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**CURRENT CONCERNS**

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**THE HOSPITAL  
OF TOMORROW**

D. Jolly & I. Gerbaud



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Division of Strengthening of Health Services  
World Health Organization

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The Director  
Strengthening of Health Services  
World Health Organization  
1211 Geneva 27, Switzerland

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THE HOSPITAL OF TOMORROW

by

D. Jolly<sup>1</sup> & L. Gerbaud<sup>2</sup>

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1 Professor of Public Health in Paris; Director of the Paris Hospitals Plan; President of the Association of Public Health Teachers of France

2 Public Health Intern, Paris.



## INTRODUCTION

A working group spent a year considering the future of the public hospital in France and more specifically the future of the Paris University Hospital (Assistance Publique - Hôpitaux de Paris).

Their prospective study appeared in the form of a book: L'hôpital au XXIème siècle (the hospital in the 21st century), published by Economica in Paris in 1988 with a preface by Mr Jean Choussat, Director-General of L'Assistance Publique - Hôpitaux de Paris.

From this study, the authors have selected a certain number of problems, questions and answers that are common to all hospitals, whatever the health system and whatever the country, in the shorter or longer term, depending on their wealth, their level of development, and their patterns of disease (whether still dominated by infectious and parasitic disease, or already by diseases of affluence).

The present document sets out the main features of hospital planning and looks at the likely activities of the hospital of the future.

### I. WHY UNDERTAKE HOSPITAL PLANNING?

In economics health is partly a non-market sector, the extent varying between countries, and demand is created - in part at least - by supply. Because of the wide gap between almost unlimited needs and scanty resources, it is necessary to make choices. Planning gives managers a certain number of methods for making such choices in a more rational way. It can be used:

- to take a "snapshot" of current supply, and compare this with the needs and with their foreseeable development over different periods;
- to determine the desirable objectives and the resources needed to attain them, taking into account the constraints (financial and economic, human, social, medical, legislative, town-planning-related);
- to define priorities, i.e. to select what is possible in terms of capital investment, operating budget, management of human resources ... in short, to decide;
- to phase funding and decision-making over time;

- to ensure follow-up; and
- to make evaluations at different points in time of the impact of the choices made, their application, and the quality of adherence to the plan

At a more general level, planning has four other functions:

- The role of the collective funding of health expenditure varies according to country. Health planning supplements the market forces in the mechanism of allocation of national resources.
- It promotes the circulation of information among the major economic partners and serves to reduce uncertainty.
- It ensures a good level of consistency between the various public initiatives.
- It fixes objectives. This is a process that needs to be deliberate (and not rigid); in particular, it enables the hospital to become organized on business lines and to mobilize energies around the "business" for health promotion.

In the hospital, there are a number of factors that make the role of planning more crucial:

- The demand for care develops (in part) rapidly. Moreover, it is difficult to forecast and highly variable over time on account of epidemics (such as influenza or cholera) and accidents (natural or technological disasters, etc.).
- Moreover, the public hospital (or similar institution) has to accept the constraints of public service:
  - . permanent and continuous provision of care,
  - . free and equal access for all who call upon it,
  - . involvement in preventive medicine (particularly as part of a public health policy), and
  - . involvement (where appropriate) in health manpower training.

In view of this, and regardless of the adaptability of each hospital, the response is slow. The time it takes to implement a decision (from choosing a capital investment project to making it operational) is generally ten years.

Since economic resources are limited, the choice of capital expenditure and the way it is spread (or not spread) over time is crucial. A capital expenditure of one dollar corresponds to an operating expenditure of one dollar every two or three years. Hospital expenditure must therefore be integrated within a more general economic framework. It should be borne in mind that in all countries the hospital is the major item of health expenditure.

Medicine is constantly evolving. Quite apart from epidemiological considerations, some areas are undergoing remarkable progress (such as imaging which in the last 20 years has seen the advent of mass tomodensitometry, echography, digitization and nuclear magnetic resonance; or such as diagnostic immunology and, more recently, therapeutic immunology), while others are regressing. Through planning these trends can be managed harmoniously.

