimuli can cause people to feel depressed and tired. Without sufficient social stimulation – positive stressors – people's feeling of wellbeing and health are negatively influenced. This applies not only to people who lose a spouse, but also to those who retire or even graduate from a course of study. After finishing a stressful period with a high workflow or busy routines they enter a sudden state of rest. Then they fall into a 'black hole', characterized by a feeling that they ought to be doing something, combined with insecurity about the future.

Loss of relationships causes further social isolation. It is common that as people grow older, their social network shrinks, either because they become less mobile, or people around them pass away. But an important aspect of relationships is the feeling of affection, which is a stimulant to feeling good. Yet elderly people's need for affection is often neglected and not provided for. Sexuality among seniors has become a taboo, so educational intervention is needed to dispel negative myths, stereotypes, and self-fulfilling attitudes in older people. The perception that full sexual expression is a part of all phases of adulthood also needs to be promoted. [18]

Because life sometimes throws us curved balls, we face situations for which we are not prepared or we thought would never happen to us, and which may leave us as elderly singles. You shouldn't worry about being alone in retirement, as there are many elderly people looking for love. You just need to know where to look and how to talk to other people and you will soon be meeting people everywhere you go! You can always feel comfortable as an elderly single, knowing that one day you will meet your true love. The best advice for all elderly singles looking for someone to spend time and go on dates with is to get out of the house as much as possible. You will want to go where there are large groups of other people your age. Practice talking to people that you do not know yet. You can think of something you may have in common with someone you see and start a conversation with him or her about it. [45]

### Depression

Depression is widespread, and set to be the world's second largest disease by 2020. It is afflicting not only the elderly, but all age groups in the developed world. It's also growing rapidly in developing societies. [16]

Many older people still do not talk about their worries and struggle on alone. Growing older is often accompanied by a loss of key social support systems due to the death of a spouse or siblings, retirement, and/or relocation. But changes in circumstances and the expectation that seniors will become less active mean that doctors and family may fail to diagnose depression and so delay effective treatment. As a result, many seniors find themselves having to cope with symptoms that could, in fact, be easily treated or avoided if noticed in time. [20]

Depression in later life frequently coexists with other medical illnesses and disabilities; it can be a 'side-effect' of chronic diseases such as heart disease. Following an event, depression often persists for at least one year. Studies have proven that post-infarct depression has a negative effect on the progress and recovery of heart patients. Worse, depression raises the risk of a new event by a factor of two and a half. Treatment for depression is based on three steps: 1) acknowledgement and understanding, 2) treatment and, most importantly, 3) instruction on how to learn to live with it day by day. [21] [22] [42]

### Medication and alcohol abuse

Failing overall health as people grow old means that the use of medication increases with age. But people are often confused about the series of medicines they have to take and frequently make mistakes. In addition, the medicines prescribed in large volumes often interact negatively with each other.

The incidence of a drug-related illness is higher in the elderly than in the general population. It highly impacts the progression and negative outcome of a disease, the loss of productivity, and the diminished quality of life that often results from such abuse. Each year almost as many elderly are admitted to hospitals for alcohol-related problems as for heart attacks. Yet most people don't realize that alcoholism is a problem for many older adults. [23]

### Depression, a global burden

Depression is the leading cause of disability as measured by the fourth leading contributor to the global burden of disease in 2000. Today, it is already the second most common cause of disability in the 15-44 age range, for both sexes. By the year 2020, it is projected to be in second place for all ages and in both sexes. [16] [43]



### The miMakkus foundation trains clini-clowns for the elderly

Laughing has been found to bring out a general sense of well-being by lowering blood pressure, reducing stress hormones, increasing muscle flexion and boosting immune functions by raising T-cells, Gamma-interferon and B-cells, all of which are pleasure-related endorphins [19]. In India, such laughter therapy is commonly used when treating stress.

Figure 5: Laughter therapy

### Families with children with disorders

It is not only the elderly who demonstrate that learning how to live healthily and building routines is important for wellbeing during transitional phases. The growing number of children with learning and behavioral disorders shows that societal changes can be a disruptive factor in growing up and finding a place in society. It's generally easier today to identify children suffering from disorders such as hyperactivity, dyslexia, autism, asthma or lifestyle-related diseases such as obesity.

Society has enlarged children's world dramatically with its new freedoms and high levels of welfare. Parents today often fail to set firm enough boundaries, and television and the Internet offer endless possibilities and opportunities. There are too many things to choose from. Yet while children have gained a certain mental freedom, they are often restrained in their physical development by their social context such as more traffic and pollution and fewer streets where they can play safely.

With children and their parents suffering from these lifestyle conditions, it is not easy to continue to live independently as a family. Parents who have to change their (work-) life can find it hard to retain their place in common networks. Their children are often referred to as 'special', both in care and education. Care institutes cannot keep up with the growing number of children who need special care. There is an increase in medication being prescribed, but what children really need is a better regulated life: peace and calm, more rules and routines, even predictability especially for autistic children. How can they continue to live their lives in a familiar environment, yet still receive the appropriate care? Many parents would benefit from good coaching to help them continue to live independently as a family. [24]

### Philips' Next Simplicity 2005 concept, In Touch [25]

Hung on the wall at the entrance to your home, or anywhere that everyone passes daily, In Touch converts one-to-one communication back into group-to-group or family-to-family communication.



