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Surgical Research and Clinical Routine in the New Century[1]

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The German Research Foundation (DFG) has recently denounced the poor state of clinical research in Germany [2]. It is therefore worthwhile to contemplate the current state of surgical research with special focus on the future possibilities to combine research and clinical routine in university hospitals.

Current State

Reading the daily newspaper one may get the impression that German universities and clinical research in particular are in a deep crisis, and that German professors are to be blamed for it. In medicine, additional insufficiencies of the system are obvious, with corruption cases brought up against clinicians and conflicts of interest due to the fact that clinical professors in addition to research and teaching devote much of their time to the special care of private patients. These headlines in the news tend to let us forget that during the last decade grant moneys for research projects stagnated whereas the number of grant applications has increased out of proportion. In Germany state governments are primarily obliged to finance the universities, and in 1996 spent some 5 billion German marks for clinical research and teaching. Most of that money, however, is used to balance the deficits arising from patient care not paid by insurances, outpatient care in particular. Only recently university hospitals have begun to redefine their legal status enabling them to better illustrate money flow within the system. In the recent memorandum on clinical research the Deutsche Forschungsgemeinschaft (DFG, German research foundation) states that patient-oriented research – although improved during the last 20 years – is still unsatisfactory [2]. As one possible explanation the memorandum states a lack of institutionalization of clinical research. Such an institutionalization includes not only the creation of defined independent units which under the chairmanship of competent researchers supply know-how and technical advice to interested colleagues. Institutionalization also implies that universities define their research profiles, which may mean that certain research topics in the future will not be funded at all 36 university hospitals but only in those centers which can prove their expertise in the topic. It is argued that increasing costs and decreased funding will make such a segregation between clinical routine and highly specialized clinical research mandatory. Actually an incentive by the BMBF in 1995 has already led to the creation of eight interdisciplinary clinical research centers coordinated by the 'Association of Clinical Research Centers of German Universities' (Interdisziplinäre Zentren für klinische Forschung, IZKF).

For all those reasons a segregation between research and clinical routine is certainly the imminent scenario for the new century. It remains to be clarified whether this

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scenario is something we want to support, how the scenario can be optimized for surgical research, and, if we should consider this scenario rather a threat than a benefit, what we can do in order to minimize it's anticipated drawbacks.

Segregation of Research and Clinical Routine: Pros and Cons

Segregation of research and clinical routine per se is clearly not wanted. Nevertheless, even minor spatial and organizational distances between the clinical surgeon and the research team will lead to a growing gap which can only be overcome by continuing efforts from both sides. Practically in most cases it will be impossible to place research groups in close vicinity to the clinic: Many universities have meanwhile established research buildings where lab space is available for projects funded by grants. These are usually in walking distance but still too far away to allow surgeons to regularly visit the lab during normal working days. Hence it is required to delegate interested clinical colleagues for a limited time (half a year minimum, one year optimal) to do research and to be trained in analytical methods and the design and planning of complex experiments in vivo and in vitro [3]. During that time they should be free from clinical obligations. Such a delegation makes sense only if it is well planned beforehand with all required legal preparations concluded (ethics commitee, permission for animal experiments, S1-laboratory etc.) and all methods established in the laboratory. Research at night, during vacations or on weekends usually does not result in data which can compete internationally. Such research practice should only receive funding if it follows a longer full-time research period and mainly involves supervision and teaching of coworkers such as students, technicians or post-docs.

Clinical Research Institutes – Minimal Segregation, Maximal Effect

Since surgeons will usually not stay in the lab much longer than the allotted time of delegation, it is necessary that the laboratory is kept internationally competitive as far as methodology and models are concerned by specialists employed permanently or at least with a long-term perspective. Without such a perspective no reasonable scientist will even consider to make a carreer in clinical research. In order to attract talented young investigators and to lure them away from the basic sciences at least a few more higher ranked positions on the level of a C3 or better C4 professorship will have to be created in Germany. These positions should be associated to a clinical research center. Examples are the Institute for Surgical Research in Munich which provides lab space and expertise for all surgical disciplines or, on a smaller scale, the Institute for Neurosurgical Pathophysiology in Mainz. Such institutes need to have a 'critical mass' in order to be able to survive. Enough personnel must be permanently available to grant the survival of methodology once established and to fulfil all functions required by law in modern research (responsibilities for isotopes, animal experiments, genetically modified organisms, laboratory security etc.). On the other hand it will soon become virtually impossible for the individual surgeon to establish the necessary infrastructure to perform internationally competitive research. Therefore in the very near future we will have to create more 'centers of excellence' – or, more profane, clinical research institutes – where interested students and clinical colleagues can find the methodology and all-day advice for their research projects. Objects of 'research training' among others are training of pathophysiological thinking, problem recognition, training in advanced methodology, acquisition of microsurgical skills, and data assessment, evaluation and quality control [3]. Hence research institutes go along with a certain degree of structural segregation between research and clinical routine while offering a maximal improvement of the scientific possibilities. And research institutes are not a contradiction to the recent trend to establish junior professorships and to hand over more responsibility to young investigators: those young researchers will have to rely on infrastructure provided by the universities where they can follow their individual research interests. This infrastructure has to be managed, maintained and upgraded to meet future demands. This cannot be achieved by conventional 'managers' but requires trained scientists. Competent and, more important, motivated managers of scientific infrastructure can only be found and kept if they benefit too. Their benefit is the position offered to them, together with the possibility to conduct their own research.

