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# RINCKSIDE

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PRO ACADEMIA

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THE ROUND TABLE  
FOUNDATION



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# RINCKSIDE

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## Fundamentals benefit image reading

Peter A. Rinck



**T**he title of a Rinckside column that appeared in 1994 was *Medical ethics and the military* [1]. It began as follows: “Woolsorters' disease has a rapid onset. It leads to rigor, rapid respiration, pain in the chest, rapid and feeble pulse, high temperature, usually with cough and bronchitis. Much frothy mucus is produced. Extreme collapse 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 old self. ... [In World War II] the British calculated that 2,690 bomber sorties would be sufficient to eliminate the entire population of Germany, their war enemy at the time.”

I received four or five comments from readers in response to this particular column shortly after its publication. By autumn 2001, the topic had been all but forgotten.

■ Then, suddenly, anthrax and an accompanying anthrax hysteria broke out in the United States and elsewhere. Imaging anthrax became a hot topic at the annual meeting of the RSNA, held in Chicago, just ten weeks later. The US Armed Forces Institute on Pathology, together with two other institutes, reacted quickly and put an excellent site on CT and anthrax on the world-wide web. [2]

“The tool is particularly timely because doctors may see a number of patients during the upcoming flu season who are worried that they may have contracted anthrax, which has flu-like symptoms,” [3] one medical journalist wrote.

Many people believe that inhalation anthrax is a tropical disease. Naturally happening human anthrax infections are very uncommon in Europe and the Americas, if the spores are not used for sinister purposes. Anthrax is more common in Africa and Asia,

although even there it is a rare disease nowadays. Inhalation anthrax can cause hemorrhagic mediastinitis that radiologically is characterized by symmetric mediastinal widening. This can be seen on a plain chest x-ray.

Using CT for its diagnosis would be considered unrealistic in most parts of the world where diagnostic imaging looks completely different from the sophisticated applications in CT, MRI, ultrasound and nuclear medicine we are used to.

■ Some recent publications of the World Health Organization help to understand the needs of basic imaging and the interpretation of x-ray images in daily routine. These publications explain that any imaging procedure, regardless of type and degree of sophistication, will have a positive effect on patients only when seen in a clinical perspective, and that any diagnostic efforts are justified only when followed by appropriate therapeutic measurements.

Where possibilities for treatment are limited, diagnostic efforts might be limited accordingly. Where certain diseases are of no or minor importance, imaging equipment for such diseases is superfluous – even if you have all the oil money of the world. If there are potentially better diagnostic and therapeutic chances elsewhere, the patient should be transferred.

In many developing (and developed) countries patients have come to believe that no clinical examination by their doctor is complete unless they have been “x-rayed”. The actual procedure is satisfying because it is usually dramatic, yet causes little discomfort or inconvenience. Yet, wherever you are, as a medical doctor one should not sell x-rays as witchcraft or placebo. Such imaging procedures should be restricted, if possible, despite pressure from patients and their relatives who are not easily persuaded that an x-ray is unnecessary.

More than 15 years have passed since WHO first published a booklet on x-ray imaging [4] which I found extremely helpful at a time when I prepared for (and passed) my radiological board examination. Most European or US-American radiological teach-

ing books of that period (and most likely today) were very good but, unfortunately, paid little attention to basic radiology. Even if you work at a European university hospital you should be able to interpret a simple thorax or wrist image. However, this seemed to be a less deserving topic unworthy of the authors of those radiological teaching books I used. Interpretations of the shadowgram of the heart seemed to be more relevant. In the meantime, heart x-rays have all but disappeared from diagnostic radiological routine; thorax and wrist examinations are still very much *de rigueur*.

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### **WHO books teaching the basics of radiology represent a useful addition to radiological literature.**

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It is here where the WHO booklet comes in very handy. Many countries do not have adequate radiological services, and some have none at all. Over 90% of diagnoses requiring diagnostic imaging can be satisfied if there is basic, general-purpose x-ray and ultrasound equipment in place and functioning.