Figure 6: In Touch, Next Simplicity 2005

## 2 The healthcare industry landscape

The healthcare industry is one of the world's largest and fastest-growing sectors. Over the past forty years, there has been a significant increase in health-care spending. It's estimated to account for on average 10% of the Gross Domestic Product (GDP) of most developed nations, therefore forming a substantial part of a country's economy. Western European countries spend between 7.3 and 11.5% of their GDP on healthcare, while in 1960 it was only around 4% of GDP. [26]

To be specific, medical care for people with chronic diseases accounts for more than 75% of the US's \$1.4 trillion medical care costs. The direct and indirect costs of diabetes, for example, are nearly \$132 billion a year. In 2001, approximately \$300 billion was spent on all cardiovascular diseases. Over \$129 billion in lost productivity was due to cardiovascular disease. [27]



Figure 7: Estimated Per Capita Health Expenditures US, by Age and Sex

## 2.1 Who pays for healthcare?

The healthcare industry consists of healthcare providers delivering health services. In return, patients usually pay directly or ask their insurance companies to cover the costs. Many countries, however, don't view healthcare as similar to other products or services on the market. They believe that government regulation or intervention is necessary. The provision of critical healthcare treatment is regarded as a basic human right, one that should not be affected by the patient's financial position. It often feels that the government is responsible for educating people to take care of their own basic health.

In general, there are five primary methods for funding healthcare systems.

1. Out-of-pocket payments made directly by the patient. Such direct outlays of cash are not reimbursed.
2. General taxation. A financial charge is imposed on an individual or legal entity by the state or the functional equivalent of a state.
3. Social health insurance. Funding for healthcare is provided by contributions from individuals, employers and, sometimes, government subsidies.
4. Private health insurance. Funding for healthcare is provided by individual contributions.
5. Charity or donations. Funding is provided by gifts, typically for charitable reasons.

In reality, healthcare systems often include a mix of funding systems. In the Netherlands, for example, competition between healthcare providers and insurers is encouraged by a system of standardized and mandatory health insurance. Under this system, insurance policies are funded by a combination of taxation and subsidies, as well as by premiums paid by those who are insured.

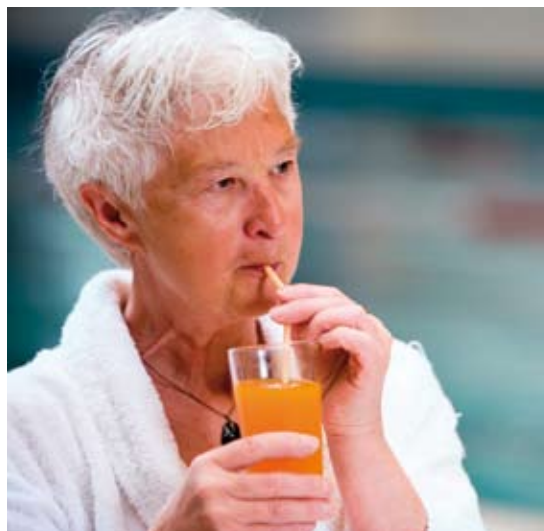
### Example: Who will pay for care? Age bank, China

"It's simple – volunteers work with the very elderly, and keep track of their hours in a little red book. Someday, when they get old, they can "withdraw" the hours and get care for themselves from the next generation of volunteers."

This comes because times are changing in China. Once, the elderly were cared for by the younger members of the family. It is still not uncommon for three or four generations to live together and care for each other. But with a booming economy, young people are moving away for job opportunities, and often leaving their elderly parents or grandparents behind. [46]



Figure 8: Volunteer trading of senior care



### Decreased quality in health care; Pyjama days

One example of the decreased quality of care in today's society involves the so-called pyjama days that have recently surfaced in the news. 'Pyjama days' was the name given to the days in Dutch nursing homes when staff didn't wash and dress residents in the morning but, instead, left them in their pyjamas as a way of coping with the lack of trained personnel. [47] [48]

Figure 9: Pyjama days at nursing homes

In contrast, the United Kingdom's National Health Service Act, adopted in 1948, provides free physician and hospital services to all people resident in the UK, (although private health services are also available). Individuals who satisfy certain criteria – such as low income or permanent disabilities – receive free prescriptions, while those who do have to pay for prescriptions do not pay the full expenses. Funding is provided by a combination of health insurance tax and general taxation.

### 2.2 From cure to care: increasing demand, decreasing resources

As outlined in the previous section, the world now faces a major increase of the senior population. This aging trend has severe implications for the prevalence of age-related, chronic diseases and general physical decline. Of course such health issues will require a more intensive demand for care: not just immediate healthcare but, in particular, long-term care. Together with the decreasing role played by family members in providing such care, these three factors will place an enormous and growing burden on our existing healthcare system in the coming years. This in turn will create demand not just for financial resources, but for trained personnel too.

### Healthcare response

Studies project a dramatic deterioration in the quality of care to be offered in the near future. This is mainly due to increased pressure on our current healthcare system caused by the general decline in trained professionals in the healthcare industry, combined with increasing demand for professional care. [28]

There are also other factors to consider. For example, the 'graying' of our society will lead to a general decrease in the labor force. People are moving out of the healthcare industry as other jobs offer better pay, lower levels of stress and better opportunities for career development.

There are some emergency solutions to solve the problem, such as decreasing the amount of time spent in care or searching for resources abroad. These are quick fixes rather than sustainable solutions.

### **Delta Lloyd, health check:**

The Delta Lloyd 'Gezondheidscheck' is a complete health check designed to detect diseases such as cardiovascular diseases or diabetes earlier. This enables treatment to be provided in good time, and increases recovery success rates. Positive results from tests carried out in healthcare trucks that can visit companies, motivated Delta Lloyd to further expand the system. The health check, developed by Amsterdam NIPED-institute, will be launched soon. [49]

### **2.2.1 Insurance company response**

Insurance companies have started reacting to the projected increase in healthcare spending by, for example, encouraging healthy behavior. Dutch insurance companies like VGZ and IZA have started refunding their client's expenditure on Becel pro-activ, a type of butter with a positive influence on cholesterol levels. They have also started to offer complete health checks as a preventative option in their health coverage.