Planning is therefore a prerequisite for proper management. Through dialogue and the attainment of consensus, it can also help to improve the climate of the hospital establishment and thereby increase its efficacy by reducing the costs of internal cooperation.

## II. INTRODUCTION TO HOSPITAL PLANNING

### HOW IT DIFFERS FROM PROSPECTIVE STUDIES, REGULATION AND PROGRAMMING

First of all, let us distinguish between these various concepts, which can certainly be useful in a planning exercise but are quite different from planning.

#### Prospective Study

This is an exercise in intellectual speculation, seeking through long-term or very long-term projections (20 years or more) to get right away from the present and from current constraints, and looking only at important trends, real or potential.

Whatever methods are used (projection, modelling, scenario approach) the usefulness of a prospective study is largely theoretical. They can be used, however, to highlight the risks of uncorrected development, to amplify (even to exaggerate) the effects of an action, and to conduct a conceptual review of an issue. Its role is therefore to act as an ideas laboratory.

## Regulation

This is most frequently used alone, without any real planning, whether by restricting supply (non-market sector) or by using market forces to bring supply and demand into line.

Its main limitation in the health sector is that this is partly a non-market sector, where external factors play an important role.

## Programming

This consists of all the specific measures and means implemented in order to set up a policy (on health or on an establishment). It refers to the assembly and utilization of resources in the short or very short term (1-3 years) and specifies the progress of activities in time and space.

By contrast, planning is concerned with the medium or even the long term (5-10 years), starts from everyday realities, participates in determining the justifications, the major policies and the objectives of the hospital, sets the hospital's priorities and objectives, and determines the distribution of resources in order to attain those objectives. As a component of a consistent health policy, it must become integrated in the health environment, permitting coordination between hospital and non-hospital sectors, and between primary, secondary and tertiary health care.

## THE DIFFERENT PHASES OF PLANNING

### First phase: Definition of Needs and Objectives

This phase comprises several stages of analysis (1):

#### Review of current strategy and of the hospital's image

In particular, this includes a review of goals and results, of sources projected and those actually used, and of the tasks assigned to the hospital.

#### Analysis of the environment: threats and opportunities

Listed below are some useful indicators. The list is not exhaustive and may vary according to the statistics available and from country to country.

- Current and foreseeable morbidity, incidence and prevalence rates, severity and type of emergency, methods of management of emergencies, etc.

- Characteristics of the beneficiaries

- . Demographic: Age pyramid, extent of dependence of old people, of young people; birth rates, mortality rates (by age group, specific mortality by cause of disease, etc.); net immigration rate, natural growth rate, suicide and homicide rates, etc.
- . Socioeconomic: Mean income, poverty rate, unemployment rate, savings rate, patterns of consumption of households, literacy rate, educational levels, possible sources of information, etc.
- . Geographical: Actual and optimum siting of the health care system, present and future; catchment area of the hospital; specific location of various risk populations; means of access to the hospital; town planning constraints; etc.
- . Psychosocial: Attitudes of the general public towards disease, death, welfare facilities for the handicapped, the dying (do people die in hospital or in the family setting?), old people, etc.

- Institutional factors:

- . Existence (or otherwise) of comparable care structures, location, size, share and type of specialist practice, competing sectors, forms of funding, etc.
- . Existence of a health care service run by professionals or paraprofessionals, method of practice (alone or as a group, specialist or otherwise), form of remuneration.
- . Health insurance scheme, rules governing professional practice (legislation, regulations, customs), amounts and types of resources available, local/regional economy.

Analysis of organization: strengths and weaknesses

In the analysis of organization, the following headings can be developed taking into account the strengths (centres of excellence, reputation of the hospital, promising sectors, etc.) and weaknesses (sectors experiencing change of uncertain outcome, "pockets" of underproductivity, etc.):

- . Professionals and paraprofessionals: Age, sex, date of qualification or date of entry into the establishment, forms

of continuous training, distribution by specialty, the various occupations, adaptability, geographical location of workplace, density by sector, etc.