In most countries of this world x-rays are not taken or interpreted by radiologists, and this actually holds true for many European countries as well. Clinicians or even technicians are mostly in charge; they are working in small hospitals or clinics with limited resources and usually without any possibility of contact with a radiologist or other medical staff specially trained in diagnostic imaging. Training of health care professionals in medical imaging should not only focus upon acquiring and reading images but also include some managing and repairing skills. All these skills should be tailored to local needs. Again, the WHO booklets help in these instances.

They also give the imaging practitioners a black-on-white back-up for referrals such as “low back pain: whole column in all projections” or “headache: skull”. They can show the referring physician that such examinations are not medically justified.

However, on the other hand, it is also pointed out that in addition to a solid knowledge about what is relevant and what might not be, an open-minded communication between clinician and radiologist or radiological technician is a fundamental requirement for medical success in this context. In any case, the clinical examination should come first and given

priority. x-Rays and blood test before the clinician sees the patient should be exception, not the rule.

■ In Europe and the English-speaking countries of North America there are usually enough radiologists at hand. Yet, more than half of all x-ray examinations are performed by non-radiologists. This leads to an enormous increase in unnecessary x-ray examinations and false interpretations. In Germany, at least 25% of all x-ray examinations are considered to be of insufficient quality – and the results are often wrong. The financial damage is several billion euros. The human damage is unknown.

Two main factors are pivotal in radiodiagnostic investigations: quality assurance and accurate interpretation of x-ray images. This holds for both developed and developing countries. However, in developed countries quality control and knowledge to interpret images can be easily acquired and learned. There is plenty of help and teaching material available. Unawareness, laziness, lack of supervision, and – last but not least – financial reasons limit medical excellence.

In developing countries this might be the case too, as it is only human. However, the main factor is lack of teachers and teaching material. Brochures, books, and teaching courses which may look and sound ridiculously simple and cheap to Europeans, can make all the difference in countries where medical resources are scarce. Basic teaching booklets, for instance, are a god given resource. The two latest ones published by WHO deal with quality assurance and recognition of normal anatomical and physiological appearances on x-ray images and changes that indicate pathology [5,6].

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### **A lack of teachers and material is the main obstacle to quality control in developing nations – and not only there.**

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Dr. Harald Østensen, the head of Diagnostic Imaging in WHO, writes in the preface to WHO’s “Pattern recognition in diagnostic imaging”:

“We would warmly recommend that this book should not be put on a shelf or into a locker, but be used by everybody whose obligation it is to prescribe, perform, or interpret simple, but often life-saving diagnostic imaging procedures especially in locations

where the presence of qualified and fully trained specialists would be a rare exception.”

I call them booklets, but in reality these are handy A4-size books with more than 200 pages written for settings where resources are sparse. Although this column is not a book review I wholeheartedly endorse Harald Østensen’s commendation because the books are well made, inexpensive, and belong to the limited number of radiological teaching and textbooks which will find a broad public – and still be up-to-date ten years from now.

In a leaflet accompanying the books and aimed at the books’ main target region of the world, the objectives are summarized:

“Diagnostic imaging can directly benefit people living with HIV/AIDS and tuberculosis or exposed to accident and trauma by establishing correct diagnoses and providing adequate information on effect of treatment. Reduced morbidity and mortality impact directly on national economies, by prolonging lives, enabling professional activity, and assuring that families are sustained by active members. Indirectly, decreased burden of disease affects the frequency of medical consultations, absence from the workplace, unemployment figures and overall social expenditure.”

These are dry words, but worthwhile to be taken into account by what is called “the public and private sectors” allocating resources for healthcare.

By the way, they do not propose CT to distinguish anthrax from flu (no sarcasm meant).

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## Screening programs must show clear benefits

Peter A. Rinck



**W**hen I was a schoolboy, all pupils went on an annual excursion to the city district's public health building to be screened for tuberculosis. By the mid-1970s, when I started working in a Swiss hospital, I still had to undergo a chest x-ray for signs of TB.

