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## Playing with numbers in the health care game

Peter A. Rinck



If you visit a country as a tourist you will see the points of interest, historical places, the most beautiful sights, and get an instant impression of that country. This impression will stick to your brain for the rest of your life.

Usually it is wrong. Only if you live in a country for at least one year, do you realize the true attitudes and problems of the country and its population.

During the last twelve years I have lived and worked as a physician in five countries in Europe and America. I have also suffered from the healthcare systems of all these countries, giving me reason to believe I know these systems to a certain extent. None of them functions in an exemplary manner.

Recently I have been exposed to Japan's healthcare system, which is different from Europe and the United States.

In 1990, Japan spent 4.7 percent of its gross national product (GNP) on medical care, which includes research and construction costs. This is an extremely small sum for a highly developed country. In the same year, the United States spent 10.7% of its GNP on healthcare and related costs; it presently spends more than 14%. In Europe, Germany is spending 9%, Italy 8.5%, and the United Kingdom 6%.

It is very difficult to measure whether the money spent in healthcare is well invested. There are very few reliable outcome studies on medical diagnostics and therapy. Quantification of medicine is nearly impossible because medicine is not an exact science.

In which unit do you measure "I am feeling well"?

Some people have chosen life expectancy as the measurement of how well a healthcare system performs. If you accept this yardstick, the results are sobering: Japan wins. The average life expectancy at birth for a woman in Japan is 83 years, for a man 76 years. That is seven years longer than average life expectancy in the United States, Denmark, the United Kingdom, or Germany. Or ten years more than in Albania, Poland, or Bulgaria.

People in Portugal and the United States have the same life expectancy. The difference is that Portugal invests less than one third in medical care per inhabitant. In other words, a nation spending more on health care does not necessarily bring its residents longer living.

Let's play with different numbers: There are 5,500 pharmacies for the 10 million inhabitants of Belgium but only 1,400 for the 15 million Dutch. Not surprisingly, the consumption of pharmaceuticals is lower in the Netherlands. Life expectancy in the Netherlands is two years longer than in Belgium.

Looking at something else, closer to radiology: In Belgium, more than 1,500 radiological examinations are performed per 1,000 inhabitants and year. In Portugal, it is less than 400. The average life expectancy differs by one year.

The number of magnetic resonance machines per one million inhabitants is 14.5 in Japan, 14 in the United States, 6.8 in Switzerland, 5.5 in Germany, and 2 in the United Kingdom. The average reimbursement rates are 170 ECU (predecessor of the euro) in Japan, 830 ECU in the United States, with most of the European countries somewhere in between.

In other words, Japan has the highest density of MR machines in the world, the lowest reimbursement rates, the lowest per capita healthcare expenditure – and the highest life expectancy.

Japan, by the way, also has the lowest prices for MR machines. Manufacturers outside of Japan claim they lose money with every machine sold there. But with one-third of the world's MR machines, I cannot believe that Japan is a losers' market.

Europe is full of Japanese cars, cameras, electronic equipment ... should we also try the Japanese healthcare system?

Personally, I do not believe this is a solution for Europe. The Japanese system has a lot of trade-offs. It is impersonal, although perhaps no more impersonal than the healthcare systems of the United Kingdom

and the Scandinavian countries. The system is supported by a uniquely Japanese attitude towards their state and their employers. Japan does not have a large impoverished low class of people and the Japanese diet is healthier than that of most European countries.

Nonetheless, playing with numbers and observing what is happening on the other side of the world might help us. Some readers will argue that playing with numbers is nonsense. Normally, I would agree. But think again about the numbers mentioned above. Something is wrong somewhere. We do not want to talk about it because there are so many taboos in our health system.

■ *The Times of London* requested in an article published in its issue of 20 December, 1992:

“... what is needed is an open, patient-driven system on the basis of accurate information on needs and outcomes ...”

Two terms here are important: “patient-driven”, which means that the patient must be the center of medical thinking; and “outcomes” because that is what is important for the patient. To many administrators, politicians, radiologists and industries, patient outcomes are secondary.

We hardly know anything about the outcomes of what we are doing in diagnostics and therapy. Do we need the preoperative chest x-ray in all hospital patients? What about coronary angiography? What about ultrasound in pregnant women? What about ...?

