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The importance of research to neurosurgical residents and qualified neurosurgeons

André Grotenhuis

Nijmegen, The Netherlands

In this lecture I want to lead you through a process of thinking about science and research in medicine in general and in neurosurgery in particular.

Is medicine a science ?

Technically no. Practising medicine is an art not a science !

Medicine is" evidence-based". Science is "Fact- based" .

For instance, no scientist would (or could) believe that blowing up a rubber bladder around your arm could possibly "measure the pressure of blood in your artery". Yet, on this myth a multi-billion dollar industry flourishes.

A doctor who hasn't first realized the distinction between "evidence" (which can be misconstrued) and "fact" (which can't), will never be a scientist.

Are medical doctors scientists ?

Medical doctors in general do not have training in experimental design, statistics and have no experience in actually conducting or even interpreting research.

They are clinicians often using findings from medical and scientific research to apply to the practice of medicine.

From this "evidence" I should conclude that research for neurosurgical residents and qualified neurosurgeons is not important…..

… But maybe I have some second thoughts !!!

What will be the future of neurosurgery when we all only concentrate on being in the operating room and performing surgeries and not participating in research ?

- We will become better and better in those surgeries that we perform more often
- Patients and colleagues will admire us for our unique dexterity and great surgical skills

.....BUT

- We will be nothing more than good craftsmen
- We will need other people *with knowledge* to tell us what we should do
- They will most probably not bother to explain to us why we are asked to do those surgeries (and those future neurosurgeons are probably not even interested to know what they are actually doing)

WOULD THAT BE GREAT ?

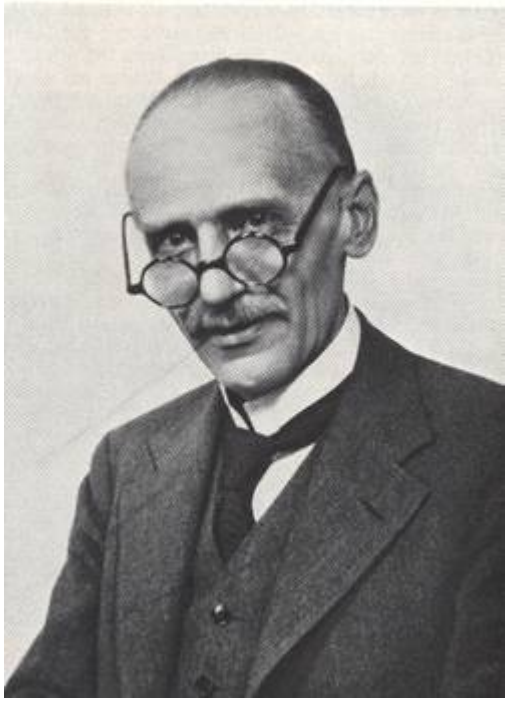
Do you want to be only a knowledge consumer or also a knowledge producer ?

Neurosurgical practice without science and research will bring us right back to where we were 125 years ago.

The first “neurosurgeons” were general surgeons brave enough to open the skull and spine at the point where a neurologist told them to do so.

Usually the neurologist had to “guide” the surgeon through the whole procedure because they had no idea what they were operating upon.

A great example of that situation was Otfrid Foerster from Breslau.



Foerster's student years occurred in a time when neurology was starting to develop independently from internal medicine and psychiatry under the influence of, among others, Jean-Martin Charcot (1825-1893), Wilhelm Heinrich Erb, William Richard Gowers (1845-1912) and particularly Karl Wernicke, who became well known by his direction toward functional localization approaches.