The Ninth Report of the World Health Organization (WHO) Expert Committee on Tuberculosis published in 1974, however, considered mass radiography a very expensive screening procedure for TB, even in areas of high prevalence. The committee listed additional disadvantages of x-ray screening, saying it:

- contributed only to a small proportion of cases found;
- had no significant effect on the occurrence of subsequent smear-positive cases, which usually develop so rapidly that they arise between rounds of mass radiography examinations;
- required the services of highly qualified technicians and medical staff, who could be better employed in other health service activities; and
- relied on apparatus and transport vehicles that were often out of service.

The authors concluded that the policy of indiscriminate TB case-finding by mobile mass radiography should be abandoned [1]. Mass TB screening with radiography was slowly phased out in most countries during the late 1970s and early 1980s. After all, TB seemed no longer to pose much threat.

■ Today, screening is recommended to detect high blood pressure, to monitor height and weight, to assess problem drinking, to measure total blood cholesterol in men aged 35 to 64, and women 45 to 64, and to check for vision and/or hearing impairments in men and women over 65. Pap smears, fecal occult blood testing and sigmoidoscopy for men and women over 49, and, last but not least, mammography for all women aged 49 to 70 are also advocated [2].

Screening is meant to detect early indications of disease in an asymptomatic population. The goal is to decrease morbidity and mortality. Some people like to rephrase this definition. They say that saving lives

by screening healthy people for cancer and other diseases is one of the most widely held beliefs in preventive medicine.

**"The outcome of screening studies must be positive. How could there be a negative outcome if all we want is to help?"**

The idea of screening and spotting disease before it damages or kills a person is attractive and fascinating. It is a scientific and intellectual challenge, and the sky seems to be the limit with today's technologies. Yet, as Brawley and Kramer point out, the case for screening is not straightforward:

"While screening can potentially save lives, and has been shown clearly to do so in the case of breast, cervical, and colon cancer, it is also subject to a number of biases, which can suggest a benefit when actually there is none, or even mask a net harm. Early detection does not in itself confer benefit. To be of value, screening must detect disease earlier, and treatment of earlier disease must yield a better outcome than treatment at the onset of symptoms." [3]

■ Since the abandonment of widespread chest radiography, x-ray mammography has become the most important screening method involving radiologists. Mammography requires dedicated equipment and well-trained staff. Quality control is of the utmost importance, even more so than with other imaging techniques. Acquiring the discernment necessary for image reading and assessment takes a long time and requires studying tens of thousands of images. Radiologists trained for mammography screening read more than 100 images per hour, a strenuous and boring task. The appeal of replacing human image readers with computers that analyze digital mammographic images is therefore easy to understand.

Yet controversy continues to surround screening mammography, particularly for women 40 to 49 years of age. A paper on this topic, based on work at

the Cochrane Institute at Copenhagen University, was published in *The Lancet* in October 2001. The abstract reads as follows:

“In 2000, we reported that there is no reliable evidence that screening for breast cancer reduces mortality. As we discuss here, a Cochrane review has now confirmed and strengthened our previous findings. The review also shows that breast cancer mortality is a misleading outcome measure. Finally, we use data supplemental to those in the Cochrane review to show that screening leads to more aggressive treatment.” [4]

In a detailed overview, the authors draw the following conclusion:

“The currently available reliable evidence does not show a survival benefit of mass screening for breast cancer (and the evidence is inconclusive for breast cancer mortality). Women, clinicians, and policy makers should consider these findings carefully when they decide whether or not to attend or support screening programs.” [5]

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### **Ill-conceived schemes can turn into ideological crusades.**

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For most people, screening mammography is a solid, indisputable technique. For them, a statement like that above is blasphemy. If you look, for instance, at a review paper in *Radiology*, you are confronted with a completely different picture:

“Since 1965, breast imaging has become an established radiologic subspecialty that accounts for at least 10% of all examinations performed by radiologists. Indeed, mammography now is the most common imaging examination that directly results in the reduction of mortality from disease.” [6]

Now, whom do you believe (“you” being a radiologist, a referring medical doctor, a journalist, or a woman who is dependent on professional advice)? In general, little notice is taken of the results of epidemiological studies. Since screening is considered beneficial for the population as a whole, results of large-scale screening studies are assessed with a biased view: The outcome must be positive. How could there be a negative outcome if all we want is to help?