Why can the Japanese perform MR examinations at one fifth of the price of the United States or one fourth of Germany? Why do radiologists in one country use more contrast agent than in the neighboring country?

These are questions begging for an answer.

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## Medical ethics and the military

Peter A. Rinck



**W**oolsorters' disease has a rapid onset. It leads to rigor, rapid respiration, pain in the chest, rapid and feeble pulse, and a high temperature, usually accompanied by cough and bronchitis. Much frothy mucus is produced. Extreme collaps and death occurs in one to three days. The mind usually remains clear.

Woolsorters' disease is caused by the anthrax bacillus. It used to be a disease of farmers, veterinarians, and slaughterhouse workers. You can also use this bacillus for bacterial warfare.

Bomblets can be packed with billions of anthrax spores. As spore, anthrax becomes easy to handle. Once again in an airy, moist, and warm environment the spore turns back into its deadly old self.

■ In the spring of 1941, Dr. Paul Fildes of the British Chemical Defense Experimental Establishment travelled to Gruinard Island off the coast of Scotland. He was accompanied by 60 sheep and several small boxes containing anthrax bomblets. The sheep were set free on the island and showered with anthrax bomblets.

Within days, all sheep were dead. In other words, the experiment was extremely successful.

Based on this test, the British calculated that 2,690 bomber sorties would be sufficient to eliminate the entire population of Germany, their war enemy at the time.

In December 1941, the United States joined the allied war effort, and the anthrax project slowed down and was replaced by the production of the atom bomb – which was finally used to level Hiroshima and Nagasaki.

However, the anthrax experiment had side-effects that outlived the war. After the end of World War II, the only place in Europe still considered uninhabitable was Gruinard Island. Still anthrax infested today, the island cannot be visited; and it will remain this way forever [1].

■ This case is a typical example of the exploitation of medical knowledge for purposes other than its real goal: saving people. But it was a case taking place at a particular time –not necessarily that this excuses or justifies it.

Nevertheless, it is not an isolated case and, even worse, such cases are not limited to periods of war.

Amidst claims of perfect and total control and the intention of defense rather than aggression, there are at present several institutes conducting research for, or in collaboration with, the military.

The example of Gruinard Island shows how it is possible to overlook (or ignore) consequences, whether in the duration and/or use of the effects or in unexpected side-effects.

■ And how do we feel about cases such as the one just recently made public in the United States, where some fifty years ago medical professionals knowingly injected people, including pregnant women, with plutonium, a toxic radioactive substance, to evaluate what kind of damage it would cause. Once again, these experiments were performed in humans, not in laboratory animals. Nobody asked for informed consent. Nobody seems to have had questions about whether this was ethical. These experiments in humans were not a single case.

Some of those professionals taking part in the experiment, when asked about it today, still defend and justify their actions. They were not punished for it.

■ Where is the connection to radiology? Most of us in this discipline tend to think that we will never be confronted with such problems. We may believe radiology has little to offer those who are interested in this type of military experiments and so, most likely, we will never be asked to conduct or take part in medical experiments for them. Therefore, we do not need to concern ourselves with these issues.

If you believe that, you may be wrong. After all, radiology provides a window into the body. As it interests some for the sake of preserving life, why would

it not interest others who are concerned with damaging and destroying it?

I was recently shaken by a statement from the leader of an NMR research laboratory: “Research funds are scarce and a little prostitution is necessary – and there is always money in military research”.

His laboratory is one of the few involved in the analysis of chemical warfare products. Some other university-based magnetic resonance laboratories are specializing in research on how neurotoxic substances influence cells. Usually such research is performed without knowledge of the local ethical committees. And it is “defense” research.

Both the scientists involved and the people in charge insist that such research is basic research that is scientifically challenging and will result in information which is of importance for the health of the public in general.

Medical research *per se* has two aims: to improve the life of patients and the career of the researcher. Medical research for companies has three aims: to improve the life of patients, the career of the researcher, and last but not least (in some instances, most important) to increase the profit of the company. Military medical research has military goals: to disable or kill human beings.

I do not mean this as an attack on the military. There is no doubt that armies, sometimes, are necessary to protect the freedom of countries. Furthermore, military research not aimed at the direct destruction of human life has had numerous spinoffs for civilian applications, such as the development of the microwave oven [2].