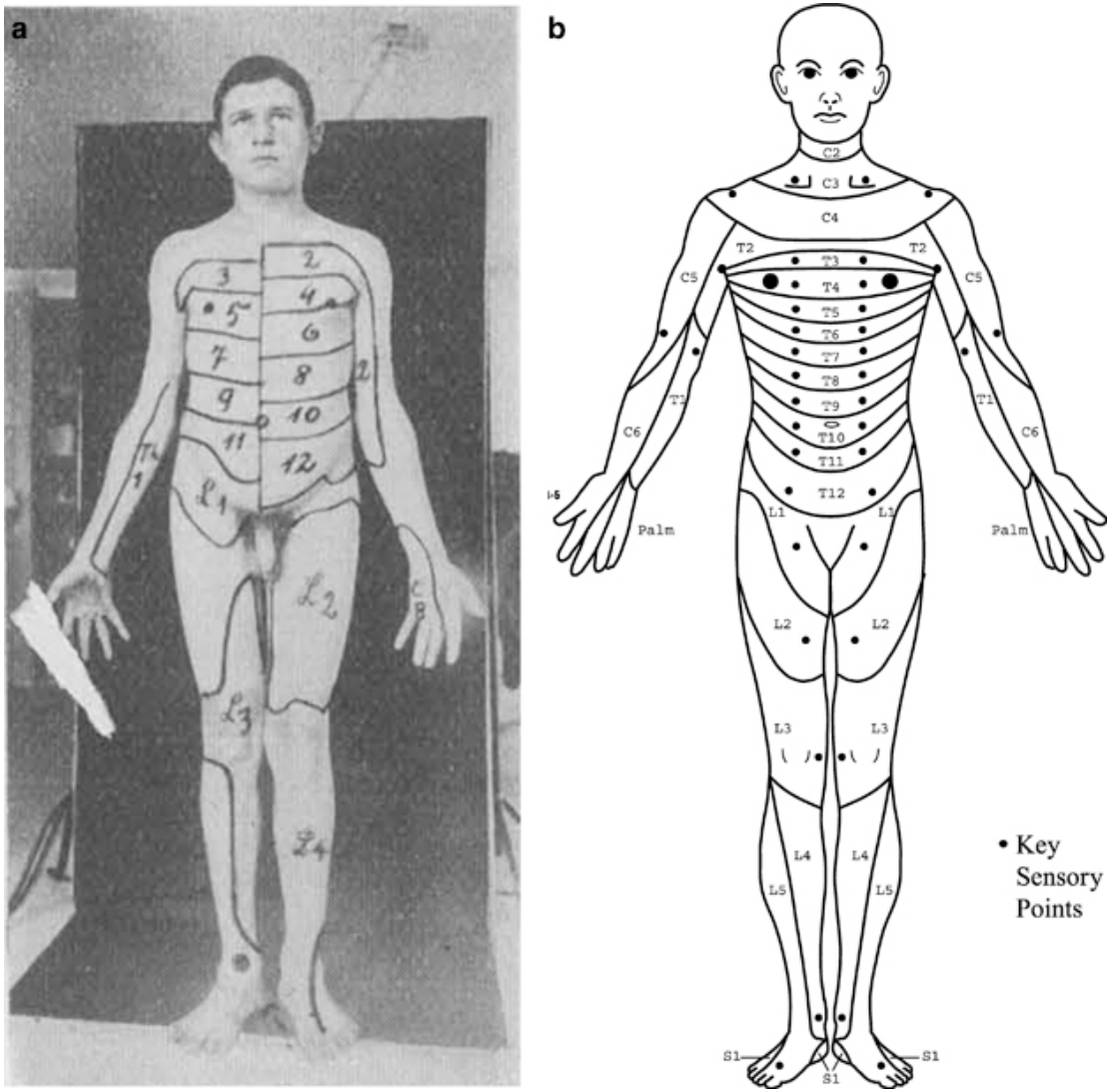
By cooperating with Wernike, Foerster's great interest in the anatomy of the central nervous system was excited. The two researchers together published in 1903 an anatomical atlas of the brain.

But Foester was so shocked by the early attempts of the “rough” surgeons approaching brain and spine tumors that he decided that he could do hardly worse himself and he became a famous “surgical neurologist” and an innovative experimental neurophysiologist.

Although best remembered for his description of the dermatomes in man, he also conceptualized rhizotomy as a cure for spasticity and anterolateral cordotomy for pain.

Foerster emphasized clinically orientated neurophysiology and was able to forge a link between his observations and proposed methods of treatment. He became famous for his epilepsy surgery (without suction, clip, diathermy!)

