

# Technology and health: impact on solidarity

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## Abstract

Looking at the medical technological development there are two important trends to distinguish. First the development of the information and communication technology and secondly the development of new medicines for always smaller and sharper defined groups. Some of the new technologies are cost-raising, others are moneysaving but as a result we see that two thirds of the autonomous cost development in Health Care is caused by the development of medical technology. The question is if we can afford this development. One hand it brings better quality of care and new and better treatments, on the other hand it raises the cost of health care systems with the result that present levels of solidarity in those systems are maybe not sustainable in the future.

**Key Words:** Biomedical Technology; Technology, Medical; Technological Development; Quality of Health Care; Health Care Costs; Delivery of Health Care

## Resumen

### Tecnología y salud: el impacto en la solidaridad

Mirando el desarrollo tecnológico médico hay dos tendencias importantes para distinguir. Primero el desarrollo de la tecnología de información y de comunicación y en segundo lugar el desarrollo de nuevos medicamentos para grupos definidos siempre más pequeños y más agudos. Algunas de las nuevas tecnologías tem mayor costo y otros son más baratos, pero consecuentemente vemos que dos tercios del desarrollo autónomo del coste en cuidado médico es causado por el desarrollo de la tecnología médica. La pregunta es si podemos disfrutar de este desarrollo. Por un lado, aporta una mejor calidad de la atención y nuevos y mejores tratamientos, por otro lado aumenta el costo de los sistemas de salud con el resultado que los niveles actuales de solidaridad en estos sistemas pueden no ser sostenibles en el futuro.

**Palabras clave:** Tecnología Biomédica; Tecnología Médica; Desarrollo Tecnológico; Calidad de la Atención de Salud; Costos de la Atención en Salud; Prestación de Atención de Salud.

## Resumo

### Tecnologia e saúde: o impacto na solidariedade

Pesquisando o desenvolvimento tecnológico da medicina, existem duas tendências importantes para se distinguir. Em primeiro lugar, o desenvolvimento das tecnologias da informação e comunicação e, em segundo lugar, o desenvolvimento de novos medicamentos para grupos definidos sempre menores e mais agudos. Algumas das novas tecnologias têm maior custo e outras são mais econômicas, mas como consequência, vemos que o custo de dois terços do desenvolvimento autônomo em cuidados médicos é causado pelo desenvolvimento da tecnologia médica. A questão é se podemos bancar este desenvolvimento. De um lado, aponta melhor qualidade no cuidado e novos e melhores tratamentos; por outro lado, aumenta o custo dos sistemas de saúde, concluindo que os níveis atuais de solidariedade nesses sistemas talvez não sejam sustentáveis no futuro.

**Palavras-chave:** Tecnologia Biomédica; Tecnologia Médica; Desenvolvimento Tecnológico; Qualidade da Assistência à Saúde; Custos de Cuidados de Saúde; Assistência à Saúde.

## INTRODUCTION

In “The Telegraph” of June 27<sup>th</sup> 2006<sup>1</sup> Intel boss Paul Otellini wrote that soon we will have a technique which will change the world. Chips of the size of a virus open a new future if it comes for example to medical treatments.

This type of technological development will be an important trend. Not only in the medical perspective, the budgetary point of view will be decisive as well. Information and Communication Technology (ICT) is a good example. ICT makes it possible to have more and more efficient care for the individual patient – at an enhanced qualitative level. We can think for example about individualized home care technology.

New medicines can be developed for always smaller and sharper defined groups of patients. The costs of research and development however will be huge. In the year 2008 for example there are still hardly any medicines for children available. The market for the kids is hard to approach. Frequently it is said: *Just take a half*. This of course has everything to do with the size of the hazy market and the possibilities to have return on investment. Well, this will change with all good and nasty consequences. A consequence of the combination of these two developments: better healthcare and higher costs. The questions for governments is: How to handle these developments?