Insurance companies want to make health tests accessible for healthy individuals. By offering early check ups and prevention, they expect to lower costs in the long run. Early detection of lifestyle diseases will lower the amount of care needed in the future. At the same time, it is likely that people will recover more quickly, possibly in their own homes.

### **2.2.2 Government response**

Expert interviews conducted at Philips showed that the Dutch government attempts to decrease spending on healthcare per capita by demanding the insurance companies and consumers to pay more. [29] The reasoning behind this is that the elderly of the future will be financially better off than today's ageing population because many of them will have paid off their mortgage and will have secured a profitable pension scheme.

Measures for relieving pressure on the current healthcare suppliers include a decrease in medical bureaucracy. Now an abundance of regulations leads to healthcare providers spending a substantial part of their time in their offices completing paperwork instead of being with patients. Governments could try not only to retain existing health workers, but also to encourage others to develop a career in the field by offering better secondary working conditions.

Tax reductions to relieve the pressure on the more expensive collective healthcare providers could stimulate demand for private care. The government is currently investigating the possibilities of day-care hotels, as opposed to day-care homes, in cooperation with the Golden Tulip hotel chain. [30]

Finally, the European Union has acknowledged the need to explore alternative solutions to target chronic and longer-term healthcare to reduce cost and pressure. One of the projects that have been initiated is MyHeart [31]. MyHeart aims to 'enlarge the reach of professional care in people's homes' by finding solutions that minimize chronic disease management costs and stimulate multinationals to innovate with state-of-the-art technology and solutions.



### Blood Pressure meter

Patients with heart or stress-related diseases often purchase a blood pressure meter, either on their own initiative or following a doctor's advice.

Figure 15: Blood pressure meter

### 2.2.3 Consumer response

Until recently, healthcare was often regarded as a type of consumer product: when you're ill, you just go to the doctor and take the medications prescribed to get better again. However, people are now realizing that many chronic diseases are the result of their lifestyle, which leads to physical conditions that cannot be cured by a prescription only.

With the growth of the Knowledge society, research findings on health and physical functions have become much more public over the last few years. Instead of the doctor being the sole source of knowledge, people are now able to educate themselves about their own health and bodies. At the same time, there is a much greater demand for alternative treatments such as homeopathy or acupuncture. This active search for information has created a strong 'consumer-pull' effect. More and more, people are demanding that doctors explain the treatment they have prescribed and then they return home to still search the Internet for confirmation. If this does not satisfy them, they seek a second opinion.

This consumer-pull effect is also apparent from recent developments in the market for self-monitoring devices such as pedometers, advanced weight scales that also measure Body Mass Indices (BMI), and other solutions that give feedback on overall health or lifestyle.

There have also been more bottom-up initiatives by elderly people to continue to live independently for longer. There has been a rise, for example, in the number of small communities consisting of independent dwellings with shared care and protection facilities, fully initiated by the inhabitants themselves. This clearly supports the finding that today's older generation of consumers has clearly different attitudes to healthcare solutions than seniors in the past. [32]

## Senior Living Communities, Sun City

The Sun City Center Community Association, Inc. is a self-governed and self-supported organization established for the 55+ community. A Board of Directors, elected by the community, has full power and authority over the affairs of the Association subject to the Articles of Incorporation and Bylaws. [50]

### 2.2.4 Response from Industry and service providers

Thousands of products have been developed to help people remain independent. These are technologies for assisted living. Rollers, walking sticks with seats and scoot-mobiles help people overcome their physical inabilities. Cooking services and meals-on-wheels help people who can no longer take care of their own healthy food intake. Alarm systems offer comfort to people who live alone and feel insecure at home. Special taxis and day care allow more freedom of movement and physical well being. Other services and products help people to stay mentally sharp.

There are also services and technologies that enable (professional) carers to support people from a distance. These include monitoring and tracking devices that show whether individuals have encountered difficulties or even have fallen. Some Japanese hospitals use electronic bears to keep the elderly company and, at the same time, give the nurses a view of what is happening in the home. A sensor in a teakettle in a Japanese nursing home can raise a flag if a patient did not make tea that morning, maybe indicating that they were unwell. Universities in the USA are conducting studies with Aibo, a robotic dog that can keep elderly individuals occupied and their mental faculties sharp.

'Self-check' shops offer people who are healthy and worried about their future the chance to conduct a full medical check-up that may well detect problems early on and help keep future healthcare costs down. Private clinics and private care services are of course available to serve those who already have problems and have money for expensive care outside the standard care system.

### Example of a Product enabling physical wellness and freedom of movement



Figure 11: Trolley for seniors

# 3 Major characteristics of existing care systems

The previous chapters highlight a mismatch between the current care systems on the one hand and people's lifestyles and related diseases on the other. Care nowadays takes place outside the context of everyday life.

Our care society focuses mainly on curing people: healthcare providers take action only after a crisis has occurred. Healthcare is also strongly culturally related: it reflects society, people's lifestyles and the economic situation in a country. For instance, people in Asia take medication to prevent diseases, while people in Western societies still take medication to cure the symptoms of an illness. This section looks at some of the main dilemmas of care in Western societies.

## 3.1 Care in Western societies

With chronic lifestyle diseases on the rise a short intervention period in a hospital is no longer sufficient. In the future it will become more important to guide people through transitions and support them in remaining independent.

### Fragmented care

There are many services designed to support people in living independently: meals on wheels, obstetric care, physiotherapy and home healthcare services. However, these are often 'bottom up' solutions that need to be requested by the patients and which offer little support for moral, mental and physiological back-up.

While the care system provides sufficient support in the rehabilitation phase, in the home – or even outdoors – care is still limited and fragmented.