Foerster's superb command of languages led to his popularity as a speaker in Europe and North America. Students who flocked to learn from his encyclopedic knowledge and skill were privy to Foerster's legendary hospitality and charm.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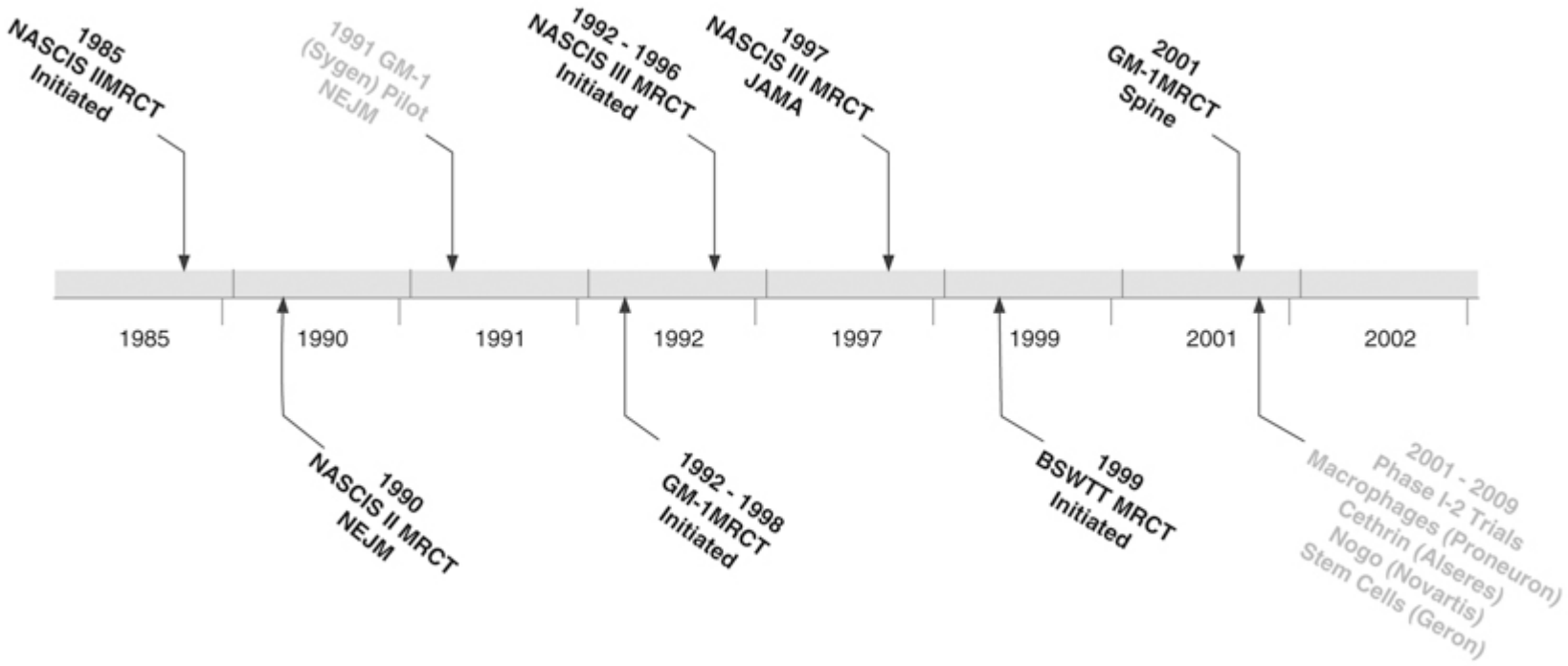
• Key Sensory Points

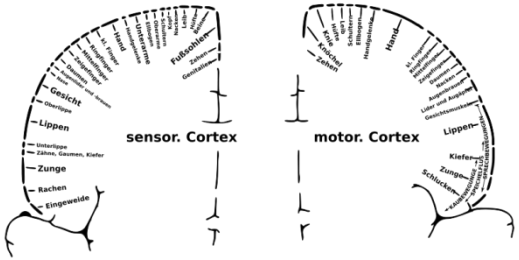
Foester together with one of his pupil, Frankel, who became famous for his studies on spinal cord injuries

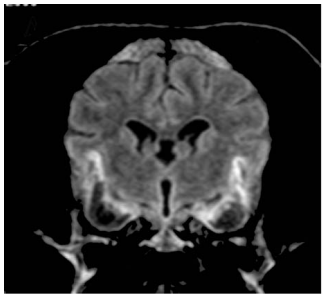
(on the left in front of the hospital, on the right during a visit to the king of Ethiopia)

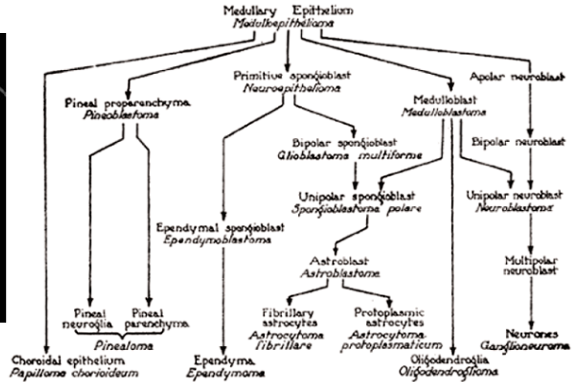


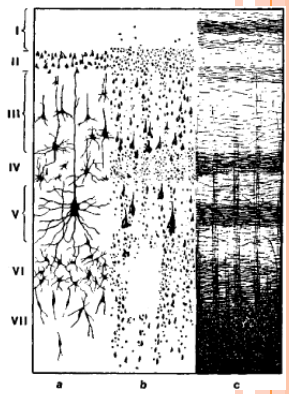
Timelines of Multicenter Randomized Clinical Trials (MRCT) on Acute Spinal Cord Injury (SCI) Started and Reported (1985–2006).

