Because of these three developments, health care in the Netherlands will no doubt see more changes in the last decade of the century than in the previous fifty years. A metamorphosis will have taken place by the year 2000. A change for the better? That will depend on the extent to which we succeed in uniting the creative clout of the free market and the classic objectives of socially based medical insurance—equal rights, solidarity, and financial accessibility. That, in turn, will depend on the way in which we in the Netherlands, within Europe, find a new equilibrium between social and liberal. So the way towards the year 2000 (health for all) is the way towards the *terra incognita* of the public-private mix.

So far, the voyage of discovery seems to be going well.

Discipline-planning: blessing or curse?

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In comparative analyses of medical research the Netherlands tends to perform better than large countries such as France, Germany, and Japan.[1,2] These evaluations have to be interpreted with care, but let us consider some of the factors that may have contributed to the good international position of Dutch medical research—notably, discipline-planning.

Discipline-plan mark I

Although nowadays all research groups depend on outside funding, university institutes still benefit from the substantial basic funding provided through the university, for periods of five years at a time. If the quality of the research is maintained and there are no cuts in the government's budget, the money will flow. The basic funding gives continuity and helps greatly with securing outside money; it also creates freedom, because there are no real restrictions regarding the research to be performed within the framework of the theme the money is allotted to.

Another important factor is the research policy developed in medical sciences since the early 1980s. In 1983 the former RAWB (Advisory Council for Science Policy) published its report, Recommendations Concerning Priorities in Health Research, which identified strengths and weaknesses in medical sciences as well as good and excellent research groups. Conclusions were based on the number of publications in international journals, citations, and international recognition (determined from more than 500 inquiries to colleagues around the world and reflected by memberships of editorial boards of international journals). The most important conclusions were published in 1986.[3] As a result of this quality assessment, the Minister of Education and Sciences at that time gave additional financial support to excellent research groups and stimulated weak areas that were judged important to health care via a health research promotion programme. A year later the same minister asked the eight medical faculties in the Netherlands to indicate, in a so-called discipline-plan, the likely medium-term developments in medical sciences as regards education, research, and health care. The research part was to be formulated in consultation with the Royal Netherlands Academy of Arts and Sciences (KNAW). The Academy's advice was published in 1985 and was integrated in the first Discipline-plan Medicine, printed in 1988. The latest version, now called Discipline-advice Medicine because it consists of recommendations to those responsible for science policy, includes evaluations not only of medical faculties but also of faculties of dentistry and of non-university medical research institutes. This plan, devoted only to research, was published by the KNAW in 1994. The next one, again from the KNAW, is due in 1998.

Concentration of skills

Over the years, discipline-planning in medicine has resulted in the concentration of research activities in particular specialties, such as cardiovascular diseases, endocrinology, genetics, immunology, oncology, in a small number of centres. Concentration of research activities is judged important because complex medical-biological problems demand a multidisciplinary approach and a critical mass is required to allow risk-taking. Besides, medical faculties cannot afford to create concentrations of expertise in more than a few areas. The concentrations of expertise as proposed by the medical and dental faculties, and the medical research institutes outside the universities, are judged by the KNAW in terms of the quality of the research and of the responsible scientists, the cohesion and volume of the research programme, and the availability of skills required to accomplish the programme. The quality of the programmes, as they proceed, is assessed by bibliometrically supported peer review. The criteria are (1) scientific output in international publications, with emphasis on the percentage articles published in the leading journals in the field and in reputable basic and clinical journals; (2) the ability of the scientists to raise outside funding, especially through agencies with a funding rate as low as 10–15%; and (3) international collaboration demonstrable by joint publications and grants, and by exchange of staff and post-doctoral or PhD students. The quality of subdisciplines that participate in the programmes (eg, biochemistry, cell biology, cardiology, pathology, paediatrics, pharmacology, physiology) is assessed by the same criteria. Concentration of certain types of research in a small number of centres of expertise has also been stimulated by a continuous debate within and between medical faculties united in the Council of Medical Faculties (DMW) of the Association of Universities in the Netherlands. In DMW all medical faculties are represented by their deans.

The differentiation in research activities between medical faculties and the concentration of these activities in centres of expertise has been reinforced by the Dutch University Education Act 1986, which gave greater freedom to university institutes to arrange and report on their research programmes and finances and to make contracts with third parties.