■ Public health screening policies, when not based on solid foundations, can easily become an ideological crusade that costs psychological stress, bodily harm, and money. These policies can even ruin more lives than they are designed to save. In particular, mass media reporting gives an extremely biased view of mammography's potential. Researchers from the University of Oxford in the U.K. examined how screening mammography had been reported in six high-circulation U.S. newspapers. Having assessed more than 100 articles published between 1990 and 1997, they concluded:

“Newspapers tended to overrepresent support for screening mammography for women aged 40 to 49 years. Reports would have been improved by identification of all sources for information cited. Medical journalism may benefit from identification of standards similar to those used for reporting medical research.” [7]

Newspaper reporters will not write learned papers with references. This is not their task. In-depth scientific articles do not sell mass-circulation newspapers. On the other hand, a woman who is to undergo mammography screening needs clear, straight, and reliable advice: Will screening mammography help to protect me?

It is neither my business nor my intention to bless or damn screening, in this particular case x-ray mammography. I believe that screening in general is an important and necessary task for medical professionals. Some screening methods, however, are much more useful than others and show clear benefits. In the case of widespread use of mammography, there are doubts if this reduces death rates from cancer, according to the review from Copenhagen. Subsequent publications have cast doubts on the Danish group's analysis, adding to the confusion.

A critical approach is necessary. Two points should never be forgotten: The screening procedure must have a clear advantage for the person screened, and the population must not be left in doubt about its reliability. If these philosophies are not adhered to, the public will lose faith in the screening test and in the people proposing and performing it.

It should be clear to everybody involved what the benefits and risks are, because if you find cancer (or something that looks like cancer), you are likely to treat it. The treatment itself may incapacitate or even



kill the patient. Depending on the circumstances, cancer might not be the final cause of death, but just a part of aging. Many people live unknowingly with cancers and die of other causes.

While cancer screening is generally increasing in the U.S., take-up is relatively low among groups that lack health insurance or another source of care [8]. Some new examination techniques, such as spiral chest CT for screening lung cancer, are being marketed in the U.S. before benefits have been assessed in strict outcomes studies. Money makes the world go round. Enough people will pay for such an examination because they are afraid of early death, and perhaps their money will lead to more medical progress.

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## New, improved radiology demands better analysis

Peter A. Rinck



**M**any, many years ago, there was an emperor who was so terribly fond of beautiful new clothes that he spent all his money on attire [1]. One day two swindlers came to town. They told everybody that they were weavers and that they could weave the most marvelous cloth. Not only were the colors and the patterns of their material extraordinarily beautiful, but the cloth had the strange quality of being invisible to anyone who was unfit for office, or unforgivably stupid.

“This is truly marvelous”, thought the emperor. His councilors and ministers persuaded him to let the swindlers cut and sew some clothes to wear in a procession at the next great celebration. When the day of the procession came, all the townspeople lining the streets, or looking down from the windows, said that the emperor’s clothes were beautiful. None of them were willing to admit that they hadn’t seen a thing. For if anyone did, then they were either stupid or unfit for the job he held.

Then, suddenly, a little child cried:

“But he doesn’t have anything on!”

“Listen to the innocent one,” said the proud father as, at last, the crowd came to recognize that the emperor was naked.

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### Is expensive high-technology equipment more new clothes for the emperor?

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Many, many years later, a hospital with a department of radiology was built in the same town. The hospital administrator and the head of radiology were terribly fond of beautiful new equipment. They had scanners and archiving systems for every possible application. Whenever a sales representative visited and described the machines on offer as “wonderful” or “marvelous”, the hospital heads would buy them. They had the latest ultrasound machines, digital x-ray equipment, digital mammography, multislice spiral CT scanners, 3-Tesla MRI, PET/CT hybrid scanners, PACS. And, of course, everything with the highest resolution, flat-screen monitors.