Can Success Be Planned?

There is a misunderstanding sometimes brought up by polititians: planning of successful research. Success in research cannot be planned. Chance and luck are major constituents of scientific accomplishments: without

chance many of the major breakthroughs in modern medicine would not have been possible, Fleming's discovery of penicillin is just one example among many others. However, chance is not everything. Success even more depends on the determined mind of the researcher who knows what he is looking for, and who, if luck brings him an answer, realizes the value of what he – and maybe nobody else – can recognize in front of his eyes. Hence we should not overdo institutionalization, a certain degree of flexibility is mandatory. The researcher in charge has to be able to move the focus of his research towards new goals. Managers of research institutes need freedom to allocate space and equipment to new teams and young investigators in order to stay competitive. Researchers on the other hand should always remain in close contact with their clinical partners, not only to transfer scientific results to clinical routine but also to understand the daily problems of the clinical colleagues which sometimes can be answered by a well designed research project.

Which Size Should Research Institutes Have?

Bearing in mind that clinical research can be performed using patient materials, animal experiments, cell culture techniques or molecular biology it becomes obvious that a typical specialized clinical research laboratory cannot offer all possible models and methodologies. If we consider, however, that most surgical disciplines will fight with similar problems, it makes sense to combine several small research teams to larger units, e.g. surgical research institutes. Such institutes so far are only available in few places. The Institute for Surgical Research in Munich as the best known example in Germany with far more than 1000 publications has proven it's efficiency as a scientific partner to surgical disciplines since nearly 40 years: prominent examples are the development of antilymphocyte globulin [e.g. 4–6], the introduction of lithotripsy to clinical routine [e.g. 7–11], evaluation of photodynamic therapy [e.g. 12–15], microcirculation and shock research [16–21], studies on mediators of brain edema and damage [e.g. 22–24], xenotransplantation and monitoring of transplant patients [e.g. 6, 25–27]. Major advantages of surgical research institutes are a larger spectrum of methods and positions for more specialists than solitary clinics could finance. By all means it has to be avoided that ivory towers develop where superspecialists study their hobby hypothesis. The main reason, however, why such research institutes are still exceptions, is probably the hierarchical structure of German university hospitals, where chairmen are reluctant to give away even minor means of influence and power. The rather shortsighted fear to remain unmentioned once research is handed over to research specialists can be overcome if cooperation contracts are signed between clinical and research departments where all obligations and rights are predefined before starting a scientific project.

Cooperative Networks

Another possibility to strengthen clinical research is offered by 'cooperative networks'. Such networks encompass research institutes and clinics of different disciplines interested in similar pathologies. An example is the recently founded GTFZ in Mainz (Center for vascular therapy and research). Here, as a first initiative, members of related disciplines regularly meet and will establish cooperative research projects. As a first step, however, it turned out necessary to make patient data accessible to cooperating clinics and to generate a basal funding to support a rather small data management. Cooperative networks can be established on a local or regional level. Local networks have advantages, since the desired and required interaction between the members of the network can only function if frequent meetings and exchanges are possible.

Outlook

Both principles, the generation of clinical research institutes and the foundation of cooperative networks will rather supplement each other than compete. Therefore we can expect in the coming years a segregation of clinical research and routine: only those clinical colleagues truly interested in research will get involved and will do this in research institutes which at best will be closely associated to university hospitals. Cooperative networks will supplement clinical research by providing interaction between related specialties and research institutes. Universities will have to develop a better understanding of the necessity to sponsor such research institutes.

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