Health care units: Number of beds, with breakdown by short-term, medium-term and long-term stays, by specialty and by disease; number of hospital bed days, bed occupancy rate, number of admissions (or discharges), readmissions (more or less long term), mean length of stay, analysis of very long stays (over 30 days, for example) or very short stays (less than 24 hours, except for day hospitals), turnover rate (mean period for which a bed remains unoccupied between a discharge and an admission), patient renewal rate (number of new patients) by care sector, catchment areas of the different health care sectors, relationship between the potential for service delivery and the services actually delivered; number of outpatient clinics, with details of their staff and their resources; existence of non-traditional hospital sectors (day hospital, weekday hospital, night hospital, etc.); dispensary activity, involvement in domiciliary care.

Technical facilities: These are becoming increasingly important. Equipment present (quantity, age, working condition, utilization rate, intermediate supplies required for its operation, distribution by sector (imaging, biology); turnover rate of equipment, ratio between operating budget and capital investment budget, qualifications of staff using equipment, opportunities for training in new techniques, maintenance problems, amount of supplementary tests performed outside the facility, and types of such tests; means of communication with the patient-care units, etc.

Service facilities: Logistic and general services: quality of accommodation, number and quality of meals, hygiene circuits (separate circuits for wastes, treatment of contaminated wastes, etc.), use of linen, disposable items, stock levels and stock management (food, miscellaneous items, drugs), delivery periods for orders, location of the various stores, distribution of the various stores, procedures for communication with users, for distribution of drugs, existence of a central store; need for heating, lighting, to run operating theatres, types of energy used and feasible, etc.

Which of these activities need to be developed, concentrated, decentralized, contracted out?

Possible integration with the training, research and health education sectors: Existence of a school of nursing, school for health workers, continuous postgraduate training, etc.

### Evaluation of challenges and definition of objectives

The preceding analyses can be used to identify and evaluate the major challenges for the period covered by the plan and to define objectives adapted to those challenges in the light of the cultural environment, the image and major areas of activity of the hospital concerned.

#### Second phase: Formulation of the Master Plan

Following the definition of the objectives, the resources, their location in time and space, starting from what already exists and knowing what is wanted, we arrive at what is possible, defined in terms of capital investment and operation, in the awareness that for every dollar spent on capital investment another dollar will need to be spent on operation every two or three years. This phase follows several stages:

- formulation of options and choices,
- which are looked at in the light of the expectations of those taking action and in terms of responsibilities towards society, and
- arriving finally at the refinement of strategic choices, on the basis of the dialogue between the various partners, by identifying a certain number of consensus objectives.

#### Third phase: Defining the Pathway

This phase is concerned with defining the pathway from what already exists to what is desirable and possible, which means specifically:

- defining the priorities for the plan and selecting the genuine emergencies that need to be dealt with rapidly, establishing an order of precedence for the various operations (e.g. there is no point in repairing an out-dated department that needs to be rebuilt); and
- incorporating the constraints of feasibility (in the context of renovation it must be borne in mind that the hospital can be "moved" but must not close) and the financial constraints.

### III. COMPONENTS OF A HOSPITAL STRATEGY AS PART OF THE HEALTH SYSTEM FOR THE 21ST CENTURY

This part summarizes the various ideas on the future of the hospital and its components in the 21st century, as expressed by the working group of L'Assistance Publique - Hôpitaux de Paris on the hospital of the 21st century (2).

#### HOSPITAL USERS

##### Demographic Factors

##### The drop in the birth rate

This concerns all countries to a varying extent. In Eastern and Western Europe and in North America it takes the form (with a few exceptions) of a population decrease (total fertility rates below 2.1). The number of births will remain almost identical or will decrease. The marked decline in infant mortality is largely over, and each pregnancy is now a "wanted" pregnancy with a heavy demand for medical care and safety.