The hospital now possessed imaging equipment with superior resolution, unmatched and unprecedented volume acquisition, unsurpassed connectivity, unparalleled customer service. “Come ride with us. The magic continues”. The sales representatives had sold them freedom, breakthrough staggering possibilities, a universe of solutions, endless reality, informed decision-making, speed, the ultimate portable must-have radiology resources with advanced intelligent media and drives. The equipment output was clearly superior to anything else and strangely incomprehensible to anyone who was unfit for radiological office, or unforgivably stupid.

Life was gay and happy, and every day new patients arrived. They knew that all passenger aircraft of the kingdom were equipped with defibrillators so that no passenger or pilot would die of cardiac arrest during a flight – and they also knew that the latest radiology equipment and computer software would heal their Lyme disease and low back pain.

Patients entering the radiology department enjoyed extremely good care. On arrival, they were tagged with a special tracking device. In case they would be forgotten in a waiting or changing room, or on a patient table when the staff left for lunch, the device allowed a central computer to track and find them again – this helped reduce unproductive waiting times for the staff and prevented revenue loss.

The radiologists had access to the latest artificial intelligence computer software and could diagnose everything with information technology. They also could produce real time movies of the entire gastrointestinal tract from the esophagus through the stomach, continuing all the way through the duodenum, jejunum, ileum, colon, rectum, and out through the sphincter. All shown beautifully on the latest flat-screen monitors.

### Bursting the bubble

One day, however, a radiologist from the neighboring country of Ruritania arrived. Ruritania happened to be backward in all matters related to high-tech medicine. They used machines that were six years

old, or even older. This particular Ruritanian radiologist worked in a hospital with before turn-of-the-century CT and MRI equipment. It even had an old-fashioned library with books and journals – and, to be frank, with just one computer connected to MedLine.

When she saw the beautiful radiological department of the emperor's country she thought: "All these beautiful new machines: I could become envious – but I wonder whether they really can see more than I do. Do they get more information about the health of a patient? Do they know more than I do? Are their diagnoses superior and are their patients better served?"

"Or am I the innocent bystander similar to the innocent child seeing that it is all a façade?"

The visiting radiologist acknowledged that imaging equipment could perhaps – or almost surely – remove of doctors' imperfections and weaknesses in knowledge and skills.

"But what difference does it make if I have a screwdriver with built-in engine, if I cannot find the screw? These people seem to mistake information and information technology with knowledge. They lack the skill to interpret that knowledge, believing simply that radiological progress is accomplished with electronic gadgets."

This is what the backward radiologist thought. We do not know how many of these thoughts she passed to her colleagues in the emperor's country. However, she communicated and discussed her thoughts with her colleagues at home.

## Answer is in outcome

The answers to her questions can be found from outcome studies.

In this context, it is worthwhile reading an article by Hunink and Krestin [2] working in Rotterdam and some of the papers they refer to. The authors propose ways of assessing new diagnostic imaging technologies and working out their value.

After an explosion of interest in outcome research and technical assessment some ten to fifteen years ago, this sort of work has been neglected. Many of the results of this research proved useless or they did not change inappropriate uses of imaging equipment.

In general, the effect of new technologies has been poorly quantified. Outcome research is not trendy or attractive. It requires a lot of time, and large quantities of information and material have to be collected. It is more work to milk a cow than watch it digesting.

In the mid-1980s MR outcome studies were performed in Germany, Australia, Switzerland, and a number of other countries. This happened at the beginning of the introduction of magnetic resonance imaging as a new diagnostic method. The studies were well intentioned, politically supported, but complex and onerous and, given the extremely rapid technological advances, prone to failure from the outset. One cannot evaluate the outcome of a brand-new technology immediately after its introduction. You have to wait at least ten years before contemplating to perform such an evaluation.

Hunink and Krestin do not suggest new procedures, but rather a different approach. They propose that a randomized, empirical trial design be used for the development, assessment, and implementation of new diagnostic imaging technologies. This design is to be based on a pragmatic study protocol interweaving research and clinical practice. Outcome measures should include factors related to clinical decision-making, costs, and patient health results. The key feature of their approach is to measure the trends in outcomes over time.

This approach appears easier to implement than well-meant, but rigidly bureaucratic previous efforts. Such studies still depend on funding, though.

