

# "Technology and health: impact on solidarity"



Prof. dr. T. de Vries

*AIM congress Buenos Aires 20-22 May 2005*

## Introduction

First I will draw your attention to various levels of solidarity in health care. I will indicate that they all have to do with modern medical technology. Then I will pay attention to the phenomena of technology as such. This is important, it reflects the technological imperative, the belief in technology, the idea that technology will be the solution to all our health problems. It is sheer optimism versus some pessimism. Then I will be more specific and I will focus on the significance of two most important technologies in health care: pharmaceutical technology and information technology. I then will conclude with some general remarks on the importance of technology in health care on the issue of solidarity in health care.

## Solidarity

I now will give you some ideas about solidarity in health care. Looking for a clear definition is a hopeless task, I found more than hundred. I rather stick then to the intuitive notion like "a common interest and a active loyalty between or within countries or groups". This said, I'm still not satisfied, because watching the reality I see many levels of solidarity, all with a different focus. Let me give you three of them.

Let me start with a solidarity between countries, which I call solidarity of the first level. About ninety percent of the planets disease burden falls on the developing world. Yet only three percent of the research and development expenditure needed for new technology of pharmaceutical industries is directed toward those ailments. The rest goes towards treating diseases of the rich.<sup>1</sup> This not only shows a direct relation between technology and the economic situation of countries, it also shows the importance of solidarity between countries. It shows that technology has to do with solidarity, or better: the lack of solidarity.

Solidarity *within* countries, the second level, is important as well. The lower the solidarity, the higher the private spending of individuals. Private spending tends to be skewed towards the more well off individuals where the returns to spending on health are smaller and away from potentially more needy populations where the returns are larger.<sup>2</sup> Well, this might be nice in theory, but can we confirm this by empirical data? It looks like. From WHO data we learn that the European Union scores better on solidarity and health performance, the United States has a worse solidarity and a bad health performance as well. And, you all may know, they spend roughly 50% more than the EU. If we look closer to the data of the World Health Organisation we may conjecture that the higher the solidarity in a country, the higher the health performance of a country, given a certain economical level. On the other hand, evidence shows that new technology will penetrate somewhat slower in countries with a high level of solidarity.

So, technology has to do with solidarity. But there is a third level of solidarity. It is the feeling of the consumer that insurance will be good to cover all his or her health needs. This feeling seems to become weaker and weaker. It is endangered by the increase of individualism in the western world. Today's technology in health care is feeding this individualism. It facilitates the consumer to maximise

his or her personal needs. If the technology or services are not covered by his or her insurance it will be bought on the market. Technology will offer more and more at increasing prices. As a result of the breathtaking paradigm shift of technology, the impact on medicine is moving from the species level to the individual level. The ingrained assumption that drugs work the same for all human beings will not be true anymore. New expensive healing possibilities emerge; the result will be a new age of medical therapy. This will be dominated by early diagnosis and individualized therapy. It is my belief that it is this individualized medicine that will endanger solidarity in health care: consumers choose their own expensive therapy because it's very effective, at the end the insurance companies will diversify their premiums accordingly. Needless to say that this will eventually erode the sense of solidarity at the individual level and with it the bases of the system on a national or on an international level.

It's not only new drugs that will individualize health care. It is also all kinds of information technology, which will facilitate the delivery of health care at home or outside, at all levels. Services can be offered according to personal needs. This technology catalyzes the today's individualism of the consumer.

Taken together, both pharmaceutical and information technology boost the shift from species-based to individualized therapy. This will change both the medicine and existing levels of medicine and solidarity forever.

More technologies will be relevant to health care. To mention are nanotechnology, stem cell technology and all kinds of genetic interventions. Together with pharmaceutical and information technology these will point in the same direction: a decreasing solidarity in the coming decades. As said, the weakening solidarity is has to be seen as in the perspective of a increasing individualism. This is only a part of the general trends. The emerging loss in solidarity has also to be seen against the background of the growing role of liberalism and the emerging post-modern value systems.<sup>3</sup> Defects in one's health may be seen as an individual problem, subject of individual and not of collective responsibility.

Information technology and new drugs and maybe nanotechnology will be dominant in the nearby future of medicine. Stem cell technology and tissue engineering will be important in the next decade. It will be time for a public debate on this future. It is of crucial importance to pay more attention to the consequences, since a shift of medical technologies of this significance is sure to have lasting political, economic and social consequences.<sup>4</sup>

Next I will give you some ideas about the technological imperative. Why are we so optimistic about technology? It surely is the quest to a better and healthy life. Let me give you some background.