Research schools

Lately the Minister of Education and Sciences took the initiative to form research schools. The formation of these schools was facilitated by the established policy to concentrate research in centres of expertise. Besides a

Panel: **Medical research schools in the Netherlands**

Research school	Corresponding university
1992*	
Amsterdam/Leiden Institute for Immunology	**University of Amsterdam** Participation: University of Leiden, Free University, Amsterdam
Neurosciences Amsterdam	**Free University Amsterdam** Participation: University of Amsterdam
Leiden/Amsterdam Centre for Drug Research	**University of Leiden** Participation: Free University
Amsterdam Medical-Genetic Centre	**University of Leiden**
South-West Netherlands	Participation: Erasmus University Rotterdam
Netherlands Institute for Health Sciences	**Erasmus University Rotterdam** Participation: Wageningen Agricultural University
Cardiovascular Research School Maastricht/Amsterdam	**University of Limburg** Participation: Free University Amsterdam
1993*	
Research School Oncology	**Free University Amsterdam** Participation: University of Amsterdam, Netherlands Cancer Institute Amsterdam
1994*	
Research School Metabolism and Nutrition	**University of Amsterdam** Participation: University of Limburg
Research School for Cardiovascular Research	**University of Amsterdam** Participation: Erasmus University Rotterdam
Groningen Utrecht Institute for Drug Exploration	**University of Groningen** Participation: University of Utrecht
Research School Infection and Immunity	**University of Utrecht** Participation: University of Amsterdam
Research School Pathophysiology of the Central Nervous System	**University of Utrecht** Participation: Catholic University Nijmegen, Wageningen Agricultural University
Research School Pathophysiology of Growth and Differentiation	**Erasmus University Rotterdam** Participation: University of Leiden
1995*	
Institute of Cellular Signalling	**Catholic University Nijmegen**
Netherlands School of Primary Care Research	**University of Limburg** Participation: Free University Amsterdam, Catholic University Nijmegen
Research School Experimental Psychopathology	**University of Limburg** Participation: University of Groningen, Catholic University Nijmegen, University of Amsterdam, Free University Amsterdam

*Year of recognition by KNAW

good environment for research, these schools were to offer a thorough institutional training programme for graduate students. The four-year training programme—three years' research and one year of courses—has to be concluded with the defence of a PhD thesis. In addition to training the PhD students as independent researchers, the programmes aim to broaden their view. In modern research there is tremendous need for researchers who are both knowledgeable in a particular area and able to communicate with scientists from other subdisciplines. By teaching classes for undergraduates the scientists in research schools stay in close contact with the curriculum of the medical faculty. The first research schools were recognised by the KNAW in 1992. This organisation will re-evaluate the quality of their research and training every five years. The schools are often formed by institutes from one or more medical faculties, occasionally in association with non-university research institutes. In general, not more than one or two research schools per area have been recognised by the KNAW. The programmes are usually complementary with a partial overlap, stimulating healthy competition. At present sixteen recognised research schools are active in medical sciences (panel).

It needs time

So, is the good international performance of Dutch medical research attributable to the concentration of quality in particular centres combined with continuity in basic funding? This may well be so. It is noteworthy that in these centres basic and clinical subdisciplines are participating in the research programmes. Strong ties between basic and clinical subdisciplines are in our opinion essential for good clinically oriented research. Although we regard the concentration of good quality research as a prerequisite for solving complex medical-biological problems, we do not mean to imply that nothing good is done outside these centres. Excellent medical research is performed by small groups of scientists elsewhere and their activities need to be protected.

The concentration of research in a limited number of topics per medical faculty seems at odds with the broad range of skills needed for tertiary care in the university hospitals. The hospitals do indeed require research in all areas of tertiary care, but in our opinion this does not have to be extensive or of the highest quality. The research outside the centres of expertise should aim to create an environment for the implementation of new diagnostic and therapeutic developments in health care. Although in our country research priorities between medical faculties and university hospitals are being attuned locally, the differentiation in research activities between medical research schools has not yet been extended to a differentiation in tertiary care between university hospitals. This is necessary from both a research and a health care point of view, but it needs time. Meanwhile, we have to live with a hybrid approach, and we must make sure that differentiation in research activities between medical faculties, reached on the basis of quality and consensus, does not result in protectionism and rigidity.

Because discipline-planning contributes to the concentration of research in specific multidisciplinary centres, a condition for high quality research, we do regard this planning as a blessing rather than a curse.