"As Hunink and Krestin say near the end of their article, their proposal is not a panacea. It is, however, certainly a good start." wrote Jeffrey G. Jarvik commenting the article in an editorial in the same issue of *Radiology* [3].

■ Let us see what will change. Will such outcome studies reveal that better use of established imaging techniques could benefit patients? What would happen to the 0.4-second 16-slice spiral CT scanners?

You and I know the answer: there will be 0.2-second 24-slice triple-spiral CTs, then 64-slice, then ...

■ However, I wonder whether apparently intelligent people can sell or buy equipment with the slogans the vendors use without thinking twice. If politicians praise computer technology as the greatest achieve-

ment after the invention of the electric egg cooker, I know with whom I deal.

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## Expertise and judgment ensure turf war success

Peter A. Rinck



**R**ecently, I asked a Spanish radiologist how he thought radiology would look in another ten years. His reply was different from what I had expected.

“I am afraid that radiology will disappear as an independent medical discipline. This will not concern me any more, since I will be retired by that time; but I see it coming,” he said.

“Radiology is an artificial medical discipline. It is not like surgery, internal medicine, or their subdisciplines. Radiology is a service. I believe it requires a higher level of medical knowledge than laboratory medicine, perhaps less than pathology, the two other main medical service disciplines. Yet, it remains a service; a radiologist is a doctor’s doctor. Surgeons and other physicians can perform without radiologists; radiologists cannot perform their trade without referring physicians.”

I was rather baffled hearing such statements from a well-established and well-known radiologist. I would rather have expected him to fight for radiology and told him so.

“Sure, I will fight for radiology. It is our field and it is our personal survival,” he said. “This is what we have learned and this is what feeds our families. However, fighting for it does not mean that we will win the fight. Perhaps we will not lose the war, we will win some battles. But we will also lose some battles.”

He pointed out that surgeons, internists, and neurologists helped create our discipline.

“Don’t forget that radiology is one of the youngest medical specialties. X-ray examinations are slightly more than one hundred years old. These days computed radiology will celebrate its thirtieth birthday. Since when do you find departments of radiology in major hospitals? Perhaps sixty years? And in minor hospitals? Perhaps forty years?”

He speculated where there is one huge radiology department today, there could be seven or eight units all

over the hospital: “Here today, gone tomorrow. The future of radiology is diagnostic imaging which might exclude radiologists. The other doctors will carve it up.”

These were strong words. The technology revolution has also opened imaging to other medical specialists who have imaging equipment in their practices. Many obstetricians, gynecologists, oncologists, and urologists have acquired their own ultrasound equipment. The ultrasound imaging business outside radiology practices accounts for 70% of the volume of ultrasound in the United States of America [1]. In Germany, the overall figure for imaging without the involvement of radiologists is of a similar magnitude.

### “Are other physicians picking cherries out of radiology's cake?”

Thus, one easily understands the resigned comments of a German radiologist: “Radiologists will be killed by physicians of other disciplines taking over imaging. Orthopedists, neurologists, cardiologists, you name them. They pick the cherries out of the radiological cake and leave us the bones.” A cherry-bone cake, *bon appétit*.

■ On the other hand, surgeons often complain that radiologists take their patients. One surgeon compared the development of radiology with throwing a boomerang. This strange comparison seems apt.

“The idea was getting our hands free for real surgical work by releasing image production to other doctors – throwing the boomerang. However, today the boomerang doesn’t hit its goal but returns and hits us. The radiologists have started doing our jobs,” he said.

Internal medicine practitioners also argue that radiologists are stealing their patients: “We have lost endoscopic retrograde cholangiopancreatography (ERCP) because radiologists perform magnetic resonance cholangio-pancreatography (MRCP).”

Cardiologists, of all doctors, complain that they could lose coronary angiography because of MR angiography.

At the same time the orthopedists complain that the traumatologists will replace them. No discipline seems to be stable any more. There is an all-fronts “turf war” going on.

Cardiologists, vascular surgeons, and neurosurgeons are beginning to acquire and control larger imaging devices such as CT and MRI, either in their own hospital departments or in ambulatory centers. They try to interpret images and bill directly for these studies.