### Crisis-driven care

Current care is mostly crisis-driven, meaning that care is only provided for critical problems. Patients move out of their own context into the professional care environments where experts 'fix' the issue. However, this kind of care is not suitable for lifestyle diseases. These diseases originate from people's choices and true care is needed to change unhealthy daily habits and routines. It is also important to track the development of the disease and health situation to be of genuine assistance.

Many health solutions are based on offering help in emergencies. Services such as Philips Lifeline are based on this principle. Philips Lifeline, a personal alarm button, enables the wearer to contact professional care services in an emergency so that the call center can offer guidance until professional assistance arrives. Philips Lifeline has indicated that the majority of the calls are simply check ups to reassure on both ends that help is available at any time. Request for additions to such services are often focused on assistance, advice and information about daily needs. Research at Philips Design showed that people prefer the positive aspects of coaching rather than the negative aspects of removing risks and fears. [35]

Emergency systems are supporting the formal and informal care network in their work, rather than supporting the patient. People are often forced to buy alarm systems to be used by their care network without being able to do anything by themselves. The question then arises as to how care can become part of people's life in a way that makes sense to them. We have to keep in mind that it is important for people to remain independent for their self-esteem but at the same time the resources to look after them outside the home are lacking.

### Fitness as a health measurement tool

Recovering from lifestyle diseases requires new ways of measuring and providing care. A lack of activity is the major risk factor in the development of chronic diseases such as heart complaints. Therefore, activity is a crucial element in rehabilitation programs. At the same time, activity is an important indicator of physical fitness and health in general. Measuring, analyzing and comparing activity over an extended period of time while crossing different transition phases, can demonstrate the progress and physical development of people undergoing rehabilitation. Measuring physical activity becomes a measure of physical fitness and this is a key element in the health and wellbeing programs of clinical and rehabilitation environments.



Figure 12: Philips Lifeline [51]

Physical fitness can be measured through ergo-spirometry. This is used to [33]:

- evaluate people's capacity for possible workload and endurance;
- define the level of disability;
- measure the impact of a disease on the exertion capacity in the area of pathology;
- decide on methods of intervention and evaluate them during rehabilitation.

For experts, it is not only important to know whether the patient was compliant and did his exercises; it's just as important to know that they made an effort to perform these activities well. This is relevant to people's further development and to understanding the way people perceive their exercises: for example, was a patient afraid to push themselves further or did they go beyond their limit? [34] [41]

Unfortunately, physical fitness, especially that involving muscle capacity and physical exertion, are hard to measure outside the hospital in daily situations. For patients, it is still difficult to translate the data gathered and apply it to their day-to-day life. Furthermore, it is especially difficult to measure physical fitness and progress when people are taking medicines such as beta-blockers that keep the heart rate low at all times and are therefore unreliable as measurement. [35]

People also feel insecure about what they can and cannot do and are sometimes unaware of their own capabilities, which too often results in signals being misinterpreted and too little or too much activity being undertaken. Both reactions negatively affect the progress of rehabilitation. For example, cycling in a physiotherapist's office on a 'home trainer' with a rehabilitation specialist next to the patient is different from cycling at home without guidance. Every home trainer has different settings and patients are advised not to compare what they achieve on different machines, as the readings from individual bicycles are often not compatible. [35]

### 3.2 Rehabilitation outside the reach of professional experts

#### Holistic healthcare model

People's coping mechanism is based on a combination of mental, physical, emotional, spiritual and social factors (see figure 13). These factors influence the way people perceive their health across time and health stages. Multi-disciplinary care is needed to be able to support people in their health transitions by taking into account all factors that influence their coping mechanism. [42]

There are two obstacles to monitoring long-term improvement and progress:

1. People do not know what to do with their newly gained knowledge: how to translate and apply measurements they are given.
2. Doctors do not yet have the means to measure physical fitness outside their own environment.

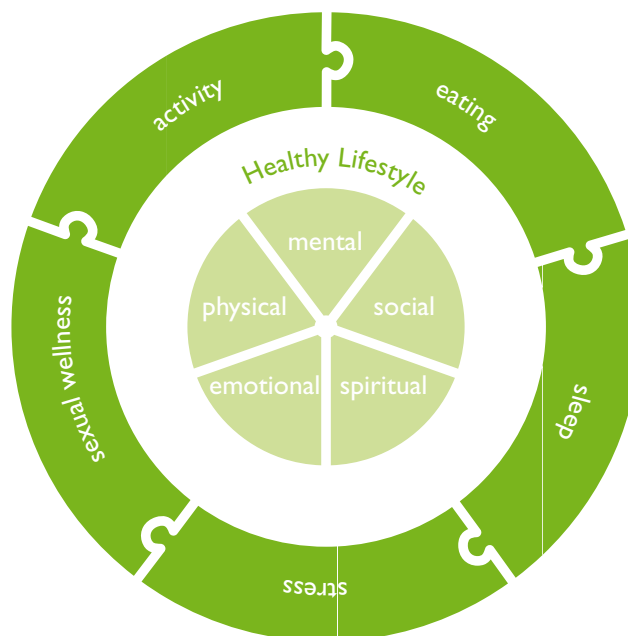


Figure 13: Holistic healthcare model of lifestyle change

### Multi-disciplinary care

One of the health situations that reveal a gap in the care system is the transition from clinical care to rehabilitation during which people are urged to get their lives back on track by overcoming the mental and physical obstacles that occurred in daily life after treatment of their illness itself.