Recent history, however, has shown that armies in the hands of unscrupulous, criminal, or incompetent military or political leaders turn wild. It has also shown how in a period of a few years the political situation of the whole world can change.

■ Those medical researchers involved in experiments for military purposes – and those contemplating it – would be wise to consider questions such as: Who is going to use my results and how? Am I absolutely sure that there will not be any side-effects or abuse of my results? Am I absolutely certain that only those I trust today are the ones who will control my results in the future?

And if these questions are not enough, what about: Would I like to be the guinea pig of such experiments without knowing it?

If the purely moral and ethical answers to these questions are relative and difficult to find, there are national and international laws and treaties that should be easy to comply with. These agreements state that involvement of physicians in biological or chemical warfare research is illegal.

■ Let's return to anthrax. For many years, the United States Army has sprayed simulants of this bacillus secretly over populated areas of the United States as part of a military Army research program. Viewed as harmless, the tests were used to assess their survivability and dispersion patterns [3].

As Leonard A. Cole of Rutgers University in New Brunswick, NJ, points out [4] the U.S. Army would like to use simulants for such experiments which differ only in one gene from anthrax bacillus. As stated in front of the U.S. Senate, the army reserves the right to perform future vulnerability tests.

Did the medical scientists who developed and prepared these simulants and those who are working in gene technology consider such a scenario?

The personal dilemma between needing research funds and the possible disaster created with “innocent” results is best avoided by not getting exposed to such research.

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## Publish and you might perish anyway

Peter A. Rinck



**W**hen I decided that publishing in medical journals would be subject of this column, I thought about using the title “How to become first author of 17 medical publications a year without having any results to publish.” I decided against it because the ranks of my enemies would again increase.

On the other hand, those people writing 17 scientific papers per year are probably so busy they do not have time to read anybody else’s work. I should not be concerned that they might see this column. I also have to be careful since I once published 17 scientific papers myself within 12 months, with four of them lacking outstanding new scientific results. I stand in awe of the Central European radiologist who, I am told, published nearly 300 papers in one year.

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### I stand in awe of the Central European radiologist who, I am told, published nearly 300 papers in one year.

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I receive at least one medical journal almost every day. Some I have subscribed to, but most I get for free. I read only a few of the abstracts and papers, and most journals I do not read at all because I do not have the time. Some are filed, some are kept for a few weeks, and others are thrown away immediately.

We seem to need a wide spectrum of journals, for reasons other than just keeping informed: to cope with unemployment among publishers, printers, and scientific writers, for instance, or to have some journals just to detest, or to be able to say: “He published in this fantastic journal and perished anyway.”

■ An estimated 4,000 biomedical journals are published worldwide. Many are so esoteric that I believe even the editors do not read them. And only those published in English have an international impact in our field in Europe and North America. The language question has become a big problem. Whatever is not published in English is destined to be lost. Most scientific papers published in Russian, as well as many

in French and German, will never reach the audience they deserve.

In some cases, publication in the native language and in English or publication in an international review journal that is translated into several languages would be a benefit, because not every scientist reads and writes fluently in English. Otherwise, duplicate publication benefits only the printers, who make money, and the authors, who can add another article to their list of publications.

Still, there are cases on the edge. I recently received a manuscript for review in a radiology journal. After reading it and checking the references, I found that the same paper, with only minor changes, had already been published in a cardiology journal. The authors referred to their earlier paper, which had been published the year before. This is not usually done and it is up to the editor or reviewer to detect it. But editors and reviewers have limited time and do not always check carefully, and the authors know that.

One common argument for duplicate publication is the interdisciplinary character of most scientific work today. Different audiences read different journals. In addition, many journals lack a supply of manuscripts, and their editors happily accept papers of even average quality.

We do not need these journals because hardly anybody reads them. However, they do allow younger academic physicians to publish their papers. Together with the few journals that can boast decades of existence, they are among the serious scientific journals publishing original papers. They are the “publish or perish” journals in which you must publish if you want a career. They might also be called “publish and perish” journals because even if you publish in them, you could perish anyway.

