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# Technology and innovation: Are family doctors and patients able to keep up?



The family doctors' new role as intermediaries in a complex world

**In industry, the mega-trend towards further miniaturization can't be ignored. At the same time, IT service performance is rapidly increasing. These technological changes, along with the dramatic progress achieved in molecular biology within the past years, provoke a wave of innovation, changing medical services profoundly.**

Due to standardized interfaces and the progress in miniaturization, component suppliers of assembled industrial goods can focus on the development and mass production of single building-blocks of the final product: Manufacturers of consumer goods purchase modules and assemble them like Lego bricks. Due to economies of scale, the components' costs and, therefore, also the costs of the final product decrease. This leads to a wider distribution of goods. The described procedure has emerged as a major driving force of innovation [1]. Also in medicine, the emergence of routine innovation processes, which imply the steady enhancement of single modules independently from others, are likely in the near future. The challenge is the strict separation of different treatments (modules) and their interfaces' proper definition: Who will be responsible for monitoring the risks of side effects that a patient takes when he has a tailored cocktail of different modules to treat his disease? The interferences of the modules with each other can never be fully tested.

The principle of building-blocks on the bases of standardized interfaces has the effect that it can be more profitable for manufacturers to directly approach the consumers. Using the World Wide Web as a cheap distribution system, the customer can configure his commodity online, according to his individual desire. Specific custom-made production on a grand scale, mass-customization, replaces the classical mass production. This is a win-win situation for manufacturers and customers, as intermediary trade is eliminated. It is conceivable that a personalized precision medicine, tailored for each single patient, is economically more efficient than the broad prescription of blockbuster pharmaceuticals. Obviously, personalized medicine requires diagnosis with an equivalent accuracy. But who makes the personalization? Will intermediaries in medicine disappear as well?

Today, some companies predict that within a few years they will be able to do a complete sequencing of the entire genome of a human being in less than 15 minutes for less than \$ 100.– [2]. These prices have already reached such a low level that gene pools for whole populations will be sequenced for scientific purposes. The trend, not to record the patient files by hand but to change to a standardized electronic patient record, will enable a more systematic search for genetic predispositions in the near future. This goes in parallel with our new paradigm of a disease: It is a genetic predisposition together with a specific lifestyle and a certain environment.

The software industry exemplifies that rapid technological miniaturization can lead to a situation in which innovation is done by small

and medium sized companies or even by individuals. This process leads to open innovation. The filing of patents is renounced and third party companies are invited to develop their products on the basis or platform of the primary one, or to engineer complements in respect to the primary. If this procedure recurs in the biotech sector, the publication of knowledge in open sources combined with a simple access to tailor-made building-blocks (e.g., specific DNA sequences), will have novel ethical implications. Individuals may soon be able to clone and specifically modify the genome of organisms. It is very possible that we will soon see competition for genetically modified organisms where particular attributes are valued, analogous to the contests for the rose breeders which we know of today.

Our society as a whole, and especially patients, are not very good in dealing objectively with risks and probabilities, respectively. If patients find out about a potentially harmful genetic predisposition, they are misled towards activism, some taking rather drastic actions. The harm of the psychological implication of false positive tests is often not taken into account. This is especially true for mass-preventive medical checkups [3, 4]. On the other hand, when overlooking the results of clinical studies, the relevance of extreme values is underestimated. Due to the extreme values' small quantity, they are dismissed as outliers. The profit-driven search for a blockbuster may neglect that after the extrapolation from the test bed to the vast number of future users, the former extremas grow to a large group that can't be negated any more, as the Vioxx® case exemplifies [5].

To a large extent, it is an illusion to believe that many patients are able to decide, on their own, which therapy is best for them and be fully aware of the scope of the decisions made at the same time. The gap between the complexity of the decisions that patients are expected to make themselves and their background knowledge is going to increase with technological progress, despite all the information on the Internet. To an increasing extent, family doctors play the role of an interpreter between the worlds of patients on one side and science as a highly specialized knowledge on the other side. There are no professional sectors more specialized than medicine! Family doctors speak the language of their specialized colleagues, they know the legal aspects as well as the financial impacts when deciding on therapies, and they understand the sometimes emotionally laden language of their patients.

Patients do rely on their family doctors' translation services in order to be able to gather the information needed to make self dependent decisions. Even if all information would be freely accessible on the Internet, the patients could not profit without the help of an interpreter because they lack essential background knowledge [6], or aren't able to understand the posted statements due to the medical terminology or the high complexity. Face-to-face contact should not be underestimated when focusing on the family doctors' role as intermediaries. A recent study by the ETH Zurich shows that even young and well educated people prefer to consult with a human counterpart and are skeptical about health related e-services [7].

Family doctors are ideally suited to mediate the knowledge transfer from patients towards specialized medical doctors and scientists too. Family doctors have information about their patients' lifestyle and environment. The specialists can correlate this knowledge with data from molecular biologists' analyses later on. This correlation is of crucial relevance for a deeper understanding of disease patterns in the future, simply because the rolling wave of innovation will be too much for most patients and even most scientific specialists. It needs somebody who integrates on the basis of human judgment: Family doctors are best suited for this demanding task in the future.

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#### Herzzermalmung

wenn alle Enge innen ist  
 und alle Atemluft  
 sich in den Brustkorb drückt  
 kein Wort entweicht  
 und Schmerz anwächst  
 und presst  
 und drohend quält  
 und sich nicht lösen kann  
 nicht Halt macht  
 vor dem Schrei  
 der Unerträglichkeit  
 und endlos tötend  
 dich zermalmt  
 und du erstarrst

dann wird  
 vielleicht  
 ganz fein  
 ein Luftzug sein  
 der Schacht  
 sich weiten  
 wird jemand  
 mit leiser Hand  
 dem Schmerz  
 den Weg  
 aus deinem Innern  
 zeigen

die Totenglocken klingen seltsam hell  
 und Unbekannte grüssen  
 ein Leichtes hüpfte in deine Welt  
 mit Lichtertupfen, die dich küssen

*Thomas Schweizer, Hausarzt in Liebefeld BE*