..just a few more famous neurosurgeons and their scientific contributions to the understanding of brain function.

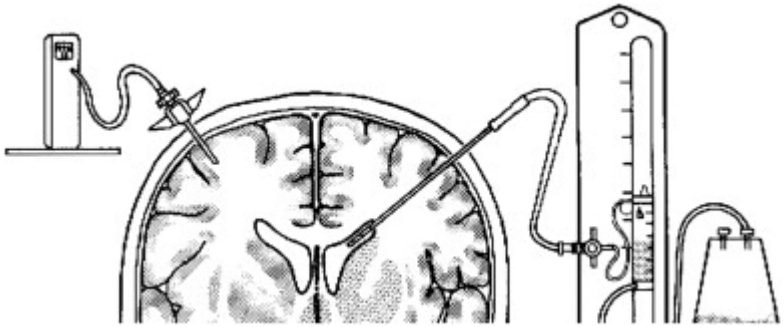








Lundberg N: Continuous recording and control of ventricular fluid pressure in neurosurgical practice. Acta Psych Neurol Scand Suppl 1960, 149: 30



78 Neurosurgical Classics II

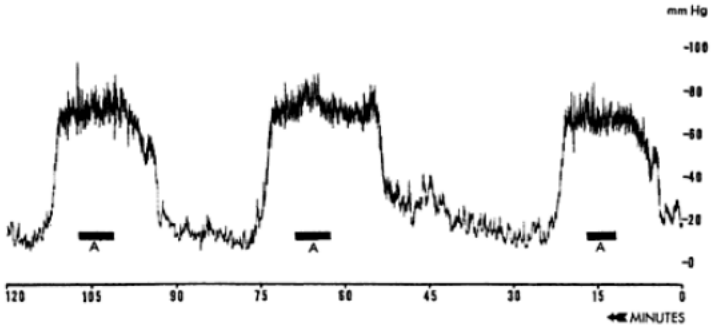


Fig. 70.

A = Attacks (see text); bold lines roughly indicate duration of motor phenomena.

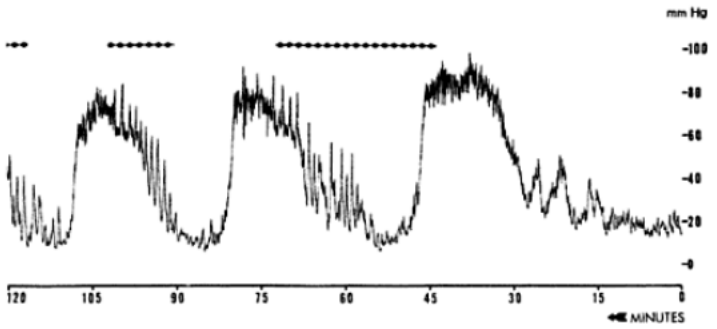


Fig. 71.

Cambridge neuroscience;
lab work on ICP and clinical application (RescueICP)

Marek Czosnyka

Peter Hutchinson

Not only basic research in the laboratory is science, but everything you do and see during clinical practice is important !

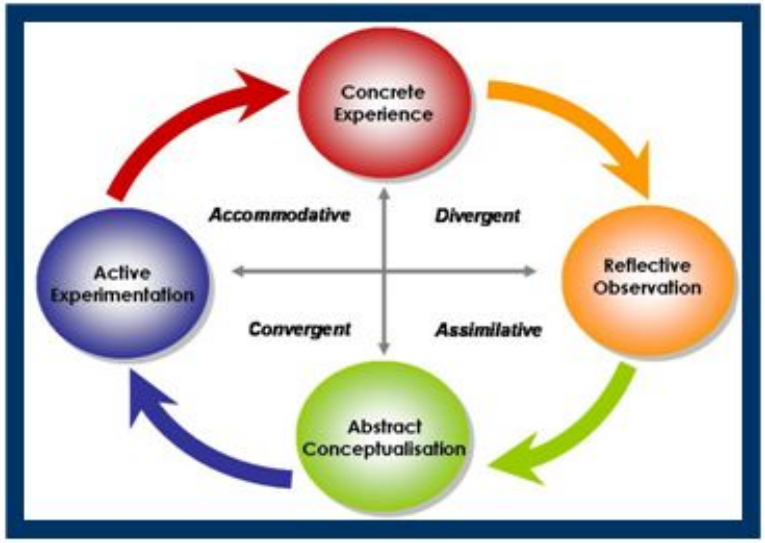
Analysis of clinical experience is the most essential step in clinical research !