■ Everybody knows Roentgen and Mickey Mouse, but who remembers Dupont (the famous French radiologist who described roentgenographic measurements of liver size in the 1930s), Müller (who described the 10 possible fracture lines of the third toe in the 1940s), van Dijk (who described the influence

of the big flood of 1953 on the size of Dutch pituitary glands), and Smith-Brown (who described the disastrous influence of pop music on the inner ear in the 1960s)? All were great radiologists in their time, as is I.P. Pavlova, who compared the influence of radiation of the American hydrogen bomb on Nagasaki with the results of the Chernobyl catastrophe. (Please note that all names are fictitious).

Because the number of articles published plays a major part in making a scientist's career, the number of superfluous publications has increased rapidly in the last three decades. In many instances, everything has already been covered, except for some new developments in new technologies, such as MRI or spiral CT. But in time even this information will be published over and over again, without reference to the earlier papers in which the same results were described.

Another negative factor is that usually all results will be stretched. For instance, if your research deals with pigs that break their legs upon impact when thrown from a tower 10 meters high, you can easily turn this experiment into three papers. The first will deal with the methodology of the selection (why we chose pigs and not frogs); the second will feature the parameters of the blood samples taken before, during, and after the fall, and their changes; and the final paper will discuss the x-ray images of the broken legs. You can even summarize all results in a review paper and add a discussion on the advantages of plaster of Paris versus plaster of plâtrique.

■ The latter point adds another component to such papers: the question of authors' independence from commercial and other interests, along with the question of scientific fraud and honesty. For many readers of scientific journals, faith in such publications has been shattered after the scandals at some major U.S. institutions. In Europe, such scandals have not yet been detected to the same extent, but it is public knowledge that publications from some research institutes are not very reliable.

Certain journals are considered above average because their reviewers and editors are tougher than those of other journals. However, the independence of the editing board is not always guaranteed, and sometimes it is not only the authors who are to blame for unethical behavior, but also the editors. Repeatedly, cases have been disclosed where editors have delayed or hindered the publication of manuscripts that

either presented results of projects similar to those the editor's own research group was working on, or results that were not in accordance with certain commercial or political interests.

It is easy to criticize the negative sides of scientific publications, but in the short term I do not believe it will be possible to change the journal market from outside. Who should be the judge and the police officer? We are all involved. Limited self-censorship guidelines, such as those of the International Committee of Medical Journal Editors, will improve the credibility and quality of the journals applying them. Standards for biomedical journals have been set in an effort to cope with the problems of multi-authorship, duplicate publication, wrong references, scientific fraud, and hidden commercial influence on scientific articles. Journals not following such guidelines will be considered secondary by both authors and subscribers.

During the past few years, a new species of journal has become increasingly popular: those directly sponsored by commercial companies. These are not necessarily inferior to journals paid for by advertisements or societies. On the contrary, some of them are much better, because their financial independence and a strong editorial board independent of the sponsoring company allow the publication of better quality articles. Such journals are usually the domain of authors with a proven track record of excellence in both science and writing.

The philosophy of quality rather than quantity should apply to publications. Quality standards should pertain to papers at various levels: original work, reviews, new developments, academic research, interdisciplinary work, etc. The entire biomedical community would benefit if the pressure for mass publication were removed. Researchers could concentrate on doing good research for later publication rather than having to publish half-finished research, those interested in being informed would not have to sift through tons of worthless paper, and editors and publishers would have no less of a job to perform.

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## Do radiologists have a future?

Peter A. Rinck



In the last six months, I have heard three talks on the future of radiology within medicine – two by radiologists and one by a cardiologist. All speakers concurred that while radiology has a future, radiologists do not. If you look around, you might agree.

Radiology involves more clinical contact than, for example, laboratory medicine, and is at the crossroads of all clinical disciplines. It nonetheless remains an auxiliary tool for medicine and surgery. A surgeon can cut patients and perhaps help them; a gastroenterologist can prescribe pills and stop the diarrhea of a patient. And radiologists – what can they do? Make beautiful x-rays to look at?

**"Independent radiologists do not exist, patients do not come straight to them. Radiologists are always dependent on referrals from other physicians."**

Independent radiologists do not exist, patients do not come straight to them. Radiologists are always dependent on referrals from other physicians.

The profession of radiologist developed from clinicians who used x-rays as only a part of their daily diagnostics to physicians who were occupied with performing the increasingly more complicated and time-consuming x-ray examinations for the referring clinician. But, because medicine was not so specialized as it is today, radiologists were still required to have a strong general clinical background.