In most other parts of the world, especially in Africa and the Middle East, birth rates are falling because of wider spacing of births, but are still high (total fertility rates higher than 4). Because of the structure of the age pyramid, the number of births will continue to show a sharp increase.

Infant mortality rates are tending to fall and simple preventive measures (tetanus prevention, nutrition education, etc.) can still be highly effective.

##### Aging of the population

All countries are affected. While it is proportionally higher and of longer duration in Europe or Japan, it also affects most of the developing countries which will see increases (in absolute numbers) in age groups that are now often almost non-existent: the over-60s and the over-75s. This irregular increase between countries and between regions needs to be assessed in the light of the demographic indicators.

The relative importance of the very old (the over-80s) also depends on sociocultural factors, but it must be noted that the greater the increase in the number of very old people, the more these people tend to be poor and isolated.

### Internal migrations

Such migrations within a country follow two patterns:

- Continued urbanization through drift from the land, except in some areas where the trend is being reversed (more through the settlement of commuters in rural areas around big cities than through the reclamation of abandoned lands).
- Trend towards special zoning of towns, breaking with the traditional mix of activities and populations whereby poor or very poor housing areas, either in the city centre (North American model, cf. Chicago) or at the fringe (slums or shanty towns as in Latin America, Africa, Asia), are separated from rich residential areas in the city centre (cf. Paris) or in certain neighbourhoods (cf. Lima). Moreover, the area of large cities is tending to increase sharply everywhere.

### External migration

Migration to another country has little influence on the demography of the country of origin. On the other hand, whatever the policies applied to curb the flow of migration by the receiving countries, immigration continues to take place, bringing with it the specific problems of migrants who are often illegal, have no means of support and hardly speak the language of the host country (cf. the Hispanic population in the United States of America).

### **Morbidity**

Certain overall changes are taking place:

#### Reduction of accidents

Accident rates of all kinds (road, occupational, domestic), at any rate in most of the industrialized countries.

#### Reduction in cardiovascular diseases (3)

While these remain the leading cause of death in the industrialized countries, there is a downward trend on account of changes in lifestyle (diet, etc.) and prevention. In these countries, there is a possibility of over-capacity for heart transplants and coronary surgery, but undercapacity for the fitting of pacemakers. In the developing countries, the situation is quite different: alongside the "traditional" types of diseases (infectious, parasitic, etc.) the so-called diseases of affluence (cardiovascular, tobacco-induced, etc.) are on the increase.

### Later onset of diseases of old age

In Sweden, the Gothenburg study has shown that the incapacities of old age (affecting heart rhythm, verbal ability, speed of perception, memory) are occurring later and later. Just as Balzac's "aged woman" became a "young woman", the 70-80 year-olds of the 21st century will be more like the 60-70 year-olds of the late 20th century (4, 5, 6, 7).

However, although the symptoms of old age will appear later, very old age will become an increasingly heavy burden because the number of people reaching it will be larger. The average age of dependent persons will therefore increase. Even so, life expectancy will hardly rise at all (78 years for women, 70 years for men) and the age at death will probably not increase.

The hospitals can therefore expect a substantial growth of everyday care for 60-80 year-olds (care that will increasingly resemble care for the working population) and of specific care for the very old (senile dementia).

To sum up, the workload that old people will represent for the hospitals will depend:

- to some extent on their number, which will certainly be high;
- to a great extent on society's attitude towards them, on the resources for accommodation or home help, and on the efforts made to develop their independence and to shorten the present waiting lists.

The diseases whose treatment requires the most resources - cancers, viral diseases - are on the increase

No international study shows any reduction in cancer. Everything will depend on progress in medicine. With the decrease in other causes of death, more and more cancers will appear and their detection will progressively improve until the day when they can be prevented. No scientist puts forward any date for this, at any rate not within the next 20-30 years.