## IMPACT OF MEDICAL TECHNOLOGICAL DEVELOPMENT ON HEALTH CARE SYSTEMS

Besides the cost-raising technologies there are labour saving, and therefore money-saving technologies, for example the cataract operation. In the past, two weeks in a hospital. Now the operation lasts twelve minutes in an eye-surgical centre. With the new technical possibilities however we also see a change in medical diagnoses. More patients than before are requiring treatment at a younger age. In addition the development of medical technology has important side effects. It leads to treatment of disorders which were not treatable before and as a result to broadening of the indication area of medicines with the result of an improvement of the quality or lengthening of life for the patient.

In the long run the lengthening of life for the patients however causes the paradoxical effect of causing an increase in chronically, not life threatening diseases for which there is no treatment at the moment but with a need of long term care on a large scale.

Looking at the development of the costs of healthcare it can be said<sup>2</sup> that two thirds of the autonomous cost development in Health Care is caused by the development of medical technology and one third by the demographic ageing of the population. For the medical technology the autonomous rising of the costs is the balance of the money-saving and cost-raising technologies. It is remarkable that by the specific character of healthcare as an industry, the technological developments lead to an increase of the costs per entity of product whereas in the remaining industries this leads to a lowering of the costs per entity.

It should be clear that an autonomous increase of 3% per year of the costs of care and an increase of the Gross National Product of 1.5 to 2.0% per year (as in The Netherlands) leads to a higher care quote (costs of healthcare as a percentage of the Gross National Product). Long term explorations of the Social Economic Council, the Central Plan bureau and the Study Group Budget Space are predicting that the Netherlands must prepare themselves for a care quote of 13 - 15% in 2040.

The question is: “Can we afford this?” Can we afford that our Health Care System stays as it is with the same level of solidarity or should for example the co-payments of the patients be raised? In other words: “What is the impact of the medical technological developments on solidarity in health care?”

First we will draw your attention to various levels of solidarity in health care. We will indicate that they all have to do with modern medical technology. Then we 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.

## SOLIDARITY

Looking for a clear definition of solidarity is a hopeless task, there are more than hundred. It is better to stick to an intuitive notion like “a common interest and an active loyalty between or within countries or groups”. This is still not satisfying, because watching the reality there are many levels of solidarity, all with a different focus. We give you three of them.

### Solidarity between countries

This could be called 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>3</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

This 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>4</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. If we look closer to the data of the World Health Organization 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.

### Solidarity as a consumer feeling

It is the feeling of the consumer that insurance, based on the broad solidarity, 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. The developments in technology zooms perfectly in this trend: 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 medi-

cal therapy. This will be dominated by early diagnosis and individualized therapy. It is our 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 increase and diversify their premiums accordingly.

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.

## OTHER TECHNOLOGIES RELEVANT TO HEALTH CARE

To mention are also 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 has to be seen as in the perspective of an 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>5</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>6</sup>

It is also important to mention the developments in Telemedicine or Telehealth if you like. The technology already exists. It is possible to have an operation by a robot done by a medical specialist on a great distance from the operation room. This could be a solution for areas with a lack of medical doctors for example. For this paper it goes too far to exploit all the possibilities it will have for the future.

## OPTIMISM AND PESSIMISM IN TECHNOLOGY

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 De Vries was at the MIT in Boston. I had a discussion on the Burden of Disease study of Murray and Lopez<sup>7</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.

### Optimism

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 start in the sixties and the seventies to see how the potential of technology has been valued in the past.

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. 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. The futurologists Kahn and Wiener examined this seriously a year later.<sup>8</sup> 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 our 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>9</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*.<sup>10</sup>

The text reads more or less as follows: “Within ten to fifteen 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>10</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.<sup>11</sup>

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

The first scenario also concerns the influencing of behaviour. The second scenario concerns replacing tissues and organs. Not by all sorts of transplantations but by application of the results of stem cell research. 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 con-

fronting 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>12</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>13</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.

## 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.

We 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.

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