## **Optimism and pessimism in technology**

### *Optimism*

There is a widespread belief that technology will be the answer on all our medical problems in health care. Let me give you an example. A couple of years ago I was at the MIT in Boston. I had a discussion on the Burden of Disease study of Murray and Lopez.<sup>5</sup> In this study much has been written on the epidemiology of the planet. It stated that in the Western world depression is a very important disease, now the fourth in importance. In 2020 it will be the second. This is a dark perspective. Not so for the participants in the discussion. "We will invent a pill for that", they said. Now this optimism seems to be justified. They had a belief in the technology, and it is this belief that makes them run. This optimism is ubiquitous. It is not typical for the time we live in; it is more than fifty years old. It is not only the optimism, which does not change; it is – to a certain extent- also the focus that remains the same. Let me give you an example.

I first will give you some ideas how the potential of technology in the health sector has been valued in the past. It will be a short excursion. Let me start in the sixties and the seventies.

From our current point of view, those years gave rise to many unrestrained fantasies. They were fed by the big successes in medical science that were quite often world news. Let me focus on a well-disputed area. In 1966, several possibilities were described to substantially influence the brain and accordingly the behaviour of people with medication, and this before the year 2000<sup>6</sup>. The futurologists Kahn and Wiener examined this seriously a year later. They saw big possibilities to alter behaviour by

influencing the brain as a result of the knowledge acquired by analysing the secrets of RNA and DNA structures. Not only did these ideas live in the United States, in my country, The Netherlands similar insights were passed on: direct stimulation of the brain, pharmacological improvement of the memory, and the like, were expected before the year 2000.<sup>7</sup> These fantasies could perhaps still be ascribed to the belief in the successes of technology during the Cold War, but the ideas about the transplantation of organs or replacing them by all sorts of substitutes were different. These were considered as real developments in the 1960s, maybe even before the year 2000. The belief in technological progress was very much alive, sceptics were hardly believed.

But also manipulation of hereditary material was discussed very seriously.<sup>8</sup> The results were considered to be very clear. The result, influencing the quality of offspring, was seen as a reality in the near future. These speculations rapidly changed into wild fantasies. Often, they were taken very seriously, as shown by the quote from 1966, for instance, that caused a great deal of controversy in the Washington Post.

The text reads more or less as follows: "Within 10-15 years, a housewife will be able to visit a new type of institution and examine a row of packages as if she were looking for flower seeds. Then, she will choose her baby on the basis of the label. Each package contains a frozen one-day-old embryo. The label states the expected colours of hair and eyes and the child's IQ (...)"<sup>3</sup>

The same fantasies continue! The fantasies are ascribed much too easily to the fanciful 1960s. In the years around the turn of the century, striking similar insights existed that have been described excellently in Francis Fukuyama's book "The New Man"<sup>9</sup>.

He describes three scenarios that might unfold within one or two generations.

The first scenario also concerns the influencing of behaviour. Many have heard of Prozac and Ritalin, medication that is effective in respect to characteristics such as self-respect and ability to concentrate. A drawback is that they can have undesirable side effects. It is probable that by adapting them specifically to the user's genetic make-up, these side effects can be almost entirely prevented. Unhappy people can become happy, introvert ones extravert, and so on. The second scenario concerns replacing tissues and organs. Not by all sorts of transplantations but by application of the results of stem cell research. This appears to make it possible in the future to regenerate almost all body tissues. In the last scenario, the line of Kahn and Wiener is further extended into the future. Fukuyama also considers influencing the quality of offspring as a realistic option. In his opinion, rich people can afford to have embryos checked on a regular basis before they are implanted. As a consequence, the social background of young people can be told to an increasing extent from their looks and intelligence. This is a confronting idea in the perspective of the values of solidarity in health care systems.

These three scenarios of Fukuyama's have a surprisingly large similarity with the perceptions of forty years ago. There is an ever-increasing technological imperative in health care, on our way towards the horizon – without ever reaching it.

### *Pessimism*

Whoever thinks that this optimism is widely shared, however, will be disappointed. There are critics, but they are less likely to express their thoughts in leading journals. Nevertheless, little by little, doubts are being expressed about the possibilities of technology in medical science *and* in connected sciences. For instance, in the year 1979, the biologist Glass came with an argument that was confronting at the time about the progress of science. He stated that the development of science had more or less reached its apex and that the pace of new findings would only decrease.<sup>10</sup> He acknowledged that much could still be learned, but that in his opinion real breakthroughs would only decrease. Glass is not alone in his pessimism. Le Fanu, a physician, presumes that we are confronted with a decline in the number of developments.<sup>11</sup> This point of view is extremely interesting, because he draws our attention to a number of inhibiting factors that appear to be becoming more and more manifest in medicine. Le Fanu, but he is not alone in this, thus provides a necessary counterbalance – necessary in order to keep both feet on the ground. For that matter, Le Fanu acknowledges the successes achieved in medical science in the past century, He cites developments such as penicillin, cortisone, open-heart surgery, MRI, liver transplantations, and so on. In his opinion, all these

developments are hardly the result of systematic scientific research but more likely of seizing opportunities, of perceptivity, of doggedness and perseverance. After the 1970s, says Le Fanu, these have been increasingly lacking, and the abundance of ideas is decreasing. New developments become more and more scientifically oriented. This will result in delays in the production of new concepts.