The viral diseases are likely to increase, together with their short-term and long-term consequences. We must expect the appearance of new, hitherto unknown viruses, as occurred with AIDS: the number of AIDS patients has been doubling each year for five years (EEC statistics). In France, there are now 1000 patients. At this rate of increase there would be 4 million patients by the year 2000! The majority of these patients are being treated in the hospitals of the large cities.

The rate of increase of the disease will slow down for three reasons:

- The disease will spread more slowly among heterosexuals. Up to now it has mainly affected homosexuals, haemophiliacs and drug addicts. The conditions for spread among these groups (number of partners, injections) were particularly favourable.
- There is no precedent for a rapid exponential increase that does not provoke corrective mechanisms (prevention, new attitudes, etc.). But even supposing that the current rate of increase continues for another five years, in view of the time it takes for the disease to manifest itself, and that the rate is then halved, there could still be 500 000 AIDS patients in France by the year 2000.
- The reality will be more complex. The increase in cases will follow a logistic curve, not an exponential curve. But there is no way of estimating when the curve will start to level off. Research should produce a vaccine within the next 10-15 years. These forecasts show that the hospitals will need to have enough flexibility to be able to adapt to severe epidemics, the consequences of which will be felt in the fairly short term (5-10 years).

Finally, although these diseases are very expensive, their individual weight is limited, like that of each of the diseases treated at L'Assistance Publique - Hôpitaux de Paris. No disease accounts for more than 2% of total expenditure. Cancers as a whole represent 13%. In the long term, the structure of hospital morbidity changes very slowly and its influence on expenditure is moderate (except in the current case of AIDS) (8).

The changes in morbidity will principally affect the way care is organized.

#### The Selective Clientele and the Passive Users

In rich countries, income has little influence on the consumption of medical care. Educational level, on the other hand, divides patients into two groups. The better educated select their system of care. They give precedence to prevention, make more call on specialists than on general practitioners, and keep hospitalization for acute and serious diseases. The less educated consult general practitioners and call very readily upon the hospital. There is therefore a selective clientele and there are passive users. The difference between the expectations and demands of these two groups of patients will increase.

### New expectations of the selective clientele

These are the clients with a high level of education who have developed new forms of behaviour. The middle class is diversifying: it is becoming structured in networks, where everyone is looking for personal growth. All the studies on "major trends" in society show that individuals will need opportunities for personal expression, warm and trusting relationships, and will need to find their way within an increasingly complex system of relationships. "Health" shares priority among their concerns with education and the family. But the needs will change. It will no longer just be a matter of "repairing" observed damage. This clientele will demand:

- Everything that will permit a "normal" family, occupational and cultural life, areas where advances in genetics, biology and miniaturization of equipment will bring supply closer to demand. The later onset of senility will increase the number of repairable disabilities: cataracts, hearing defects, hip fractures (especially women), rheumatism, etc. There will be increases in the number of prostheses and in surgery to "keep the body in working order". The future share of public hospitals, private hospitals and ambulatory medicine is not as yet clear (8,9).
- Rapid and effective care. Society as a whole is becoming more professional. Advances in medical technology and information provided by the media will increase the demands. In particular, people will want to evaluate the results. Well-informed patients will want to choose their surgeon and their hospital on the basis of past performance. They will want to be treated quickly and well, to keep their stay in hospital as short as possible and not waste their time there.

Surveys by the School of Advanced Studies in Social Sciences (1986) and the French Institute of Public Opinion (1984) showed very clearly that only specialist departments, which confer a high status on the patient, can hope to meet these expectations. Hospital departments also need to improve their relations with patients, who are still denied information about their condition and their treatment.

A wide gap could form between these new expectations and the patient's actual experience in many cases. The public hospital is in great danger of losing some of these patients, who are becoming clients of other health facilities, and its respective share could fall as a result.

### The needs of "captive" users

These are the casualty patients, the badly informed, the welfare cases, the drug addicts, some foreigners, and many old people of slender

means. Those who fall ill will not make the same demands for speed and professionalism.