In the current healthcare system, only a small percentage receives a rehabilitation trajectory through a rehabilitation center that offers multi-disciplinary care to smoothen the transition from hospital to home care. However, most people get 'peripheral care', meaning that they receive a certain amount of stand-alone physiotherapy in their neighborhood and occasionally psycho-therapy as after-care of their illness, but do not receive health guidance in daily life. As a result, people have to deal with their physical and mental disabilities and limitations on their own, which often requires a considerable effort and knowledge on their behalf. Periphery care providers indicate that their patients fail to translate the care learnings into daily practice. Therefore, there is a growing trend among them to offer multi-disciplinary care. [35]

### Self-help care

Rehabilitation exercises and training do not take place at home but in a protected environment. People find it hard to translate the lessons learned into their everyday life and activities. Yet, if they have to learn to live with their disabilities and create new possibilities, they need to experiment. However uncontrolled experimentation could have potentially serious consequences. Professional assistance is therefore critical.

Long-term professional guidance is key to ensure people are able to translate learnings into daily practice and experiment safely. However, fragmented rehabilitation care (e.g. eight visits to a physiotherapist) does not provide sufficient opportunity for such long-term support. Self-help care is a solution that is designed to help people learn to deal with problems over time. [35]



### Exercise program; an example of self-care

People who visit the doctor will get a prescription of an exercise program instead of medicine. For a personal contribution of € 11.00 they will receive 10 exercise sessions under expert supervision. [52]

"I had trouble with my pelvis," says Nita. "But after nine sessions with the physiotherapist, I still wasn't cured. So he suggested that I try fitness training. That sounded like a good idea, since I really wanted the pain to stop." For a few weeks now, she's been going for an hour-long fitness sessions. "I'd never done any sport before, except for swimming. I feel much fitter now. The pain's decreased and I've developed a much better overall condition. The running machines are my favorite. Once the ten weeks are up, I'm going to keep going."

Figure 14: Exercise program for seniors

### 3.3 Self-help principles

The informal care network can offer support when people need to take care of themselves. But there are also some self-help principles that can empower them to learn to deal with their health issues and overcome obstacles.

#### Routine

Building up routine is an important aspect of rehabilitation and general lifestyle improvement. It helps people to prioritize, re-learn how to live properly and discover new abilities after an event has occurred. Setting priorities is one of the things people have difficulties with, especially when their illness impacts their energy levels and memory.

Routine gives people a sense of control over themselves and their health and this can significantly improve their mental and physical wellbeing. Routine helps to secure compliance to medication, training programs, and adoption of healthier habits. This is important as the success of a rehabilitation program depends heavily on the patient's level of compliance. [31] [35]

#### Home as the center of care

Home is important in underpinning new routines next to a supportive social context. Some hospitals are starting to create situations that resemble home, where patients together with their families can relearn subjects such as cooking. In the same vein, some care institutes are starting to build extensions that look less like clinics and more like homes.

To prevent people from falling back into health-threatening situations, it is vital to enable them to translate achievements and learnings gained in the professional care environments into their own everyday situations. The home environment is currently recognized as the preferred center of care as it is where the patient will have to keep up healthy habits, maintain independent and improve his or her quality of life. [31] [35]

#### Edward Plainfield outpatient centre

Common medical services are now available just minutes from home for Plainfield residents. Edward offers immediate care services at the Edward Plainfield Outpatient Center, in a home-like environment. Here, adults and children can walk in and see a doctor for non life-threatening emergencies, including high fevers, broken bones, and workplace injuries. The atmosphere is calm and comfortable. The center is staffed by physicians qualified in emergency medicine. [53]

Figure 15: Care services in a home-like environment



#### Education

Lifestyle choices are often the root cause of chronic diseases. However, they are also the starting point for learning to deal with disease and improve health and wellbeing. Education is vital and therefore an integral aspect of rehabilitation. In order to make a change and the right lifestyle choices, people need to learn about lifestyle influencers like the effects of smoking, their food intake, stress and sleep habits.

Measurements are used by experts to better track development and break down possible misconceptions. Normally, the results of these measurements are interpreted by experts, but the new generation of significantly younger patients tends to be more knowledgeable and demands insight into their health condition. Therefore, they could use the measurements to learn about their health behavior. As a consequence, the demand for self-measurement devices would grow. The use of self-measurement devices in this way is expanded upon in *Tuning your body* [14] and *Living in Balance* [15].

## Home monitoring solutions

Monitoring by biometric sensing reveals more than a single visit to the doctor, and offers direct feedback to show improvement. Patients learn to understand, and get a feeling for, their body and health status.

### The role of informal carers

People are not alone when it comes to dealing with their health. Patients are surrounded by a care network (doctors, nurses, experts, insurance companies, home care, family members, self-help groups and peers) who all influence the quality of care.

Self-help groups can assist people in learning how to move successfully through transitions. Over time people can even become experts about their own condition and start advising others. These groups have in common that they offer moments to reflect and these interactive moments work highly motivating in their journey of care.

Now that governments can no longer cope with the growing demand for care, informal carers such as children, parents or loved ones are again becoming more important in our society. Governments are starting to rely on informal carers to replace the care offered by hospitals, daycare centers and nurses. However, although informal carers receive financial support, emotional support is still lacking. It becomes very helpful to downsize bureaucracy like filling in application forms and a supporting community enabling them to share their worries and experiences.

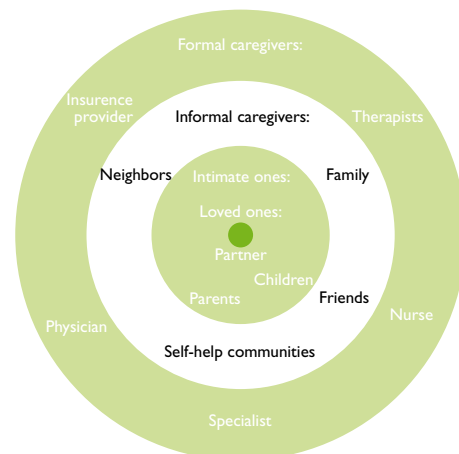


Figure 17: Informal and formal care network around a patient [31]

### Kangaroo dwelling: Living together with your parents [37]

A growing trend is Kangaroo dwelling. To support the informal caregiving system, a home can be created that consists of two complete living areas, one on top of the other and each with its own kitchen, bathroom and living room. They are connected by a staircase.