RSR and HKAV were chairman and vice-chairman, respectively, of the

KNAW committee responsible for bringing about the Discipline-advice 1994; ABMK was secretary of the committee.

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The dichotomy of medicine

L A van Es, A Hofman

Medical research in the Netherlands has undergone wholesale transformation from an academic activity within monodisciplinary university departments to integrated projects between investigators of all sorts, many of them outside the universities. Furthermore, the spectrum now extends from molecular biology to health services research. Yet academic medicine and the health care system continue on divergent courses. Why should this be and what can be done about it?

The drift from the patient

After the Second World War health care came to be seen as a human right, and governments invested heavily in medical services. As in most western countries, the Dutch emphasis began to switch from acute fatal illnesses to chronic diseases and disabilities such as cardiovascular, musculoskeletal, and neurological disorders and psychiatric illness—diseases whose pathogenesis frequently includes exogenous as well as endogenous factors.

In the 1960s a large influx of medical students stimulated rapid expansion of medical schools, where the number of departments, divisions, chairs, and faculty members tripled or quadrupled. The multiplication of faculty occurred mainly in the basic sciences; and few of the scientists were trained to relate the insights obtained at cellular or molecular level to disease in the intact organism. As a result molecular and cellular biology prospered and physiology dwindled. After large numbers of medical graduates had been absorbed by the health care system in the 1970s, the 1980s began to see medical unemployment, and the government reduced intake of medical students. To compensate for loss of income, medical schools initiated broad biomedical courses and introduced a new low-cost grade: after 4 years of basic academic training, the most talented students entered a PhD programme as "assistant-investigator", and most of these went into biomedical research.

Two areas of medicine remained underdeveloped. The first was clinical science. The strong demands made on academic hospitals as referral centres and centres for advanced care consumed most of the resources that were previously used for clinical research. Few faculty members were formally trained to accept academic responsibilities. The second included community medicine, mental health, and public health. The academic interest in these areas was so rudimentary that they were pursued mainly in extra-university institutes. Consequently these institutes were and still are only marginally involved in the training of health care professionals. How far do medical schools wish to be the research and training ground for the health care system? If they continue to show only marginal interest, they should not be surprised if the health care system stimulates the further development of these extra-university institutions.

The dichotomy

The dichotomy of medicine (not confined to the Netherlands) consists of the diverging developments of town and gown. The town seeks a clearer vision of complex medical problems that are strongly connected to demographic and social factors. Most of these disorders are chronic. The gown is insufficiently aware of the changing pattern of disease in the population, and university appointments in community medicine, public health, and preventive and social medicine have been cut instead of increased. In resisting the reduction of government support the gown pointed to its good performance in international publication, reflected by high citation rates; but the inability to measure medical relevance caused medical schools to lose their taste for this index of success. Although it is generally agreed that the gown should keep its independence, in modern society it cannot afford to neglect the wellbeing of the town.

Push and pull in public funding

In 1989 Dutch parliament passed a law that converted the Netherlands Organisation for Pure Science (ZWO) into the Netherlands Organisation for Scientific Research. From the parliamentary and public debate it became abundantly clear that the new organisation NWO should not only recognise and support excellence in science but also promote the research that was perceived necessary by society. Medical research had commanded a small budget within NWO. The first NWO Medical Sciences Council under the new law declared that it was willing not only to "push" but also to be "pulled" by society. However, there was an obstacle: the internal organisation of the Medical Sciences of NWO was not ready to be either pushed or pulled. The only criterion that would count, in their eyes, was quality based on citation rate. Most research funding organisations were not willing to collaborate with NWO on society-oriented strategies since the Medical Sciences were seen as a closed shop for basic scientists.

The first step in the reorganisation of the NWO Medical Sciences was to abandon the debate about the merits of fundamental versus applied research, and to replace it by the notion that medical research is performed at different levels of complexity ranging from molecules and cells, to tissues and organs, to the intact organism and groups of patients and risk groups. At all levels medically relevant questions can be raised that are either more basic or more applied. This notion was founded on the view that the goal of the medical sciences is not to increase the body of knowledge but to improve health. To implement this philosophy the NWO Medical Sciences Council started an integrated training programme for clinical investigators requiring joint supervision by a scientist in either epidemiology or a biomedical discipline and by a clinician responsible for specialty training. The programme is executed partly during specialty training (partly before, partly after). The