### The Professionals and Para-professionals of Non-hospital Medicine

Physicians and other health workers outside the hospital often make use of the hospital for diagnosis and more specialized therapy and for part of their continuous training. In the future their relationship with the hospital will be a decisive factor:

- If it is good, hospital and non-hospital doctors will complement each other, leading to rapid diagnosis, short hospital stays, and the spread of better care techniques.
- If it is bad, the hospital and the non-hospital practitioners will be in competition with each other, depriving patients of the benefits of the quickest, simplest and most effective care.

In the future physicians and other health personnel working outside the hospitals should form networks in regular touch with their colleagues inside the hospital. In France 40% of patients in public hospitals are referred by private practitioners.

Information technology will transform exchanges of information and the methods of communication between general practitioners or specialists in private practice and the hospital departments. Patients referred to a more specialized level will no longer take a letter with them. The patient's file will be transferred from one microcomputer to another and feedback will follow the same route. Will it be the specialists at private hospitals or public hospitals who offer formulas that best meet the aspirations of general practitioners? The contest has only just begun, but the stakes for the public hospital are high. If it should lose, it could well become to some extent an isolated citadel, full of captive users.

### HOSPITAL STAFF

#### Internal Determinants of Change

These are associated with the youth of the hospital staff, their educational level which is usually high, the higher number of women than in many other economic sectors, and the opportunities for staff mobility.

Sociological studies show that young people are becoming less attracted by ideology and principles. Leaders are more often seekers

of compromise than fighters. They try to understand, endeavour to find solutions, and the interest taken in management by young executives and doctors is a really new departure.

Women also have a more pragmatic attitude, the hospital often being seen as a place for social advancement. Mobility applies unequally to different categories of staff: little to physicians, more to technical personnel.

Recognition of the usefulness and efficacy of non-medical staff is essential. Here the management of human resources plays a central role.

Good relationships between nursing staff and medical staff, on professional matters but also in terms of communication and support, are needed in order to achieve care of satisfactory quality.

In all countries patients treated in hospital are increasingly demanding more than good-quality medical and nursing care. They want to be treated as users and their satisfaction also depends on the quality of the accommodation, the catering, and the human relations between staff and patients.

#### Motivation of the Staff

The hospital world is split in two (10):

##### Motivating organizational settings.

This is the world of specialist departments, intensive care, fighting for patients' lives, research, celebrity patients, children, cancer patients, transplants, etc. The organization complies with a scientific logic. The staff can take action. There is a belief in the ability to care and to cure. The results can be measured and can be improved. The staff are motivated despite being under stress. Interest in the work is high. The authority of the head of department is backed up by his medical skills and is exercised in units of human size. This is also the world of clinical research.

##### Demotivating organizational settings.

This is often the world of general medicine departments, casualties, long-stay patients. The logic is more humanistic. The objectives are poorly defined, hence not measurable. The organizational structure, inherited from the days when the hospital was a place of shelter, is no longer in keeping with users' needs. The real problems are not faced up to: death, pain, distress. Whose task is it to disclose them? Should the patient know? The staff are often demotivated and are given little responsibility in overlarge departments. The overall result depends on

the moral presence and involvement of the head of department. There is an immense gap between the aspirations of the staff and their job satisfaction.

The public hospital carries out its main task well: providing care. It has become professionalized. If it has to retain other tasks - casualties, welfare, etc. - perhaps it will need to rely on staff other than the medical profession. Nurses for example, whose vocation is both to care and to cure. Perhaps it will need to develop the concept of "care focused on the whole human being" rather than on "disease".

### Strategic Options

Hospital staff distinguish three such options:

- Improving collaboration with colleagues outside the hospital.

These colleagues can no longer do without the hospital. It could well be easy to establish good relations with them: many of them were trained at the hospital, many of them work there part-time.

Developing a personal and lasting relationship with them is one way of improving the quality of the care provided for the patient.

- Exercising control over the process of patient admission and discharge.

Many patients receive no outpatient or community medical care. The hospital staff should help them to make the best possible use of very short hospital stays.