Providing care to a loved-one day and night puts psychological and social pressure on personal life. Providing 24 hour care leaves no time for personal leisure. How can the carer be supported when they have to take over so many professional tasks? [36]

### 3.4 Care from crisis to transition

The existing care system which merely reacts to solving a crisis does not fit with people's lifestyles anymore. When people today overcome a disease or a chronic health condition, they are often highly motivated to pick up their own life again and readjust it accordingly. But rehabilitation often still takes place in the official care environment, leaving people puzzled on how to cope at home.

The question to be answered is how people can be helped to see their illness as a starting point for a different life phase with new and healthy opportunities. As they enter this phase with the onset of a chronic condition, they need to be able to rediscover their new abilities. The best place for this rediscovery is the home, away from doctors and medical equipment.

Figure 18: Exploring new lifestyle as part of health management



# 4 Supporting independent living throughout transitions

This chapter focuses on the question how people can be helped to explore the best options in their new life situation instead of continuing their old lifestyle leading to the same health risks.

## Health stages in relation to care and transition

With regard to care, there are generally 4 health stages, and moving from 'healthy' to 'unhealthier' and from 'unhealthier' back to 'healthier' is called 'transition'. The illustration (figure 19) shows the four overlapping health stages, and the transitions between them.

1. Clinical care. Patients are institutionalized and receive all the care they need to be cured.
2. Rehabilitation. Patients require rehabilitation to learn how to deal with their physical and mental abilities and limitations. The majority of patients, however, is not sent to rehabilitation centers and must cope with their mental and physical problems without full support.
3. Reassurance. Patients have learned to deal with their new situation, although progression in their daily lives is limited. This is when they need mental, physical and social support. There is a strong technology pull to offer a reassuring and motivating environment.
4. Prevention. Patients need to acknowledge that they are putting themselves at risk when they continue to live their current lifestyle, and they would be better off taking up healthier activities and adopting more appropriate routines which incorporate natural tuning. In this phase there is a need for enabling solutions to support, educate and motivate people when they take up new, healthier lifestyles. Handling stress and getting adequate sleep, nutrition and physical activity are major factors in this phase.

These stages are not static, as mentioned earlier: there can be obstacles to staying healthy and independent, and when people are in transition their life does continuously change. This is when support is most needed.

## Transition phase I:

'getting yourself back on track'. During this phase, there is a strong inner drive on how to deal with immediate physical and mental symptoms;

## Transition phase II:

'getting your life back on track'. This is a phase in which more attention needs to be paid to real life issues such as social activities and flexibility;

## Transition phase III:

'maintaining independence'. In this phase, it is crucial someone can 'tune' in with health issues to prevent falling back into the lifestyle that led to their illness, and avoid serious health problems.

If people are not guided and supported through the whole transition phase, they run the risk of failure because they cannot alter their existing lifestyle. They either fall back into old patterns – thus risking their health – or lead a limited life and losing quality of life. A failed transition can cause people to feel lonely and lost in society and, in some cases, can lead to depression and abuse of medication.

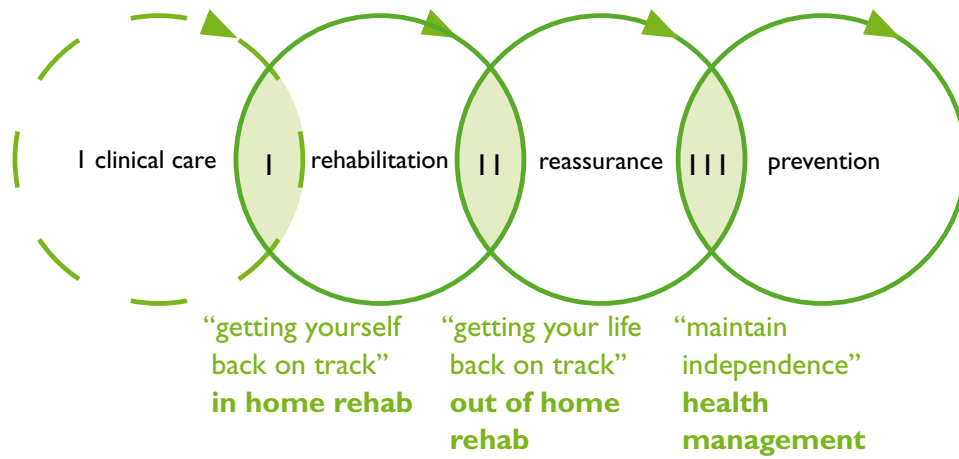


Figure 19: Health stages and transition phases

### Misconception as a barrier

People going through life transitions experience mental, physical and social changes. These changes can force them to reset and rethink almost everything they do. They will need to rediscover their possibilities to see how they can improve their quality of life. [31] [35]

To do this, however, people need to be able to listen to their bodies and minds, as well as be aware of new social environments. As they are often unaware of how to deal with their new situation they do not know what is right for them or whom to consult for advice and help. This leads to health risks in the long run.

People often have misconceptions about their body's signals. This can result in either a lack of activity or overdoing activities that could be dangerous. So it is important that people in a transitional phase understand their limits as well as their abilities.