And indeed, we see a worldwide decrease of, for instance, new pharmaceutical products – in ten years a decrease of 30%. At the same time, the R&D costs in Europe have more than doubled in this industry over the same period. In the USA the increase is more than fourfold.

The pessimistic views of Le Fanu seem to be contradicted by the enormous R&D in the pharmaceutical world and the breathtaking pace of penetration of information technology in all fields of medical care. It is nevertheless important to keep the views of the practitioner Le Fanu in mind, since new technologies never come without problems.

## **Two important technologies**

### *The pharmaceutical technology*

At first sight Le Fanu seems to be right. As for Europe, the number of real new drugs on the market per year is decreased, since the research has become more complex and takes much more time than, say, twenty or more years ago. Important new drugs used to appear on the market frequently. This is not so anymore. As said, the number of really new drugs coming out each year has decreased in the last ten years with an astonishing 30%. At the same time the marketing costs has risen in the same period with a factor of four to five, also an indication that the number of new useful drugs is stagnant. However, the number of new drugs is only an indication of the future pharmaceutical technology – and to my opinion it is a bad one.

R&D in the pharmaceutical sector increased even in the recession years 2001 and 2002. In those years R&D of only three product groups in the economy were increasing: biotech, medical and pharmaceuticals and semiconductors.

The paradox mentioned lets us presume that there is more going on. Traditional R&D techniques are being abandoned, a trend of computer-related research techniques is emerging, which is making “wet chemistry” partially redundant. But this is not all. New knowledge is emerging by way of alliances with all kinds of genomics and “baby biotech” companies; convergence of disciplines (nanotech, biotech and infotech) is more and more common. This appears to be giving rise to new research cultures both within and outside the pharmaceutical industry. There is every indication that in the near future the downward movement of the number of medical innovations will stop. Reorientation of scientific research is the decisive factor in this context.

It is no longer unthinkable that researchers have almost solved the mystery of how cancer develops. Findings of the Humane Genome Project played an important role in this. It is clear that much progress has been made and that it is probable that in approximately ten years various forms of cancer will be reduced to chronic diseases, like diabetes.<sup>12</sup>

This all might be very important. New developments indicate that future pharmaceutical products will become more and more specific. The number of cancerous disorders they are confronted with will increase, because diversity at a molecular level is very extensive: for each type of cancer a separate approach will have to be selected. This means that the markets for medication will become considerably smaller. The consequence will be that the industry will only focus on subtypes of frequently occurring disorders. Less frequently occurring disorders can be dealt with but will often not be developed for market technical reasons. Prices will considerably increase, not only because of the smaller markets but initially also because of the necessary research that has to be done with smaller populations.

The consequence will be that very effective but also very expensive drugs will be created. There is a clear trend towards personalized medicine. The most attractive markets for the industry are the elderly – as for numbers and effectively anticipated demand. Then it is the question whether the health care system can produce the solidarity to finance qualitatively superior drugs (including expensive

maintenance doses). It must be feared that in this field important social issues will occur. The solidarity will not only be limited to the price but also to the question whether the available knowledge must or can be applied for less frequently occurring disorders. To maintain a system based on solidarity, it is essential that new technologies should always be evaluated for their effects on the health care system – it is hardly possible to exclude the technologies, but a careful introduction process can prevent many problems.

### *The information technology*

We see a momentum building in health care. There is a technological imperative.

“We believe that we are just scratching the surface of the possibilities created by electronic communications”

“We can no more foresee the shape or extent [of the effects of information technology] on the health systems than our ancestors could have foreseen the blossoming of science that followed the invention of the printing press.”<sup>13</sup> Though provoking, this quote of a recent editorial of the British Medical Journal seems to me very true.

The importance of information technology is really set to boom in health care. The increasing importance is not in the first place the result of R&D. It is more the result of applying proven information technology in a new playing ground – the health care sector. The character of this technology is different. It does not so much aim at improving the medical condition of a patient; it is of importance to the process of delivering of all kinds of medical services. Whether right now the success of information technology is as convincing as is the case with pharmaceutical technology is doubtful, the prospects however are quite promising.