- Seeking ways to provide fresh motivation for non-specialist departments.

How can objectives and responsibilities be redefined, and how can performance indicators be created? How can the problems caused by the overlapping areas of competence of physicians, nurses, managers, etc. be settled? What new units should be organized to meet the real needs of users? How should the hierarchical structure be reorganized to ensure a functional distribution of tasks? These non-specialist departments, in particular, need to be run on business lines. The evaluation of care should make a major contribution to motivating these services, for the quality of the care they provide is the "only" thing they have to offer, yet they are essential to the smooth running of the entire hospital.

## ECONOMIC AND FINANCIAL ENVIRONMENT

## Will the "Crisis" be Over in the Twenty-first Century?

Without entering into the debate over whether the crisis is structural or economic, a number of points deserve to be stressed (11):

- The failure of economic forecasting models; nevertheless, a return to a long period of economic growth (the 30 boom years from 1945 to 1974) seems to be ruled out.
- The emergence of newly industrialized countries and the relative retreat of North America and Europe. Will Europe be reinvigorated by the single European market of 1993?
- The indebtedness of the United States and the developing countries; the increase in the American budget deficit is liable to jeopardize the growth of these countries.
- The risks of monetary imbalances and the revival of protectionist ideologies are threatening world economic expansion. Nevertheless, some areas of stability are emerging: the mark-franc axis (ecu), the yen, etc.
- The constraints that human activity places on the environment are producing changes in industrial procedures (increased desulfurization of coal and petroleum, elimination of CFCs, etc.). The pressure for such changes is growing, although it is not known how long it will play a major role, nor is it known whether it will check growth (by slowing down industrial growth) or stimulate it (by the expansion of the "depollution") industries.

However:

- The factors of production are plentiful. The resources of high-quality trained manpower are constantly increasing in the industrialized countries and in the developing countries. The resources of energy and raw materials will be plentiful up to the year 2000 (particularly on account of the growing importance of the tertiary sector of the economy, energy savings and the recycling of wastes).
- A wave of technical progress is spreading (information technology, communications, biotechnologies, etc.) and should become a growth factor via the industrial and geographical changes.

## The Leisure Society

### Spare time will be a plentiful resource

Four forces are acting in this direction:

- Unemployment and/or loss of job security for entire sections of the population.
- Shorter working week as a result of increasing productivity (especially in the manufacturing sector).
- Longer basic or further training.
- Earlier retirement.

What use will be made of this time: recreational or community-oriented activities?

Two generations (the 60-80 year-olds and the over-80s) will have retired. How will society react to this major change in the life cycle?

### The dual society

The job structure presents a major risk: society will split into two groups:

- an educated middle-class who use modern forms of communication (information technology, media, etc.), have well-paid but often stressful jobs, and accept the economic logic of open frontiers;
- an excluded group who are left with insecure jobs, who are no longer protected against all risks by social security, and whose attitudes or living and housing conditions gradually alienate them.

These prospects concern all the industrialized countries and the developing countries. The United States of America and Sweden have made a start with job-sharing and income-sharing (drop in wages, part-time work). Europe's attitude is not yet defined. It is difficult to say whether when a certain threshold of unemployment and new poverty is reached there will be a heightening of awareness that will lead to an upheaval in the distribution of time and incomes.

The Secretariat for Future Studies in Stockholm proposes an interesting informal solution to the problems of working hours, unemployment and solidarity (12):

- The facts

- . Uncontrolled growth is unacceptable:
- . If the health care system continues to grow at its present rate, its cost will double and employment will increase by 50% by the year 2000.
- . If the employment of health care staff is blocked, the volume and quality of care will drop.

- Basis for the proposals

- . Preserve solidarity by allocating some of the time that technical progress releases in companies to community-oriented activities.
- . Give everyone a place and a function in the life of society, even non-professionals, so that no one feels left out.