In general, people feel insecure about what they can and cannot do, and are often afraid to experiment, especially since the consequences could be potentially serious. Yet experimentation is essential in learning to live with disabilities and in regaining a higher quality of life, also in new situations outside daily routines, such as holidays and parties. [5]

### Lifestyle changes

Societal changes are provoking a growing demand for care, for example the needs of an ageing population, new behaviors related to the Knowledge Society, the increase in lifestyle and chronic diseases, stresses caused by distorted family structures and single households. On examination, the current care sector reveals a gap between supply and demand. Support is needed during all transitions across the health stages people will encounter in their lifetime. This could involve triggering or motivating them to take action, or helping them to overcome obstacles when they do make changes.

People's choices and daily behavior will influence their health. Therefore, to help individuals through these transitions, it is important to understand what it takes for people to change their lives, and what they will experience during different health stages. [31]

### Offering enabling solutions

To achieve long-term solutions that help increase people's quality of life, it is important to empower them. A system approach offering solutions tailored to users' needs over time is needed to provide the combination of information, feedback and tools we have discussed. Such an approach should be able to fade in and out as required. It should be adjustable and scalable to the type of information and exploration required. Therefore, different partners – from care and content experts to technology and service providers – will have to team up to produce them.

Philips Design [35] has explored enabling solutions in two directions: boundary stretching and life-driven. 'Boundary stretching' refers to empowering people to safely exploring their boundaries in daily life after rehabilitation. 'Life-driven' refers to the demand for new care solutions that are not focused on the disease itself but the surrounding daily needs. Such solutions should support both the carer and the patients.

#### 4.1 Boundary exploration

Current self-care is based on specific care principles. These include routine, home-centered care, education, and cooperation by multiple stakeholders. These principles have all proven to be very successful and powerful elements in supporting self-help because they empower people.

However, these principles are often based on supporting people only in the first phase of transition. The feeling is that once people have their health situation under control, they should be able to get their lives back on track.

The fact that people need to build a new life does not mean it becomes a lesser life. It means they will be facing new challenges for which they need support, flexibility and reassurance. Unfortunately, current self-care principles do not always support the later phases of transition. It is crucial to empower people in playing a more active role in their own lives supporting their work, social contacts, activities and relationships.

#### Flexibility: beyond routine

Routines should not become a cage in which people are trapped: flexibility is important for learning to deal with the new challenges and experiences. Solutions aim to enable normal life, with both routine and non-routine activities. Companies such as Philips can offer reassurance through connected, body-driven care systems.

#### Flexibility: China and India

The need for flexibility is even greater in countries such as China and India. Burgeoning economies in these regions mean they are facing similar health and care problems. There has been an increase in lifestyle diseases such as diabetes and cardio vascular diseases, especially among a much younger group of the population. This is a big problem, because these are the individuals who play important social and economical roles in society. A chronic cardiovascular disease will not stop them from working and taking care of their families. They can not afford to be isolated. They need flexible solutions that will enable them to continue their role in society. [16]

#### Heart Failure Management (HFM): Philips TODOSO 2006 [35]

The HFM concept was developed to support both carer and patient in the event of chronic cardiovascular disease. A set of daily 'on-body' measurements offer the expert insight into the progress and health status of the patients. The patient needs to perform a simple set of measurements in the morning, using a specially designed chair and a shirt made of smart textiles and embedded sensors. These are everyday objects that fit smoothly into the daily environment. The patient is guided through the ritual by a screen in the chair.



The repetitive nature of the exercise not only makes it reliable; it also has a predictive value and the expert will be notified immediately in case of emergencies. Because a possible event can be predicted up to two weeks in advance, and acted upon in time, demand for clinical care and related costs will be reduced. The data seen by the expert is also visualized in a simpler and more understandable manner for the patient, who can then use it to gauge his progress and better understand his health.

Figure 20: Home monitoring solution for heart failure management

Figure 21: Wearable harness for monitoring.

Some people are afraid of any new activity. We call them 'mama-mia' patients. They do not even dare to raise their arms when getting dressed even though they do similar exercises here in the clinic. [35]

A year after my event, my husband and I went on holiday with a friend, to France. When they went for a hike in the mountains, I didn't feel sure that I was strong enough to go with them. Finally, I decided to stay at the camp site. [35]



Since activity is a crucial element of rehabilitation the system allows room for experimentation. During the day, users who feel insecure can use the shirt in combination with a Pod for feedback on their status. They can find out whether they're within the safe limit, set by the expert, and whether they should do more or less exercise. The device can be used at any time, in- and outside the home.

The system has been developed in such a way that it offers the chance to experiment and reflect and is designed to reassure the user and his/her care network.

Figure 22: User interface guiding the check up ritual

Figure 23: Pod for feedback on health status



#### Flexibility: everyday routine and experimentation

Diseases, especially lifestyle diseases, manifest themselves differently in every individual. Therefore education is needed to help people learn to live with their disease in their own every-day context. This is an integral aspect of rehabilitation programs and therapies. Yet despite better education, it remains hard for people to apply what they learn to their daily lives.

When developing empowering solutions, the challenge is to offer flexibility and room for experimentation without increasing risks. This calls for monitoring devices and coaching systems that also offer reassurance wherever and in what everyday context the person is, in order to reduce anxiety.

Flexible solutions that are relevant to daily life situations are needed. They should also allow feedback from different types of people: experts, loved ones, or even people with the same problems.

#### Scoot-mobile championships

In the Netherlands, many elderly people possess a scoot-mobile but are reluctant to use it. Scoot-mobile championships were organized as a playful way to teach them how to use their new mode of transport without fear.

#### 4.2 From crisis-driven to life-driven

This paper has made many references to the importance of people's ability to live independently. Two solutions can be recognized: those that enable physical and mental freedom, such as the roller and those that offer reassurance, such as a strongly supportive care network.