As for Europe, the market potential is quite substantial, it is expected that sales of information technology in health care will increase from 25 billion euros in 2005 to 50 billion in 2010. This might look promising for the industry. However, the evidence of the efficiency of applications using information technology in health care is scarce, technology assessment in this area does hardly exist. Nevertheless, tendencies become more and more clear. Mobile health care is set to boom with a growth rate of a factor 3 in four years. All kinds of eHealth are emerging with a breathtaking pace. Many know already all kinds of online pharmacies, second opinion via Internet, and so on. All these technologies have a common factor. They are aiming at the empowered patient, the patient who knows what he or she is doing, who can take decisions for him or herself. As with pharmaceutical technology, information technology in health care will catalyze the individualism of the health care consumer. And this is the heart of the matter. Information technology in health care will emphasize the role of the health consumer. He or she has a preference drift towards the best products and services available in health care, according to the latest technologies. Eventually he or she will pay for these. Not so the elderly and the lower income groups, however insured they are either not informed or they simply cannot pay the new services, which are offered outside the insurance schemes. The European Union sees this problem of exclusion and seeks ways to avoid that. Until now there are no tangible results.<sup>14</sup>

### *More technologies*

More technologies are emerging.

Nanotechnology is an important one, especially the nanoparticle drug delivery systems. There are plenty of nanoscale technologies that are useful for building tiny sensors, for example to detect and fight infection, which is likely to become much easier in the next three to five years. An array of new technologies will be important in health care. Due to convergence of existing technologies a vast area of new products will be developed.

Most of them will have important common factors. They will be applied on an individual scale, they will be expensive, especially in the beginning. They will be very diverse. As indicated before, these elements can be a thread to the third kind of solidarity, that of the innate feeling of solidarity of the future consumer of health care.

## **Conclusion**

There will emerge an increasing amount of technologies. These technologies, in combination with information technology will induce far more possibilities than in the past. No doubt these new possibilities will have a potential to cure many more diseases than ever before. However, this also means that the ability to process different options will become a problem to the lower educated.

At the same time there is a serious risk of a loss in solidarity due to the coming vast amount of new products and services and the increasing amount of money that is needed for them. Needless to say that this also widens the gap between haves and have-nots, to the educated and the non-educated, to the healthy and sick, to the young and old.

I think it is difficult to influence market driven technologies in health care in a direction, which is respecting an accepted level of solidarity in health care. However, health insurance institutions can play an essential role in all this. In principle they have buying power that can be used to influence research agendas towards preferred medical technologies. They should be active in this area and not reactive.

New effective health policies in this area cannot be effective without a clear view on new technologies, without assessment of coming technologies. Constant monitoring technologies is mandatory. This all should be realized on an international level.

Thank you

---

<sup>1</sup> The Economist April 16<sup>th</sup> 2005 p73-4

<sup>2</sup> C. Flood et al, *The Borders of Solidarity: How Countries Determine the Public/Private Mix in Spending and the Impact on Health Care*, U Toronto Law and Economics Research Paper No. 02-02, 2002

<sup>3</sup> B. van Steenberghe. *Man on the throne of God? The societal implications of the bio-medical revolution*, Futures 34 2002 p 698

<sup>4</sup> S. Gottlieb, *The future of Medical Technology*, The New Atlantis, 1, Spring 2003, pp 79-87

<sup>5</sup> C.JL Murray and J.L Lopez, *The global burden of disease*, WHO/Harvard/World Bank 1996, p 376

<sup>6</sup> H. Kahn and A.J Wiener, *The Year 2000*, Macmillan Company, 1967 p 111

<sup>7</sup> See for instance JCM Hattinga Verschuere, *Patiënt, Ziekenhuis, Gezondheidszorg op weg naar 2000*, Agon Elsevier, pp 36-52

<sup>8</sup> *Forseeing the Unforseeable*, Kaiser Aluminum News. No 6, 1966, p22; cited by H. Kahn and A.J Wiener, *The Year 2000*, Macmillan Company, 1967; and: Washington Post, October 31, 1966; also cited by H. Kahn and A.J Wiener, *The Year 2000*, Macmillan Company, 1967.

<sup>9</sup> F. Fukuyama, *De nieuwe mens, Onze wereld na de biotechnologische revolutie*. Olympus 2002, p 23 et seq.

<sup>10</sup> B. Glass, *Milestones and Rates of Growth in the Development of Biology*, Quarterly of Biology, March 1979, pp 31-53.

<sup>11</sup> J. Le Fanu, *The Rise and Fall of Modern Medicine*, Little, Brown and Company, 1999

<sup>12</sup> The Economist, *A survey of nanotechnology*, Jan 1st 2005 pp 1-15

<sup>13</sup> AR Jadad, *What next for electronic communication and health care?* BMJ 328 15 May 2004 p1143

<sup>14</sup> IPTS *eHealth in 2010: Realizing a Knowledge-based Approach to Healthcare in the EU*, European Commission, April 2004 (Draft) p58