Training in minimally invasive interventional radiology has been introduced for surgeons who try to reclaim their territory. Private radiological practices that rely on patient referral from vascular surgeons suddenly find that these referrals run out if surgeons perform their own image-guided procedures.

As radiologists, of course, we want to fight them. However, even if we could beat them (we can't), I suggest we join them instead. They need our expertise. They also need somebody to do the job. Economical, collaborative solutions can be arranged according to local laws and medical ethics.

An average cardiologist who starts performing MR imaging examinations of the heart, faces a number of different possible outcomes: remain an average cardiologist and below-average MR specialist, become a good cardiologist who can read some MR images, become a bad cardiologist who finally will become a radiologist, or turn into a workaholic who is a bad doctor.

Exceptions are possible. The same holds for radiologists.

### **A way out?**

In the future, radiologists might have to re-organize their daily work lives and professional activities. However, hasn't this been the case anyway over the last thirty, twenty, definitely ten years?

I can understand that you don't want to deal with further changes, but if you want something stable, you may be in the wrong business. Changes in imaging technology influence our daily lives permanently, for good or bad.

Lack of either leadership or cooperation is a problem in radiology as a medical discipline. There is no united front of radiologists, but rather different groups with diverse goals. Money is often the main goal – not the survival of radiology as such. Management of both professional and technical resources has risen in significance. Radiology has turned into a business, even at the small hospital level radiology.

Image reading skills and medical knowledge remain important for radiologists, however. The contribution imaging makes to medical care has grown impressively over the past few years and offers even more promise for the near future. In spite of this, it is difficult for radiologists, referring colleagues, and the public at large to recognize that technological progress does not necessarily ensure a better outcome for patients or financial success for radiologists.

Everybody complains, but only those who act will stay in the race. Radiology is a specialty undergoing rapid transition. According to a recently published study, a total of 73% of the procedures performed by radiologists in 1995 relied on technologies that did not exist in 1970 [2]. Soon you will have to deal with molecular, cellular, genetic, and functional imaging applications. However, radiologists will have to devote more time to managerial, entrepreneurial, and bureaucratic activities, leaving less time to interpret images.

Many radiologists, including department heads – from provincial hospitals to the biggest university hospitals – are unable to find their way through the complexity of their discipline and their departments. New techniques, turf wars, complex administration and reimbursement rules, staff problems, and fights with bureaucrats have made it less attractive over the years.

Radiologists in Europe and the United States are retiring from practice at younger ages for a variety of reasons including, if they are lucky, successful management of retirement funds and the desire to pursue other interests while still healthy. Additionally, many countries also face a growing shortage of radiologists because there is no fresh blood coming in. The reasons are manifold and include the lack of attractive professional prospects, recognition, and financial security.

Some young radiologists in the United States, but also in Europe, lack relevant training. Teaching



should be recognized as an essential component of radiology residency training. This is a multi-layered and complex problem.

■ In his Annual Oration in Diagnostic Radiology at the RSNA meeting in 2000, Dr. Gary J. Becker pointed out, that “a problem long recognized by interventional radiologists is the lack of clinical training emphasis in radiology residency programs. Because we faculty have been training and creating young interventional radiologists in our own image, they tend to lack clinical skills and their practices lack the infrastructure to compete with other disciplines.” [2]

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### **There will always be a market for a radiologist who delivers good services.**

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This is where the circle closes. Training of radiologists has to be clinically relevant. If radiologists are doctors’ doctors, they have to understand their medical partners’ needs. In other words: If you deliver good services, there will always be a market for a radiologist.

Surgeons, cardiologists, orthopedists, and internists cannot handle medical imaging without a major loss of quality. In an ever more complex imaging environment, they will need people to produce and interpret images. Even if the medical specialty of radiology doesn’t look like it, never forget that medicine, radiology included, is not an exact science but an art. If handled like a craft, a mixture between art and technology, radiology is difficult and time-consuming to learn and to perform.

■ You can teach monkeys to push the bottoms of a CT. However, it takes years to learn how to reject an x-ray examination because it is not necessary.

Relax: The skies are not always gray.

## **References**

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