#### From responsive to supportive

Responsive solutions are being developed for crisis-driven emergency situations which occur occasionally. Since people do not always see the benefit in the short term, these solutions are often forced upon them. At the same time, they may experience rejection or dismissal of their personal human needs like love, intimacy, gossip, support in dealing with technology, the opportunity to ask questions about anything beyond taboo. This kind of care and reassurance is required every day.

#### Guiding lights concept

The elderly develop a fragmented sleep pattern at night which is often perceived as a problem sleeping. They frequently need to get up to visit the bathroom, something they find less disruptive with the aid of guiding lights. When they get out of bed, the lights come on and project a blue glow just strong enough to show the way to the bathroom. This means sleep is not disturbed by bright lights.



Figure 24: Guiding lights example

### Adjustments in the context of everyday life

When people grow older or become chronically ill, they will need to adjust to living independently. They can rediscover the opportunities their new situation offers, especially when they are empowered with tools that help them adjust as necessary. But these tools need to be flexible so that they can be adjusted to new situations.

The development of new materials such as intelligent, multi-functional high-tech textiles, human tracking software, and sensing techniques has enabled Philips to improve its non-obtrusive health care solutions even further. For instance, Philips recently created 'health ware', a series of sensor clothes that enable unobtrusive constant monitoring when necessary.

Such solutions are meant as a tool for both expert and patient. With measurements based on everyday activities and events, constant monitoring with biometric sensors reveals more than a single visit to the doctor: it also shows improvements by giving direct feedback. The same data is also translated into simple and understandable feedback that helps patients in learning to understand their body and health status. These systems are designed to minimize patients' effort but provide reassurance when and where they need it any time.



### Social networking

The round table is a concept that enables seniors and schoolchildren to contact each other through interactive tables. A concept from the Technical University Delft team in the Microsoft Design Competition, 2000 [38]

Philips Design developed a similar concept called Living Memory facilitating social networking in the local neighborhood. [55]

Figure 25: Living Memory community table, Philips Design 2000

### Supporting social contexts

In our immediate environment, people to whom we are close can offer reassurance, comfort and pleasure. Although we know that exercise is beneficial, it's not easy to motivate yourself to be active by yourself. Groups often encourage activity and a sense of community. The 'Activmob' [57] is an example of such a solution: the platform supports small, self-organized groups to undertake regular activity in a way that fits with their lifestyle, interests and abilities. It helps people to become and remain active.

Another support opportunity is found in art and crafts. This brings the opportunity to open a window onto people's emotional interiors. Creative and art therapy provides many people with the chance to 'sharpen' their senses and increase the likelihood to taking action themselves. Such non-verbal therapies – painting and music for example – can positively influence well-being and support healthy living. Philips, with its expertise in ambient experience technology, can create new solutions enabling creative group sessions and interactive environments.

Within our society, children and the elderly often demonstrate a special understanding of each other in terms of communication and affection. They frequently tend to share similar physical and mental needs. The round table and Living Memory are examples of solutions that enable more social activity. [38]

### Apply solutions to everyday problems

Various concepts developed for sick people could very well support others keen to pursue a healthy lifestyle or tackling minor health issues. Philips has developed a shirt for people to wear after having a stroke. [31] This neuro-rehab garment helps wearers to learn how to move their muscles again and to adjust posture. Such a shirt could also be used for orthopedic patients in the treatment of aches and pains resulting from bad posture. These technologies are also emerging in the leisure industry for electronic games. They could be further used to coach people practicing Tai Chi, Pilates and other relaxation exercises. Clothes with sensors not only help elderly with serious health problems but they also reassure parents with regards to a sleeping child's welfare.



**Momento, Philips' Next simplicity 2005 concept [26]**

Momento stores the most cherished moments, recorded as short movie clips, and replays them as floating magical fragments in a glass ball.

Figure 26: Capturing cherished moments through Momento



# 5 Conclusions

Companies like Philips can contribute to promoting healthy and independent lifestyles through solutions based around motivation and education. However, the key to any successful approach is to empower people so they can live their lives to the full both during and after an illness. If this is not achieved, it will be difficult to persuade them to effect the necessary changes.

Broadly speaking, there are solutions that foster physical and mental freedom, and those that offer reassurance. It is clear that the most practical solutions are also the most flexible. If measurements of a patient's condition are based on and embedded into everyday activities and events, they are far easier to implement.

In addition, constant monitoring with biometric sensors is more valuable than a visit to the doctor, not in the least because it shows improvement through direct feedback. These systems should minimize patients' effort and provide reassurance whenever it is required. The development of new intelligent materials, human tracking software and sensing techniques, facilitates non-obtrusive healthcare solutions.

All key stakeholders in the healthcare landscape must be considered when developing care- and prevention driven solutions. The informal care network and the patients should not be neglected either.

Technology and service providers can certainly play a meaningful role by producing enabling services and solutions that help people resume a normal lifestyle again. These solutions support people in the transitional period between depending on medical care and living a healthy and independent life.

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### About Design Research at Philips Design

Design research is a key area in the Philips Design portfolio, providing knowledge, competences and capabilities to create distinctive design services with a competitive advantage. The design research program recognizes the need to respond to a new world, new economies, emerging needs and expectations of people by exploiting intelligent adaptive technologies in relevant ways.

## About Philips Design

Philips Design, with branch studios in Europe, the USA and Asia Pacific, is one of the largest and longest-established design organizations of its kind in the world. Its creative force of some 550 professionals, representing more than 30 different nationalities, embraces disciplines as diverse as psychology, cultural sociology, anthropology and trend research in addition to the more 'conventional' design-related skills. These professionals strive to create relevant and meaningful solutions that satisfy people's needs, empower them and make them happier. All of this while respecting the world in which we live.



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