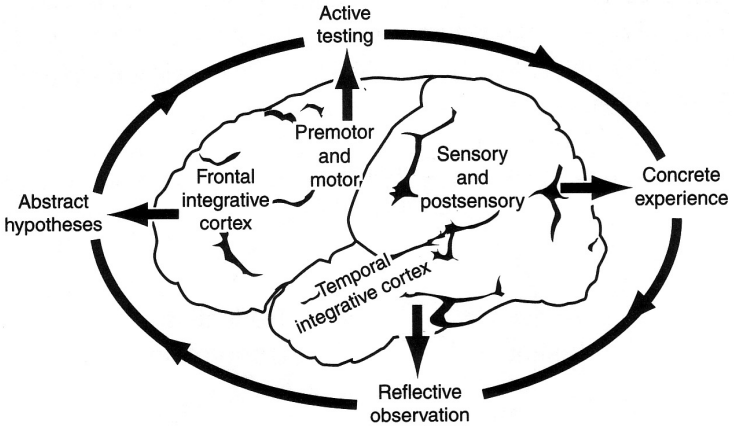
A mechanism by which new knowledge can arise through an analysis of experience was described by the cognitive psychologist David Kolb, who developed a model of learning based on the brain's natural tendency to make sense of concrete experiences, which he called the "learning cycle."

In Kolb's cycle, active analysis (or what he termed "reflection" on experience) initiates a series of cognitive activities that lead to abstraction, which is essentially the process of forming new ideas or concepts.

The transition between reflection and the development of new mental arrangements is what Kolb called the "transformation of experience." This transformation is where learners advance from passive recipients of information to active producers of knowledge.

KOLB'S LEARNING CYCLE





Educational visionaries have long understood the importance of learning through systematic analyses of daily experience.

The importance of this activity has been highlighted over the last few decades though the work of scholars of expert thought in modern society. These researchers have shown that high-performance knowledge workers, such as scientists, and physicians, habitually engage in the following activities: they constantly reflect on their own experience, identify gaps in their knowledge, and take steps to remedy any deficiencies.

The quality described by these activities, metacognition, is necessary for the non-routine problem-solving activity that defines knowledge work.

But do this according to this citation from Osler:

Begin early to make a threefold category —clear cases, doubtful cases, and mistakes.

And learn to play the game fair, no self-deception, no shrinking from the truth; mercy and consideration for the other man, but none for yourself, upon whom you have to keep an incessant watch…

It is only by getting your cases grouped in this way that you can make any real progress in your education; only in this way can you gain wisdom with experience.

Sir William Osler

Professional growth emerges from the practice of neurosurgery in large part via contact and communication with peers and patients.

When information derived from our practice experiences is accumulated, analyzed, and made accessible, the progress Osler described becomes powerful !

People still value and expect medical innovation, but priorities have shifted dramatically toward issues of cost, safety, and quality.

Private insurers, federal and state governments, advisory councils, employer groups, the media, and patients are all demanding that individual physicians and groups objectively account for the value of care they provide.

Specifically, they are demanding high-quality information about the real-world therapeutic effectiveness and cost-effectiveness of medical and surgical interventions.

Unfortunately, traditional clinical and translational science has thus far largely failed to produce that information.

We are in the middle of a paradigm shift from an era in which medical knowledge was generated by a small percentage of researcher-physicians to a time in which most physicians will actively participate in the collection of new facts, their interpretation, and the generation of new knowledge.

This activity will be made possible by physicians' ability to deposit, access, and compare clinical data in huge long-term prospective databases of medical disorders and treatments.

This also reflects in an overall new trend in professional neurosurgery —the “science of neurosurgical practice” — from its beginnings to its projected future.

It will be a future of neurosurgical practice–based science as it relates to neurosurgical training and practice to advance the quality of patient care and to serve the research needs of neurosurgeons as well as to improvements in patient-care delivery and compliance with regulatory mandates.

Tremendous scientific and economic potential resides untapped within our routine clinical activities. The methods to realize that potential now exist.

The promise of those methods can only be realized through concerted effort and organized action.

If neurosurgeons choose to embrace practice science as an essential feature of modern neurosurgical practice, we will help meet the challenges of creating a sustainable health-care system, and we will also define the relevance of neurosurgery within the broader realm of medicine and society.

From these considerations I can conclude that research for neurosurgical residents and qualified neurosurgeons is *EXTREMELY* important.

Thank you for your attention and Wishing you all a happy, healthy and prosperous new year