When specialization in medical disciplines accelerated after World War II, general radiology followed suit. Neuroradiology and, in some countries, pediatric radiology, became sub-specialities. It is now obvious that the general radiologist cannot cope with the overwhelming flood of radiological knowledge and procedures that include not only detailed anatomy and morphology, but also metabolic studies, dynamic and kinetic functional studies, as well as complex and sophisticated new technologies.

### Tremendous chance

During the last twenty years, radiological examinations have changed tremendously. Conventional x-ray examinations are now only a minor part of the available imaging armament in many countries. The general radiologist who does not adapt to permanent changes in the fields by sub-specializing is extremely vulnerable. For specific questions, many referring physicians perform the x-ray examinations themselves to ensure quality and save time and money – or make money.

Some clinicians argue that patients benefit when both diagnostics and therapy are performed by someone with a clinical background. Sophisticated electronics and computerized techniques have largely replaced craftsmanship, enabling non-radiologist physicians to easily perform “radiological” techniques on their own and forego seeking the professional advice of radiologists.

New imaging technologies are also attractive to non-radiologist physicians. In most institutions, ultrasound is no longer or has never been part of the radiological domain and specific areas of x-ray angiography are routinely performed by non-radiologists. On another front, MR imaging for specialized applications, such as cardiac and musculoskeletal imaging, may soon be adopted by non-radiologists. Radiologists will be replaced by more clinically knowledgeable cardiologists, orthopedic surgeons, gastroenterologists – and dentists.

The fight of radiologists to exclusively own and operate x-ray and imaging equipment was lost long ago. Likewise, the fight of interventional radiologists to exclude other disciplines from “their” domain is probably doomed to fail. Only where diagnostic radiology is a simple and boring service for other medical disciplines will it continue to exist untouched.

The practice of diagnostic radiology does not include any treatment and, in many instances, lacks direct patient contact. Although it was part of my radiological training to see and talk to the patient before x-rays

were taken, this is not done in most cases. The radiologists neither sees nor examines the patient directly, although the clinical history provided by the referring physicians is usually insufficient. The interpretation of the images is based only on the images themselves, increasing the chance for error.

Under such circumstances, it is not far fetched to think that the radiologist could be easily replaced by a service engineer or even by pattern recognition software on a computer. Some physicists with medical background have moved into radiology because they understand the latest technology better than radiologists. They can not only program and operate a computer, but even repair television sets and MR scanners. They do not come close to being physicians, however.

### Survival tactics

To survive, radiologists must focus on clinical relevance and sub-specialization, either by organ group or by technology. For the sake of the patient, organ group sub-specialization, similar to that of surgeons and internal physicians, seems more sensible and useful than sub-specialization according to technologies. Technologies change, but organs remain the same.

In this context, sub-specialization means acquiring a relevant knowledge so that one is an equal partner of the referring clinical physician. If I cannot talk to a neurologist or neurosurgeon about specific aspects of the central nervous system, they will soon stop talking to me about it and will rightly believe that they can perform and interpret imaging procedures better than I can.

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### "How do you know? You're only a radiologist, aren't you?"

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Or, moving to another discipline: What do you know about treatment of knee injuries? Do you know what is important to see and describe on plain x-rays, CT scans or MRI examinations? If so, you belong to the minority among general radiologists – you are already sub-specialized.

If we look at this issue from the service-to-the-patient perspective, why shouldn't I, as head of a radiological department, hire a cardiologist or ask for coopera-

tion when I know that this specialist has a better knowledge of the clinical relevance of specific cardiological examinations, and when I cannot get an adequately trained radiologist for the job?

Referring physicians, especially young ones, often are unsure about what to do with a patient and hesitate to make diagnostic or therapeutic decisions. They therefore send the patient for yet another examination. Have you ever resisted performing such unnecessary tests, only to be told:

"How do you know? You're only a radiologist, aren't you?"

You can survive by convincing your fellow physicians that you are their competent partner – you understand the case history, can select the appropriate diagnostic imaging method and propose a sensible course for the monitoring of therapy and follow-up.

Unfortunately, radiologists remain divided on most of these issues. Some of the radiological societies are immersed in internal political fights, with their functionaries competing to keep their sinecure. If radiologists do not unite among themselves and find a common goal, the circle will close and radiologists will sink into the lower ranks of the medical profession.

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