- The proposals

- . All young people (male and female) should do a year of "community service" (military, social, community-based).
- . All adults should devote 4-6 hours a week to a community activity; such service would become optional at age 65.
- . Everyone can take two sabbatical years between age 50 and age 70 to develop activities in preparation for retirement (which can be taken between 60 and 70 years, as desired).

### Will Solidarity be Undermined?

Until recently, solidarity activities were decentralized and often voluntary (religious, family-based). The welfare state that gathers in funds and arranges social security for all is a recent phenomenon associated with post-war growth. Will it last? It seems likely that it will break up (United States of America) and will make way in part for spontaneous and local forms of solidarity (Sweden, United Kingdom).

"Futuribles", a French study group, has drawn up three scenarios for social security in France, depending on economic growth and society's reactions to the consequences of modern progress (13):

Scenario of "controlled privatization"

With economic activity picking up in the early 1990s, the financial context becomes difficult but not enough to undermine the structure of social security. Because pensions, unemployment benefits and health expenditure are not regulated, they continue to increase faster than the revenues of the social insurance funds. The chronic deficit is made up from year to year by a creeping privatization that leads insidiously to "two-level" social security.

Disorganization, decentralization and poor man's medicine

The crisis persists, unemployment increases, the social security system is in danger of falling apart for lack of funds. The State then hands over to local communities (social assistance, municipal authorities) the problems of unemployment and the family. The coverage of health care expenditure decreases. Low-quality medicine is provided for the poorest people. A two-level society is openly served by two-level medicine. This scenario is a scenario of breakdown.

Scenario of "creating a sense of responsibility"

No solution is found to the international financial crises. Growth has slowed right down, but society agrees to give up adjustments and to reconstruct solidarity on a new basis:

- sharing of available jobs and corresponding income;
- productive use of spare time;
- definition of a "right to health" which is exercised through the free choice of a protection scheme. The poor are issued with a "health care voucher", people in employment pay part of the cost.

Although the welfare state seems solid, it is not impossible that its centralized structure will be called into question. Although it seems monolithic, its different components (old age, family, health and unemployment benefits) are interlinked: the more difficult it becomes to finance unemployment benefits and old age pensions, the more collective health expenditure will need to be brought under control. New partners may have an important role to play: the insurance companies, patients with a sense of responsibility, local communities.

It cannot be predicted with any certainty what will happen in the next 15-20 years, but in practically all countries, whether developed or developing, the provision of totally free health care, entirely financed by the State or by community mechanisms, is being called into question, and ways of making individuals (partially) responsible and getting them to

participate directly in financing their protection against disease are now being considered.

## HEALTH EXPENDITURE AND HOSPITAL FUNDING

### A Past Conducive to Growth

From 1960 to the late 1970s, hospitals in the industrialized countries were able to spend a great deal of money: they were expanded, modernized, equipped, humanized, made open to all. Three factors were conducive to this:

- they derived virtually all their resources from health insurance schemes (or other systems of collective funding);
- economic growth was high (average of 5% up to 1974); and
- the income of health insurance and social security schemes was adjusted to expenditure each year.

These financing conditions were the factor that permitted the expansion of public hospitals. The volume of hospital expenditure increased each year by between 8% and more than 10% from 1960 to 1980.

This period now seems to be over. Hospitals, which account for 50-80% of health expenditure depending on the country, will see this share level off or decline.

### Blind Rationing or a Budget Linked to Level of Medical Activity?

Funding could be based on an identical annual rate of increase for all hospitals or on an indicator of medical activity. The latter system is applied in the United States of America, and various European countries are moving in the same direction (Benelux, Portugal, United Kingdom). This system will make funding more flexible. Success will depend on the use made of the Project for Medical Applications of Information Systems and on the quality attained by the hospital information system, the key problem in the hospital management of tomorrow.

### How Much Rationing?

It is reasonable to suppose that the annual rates of increase will be in line with economic growth. This gives a range between 0% and 2.5% up to the end of the century, adjustable if the PMSI is used to distribute

resources among the hospitals. The future will therefore be in striking contrast with the recent past - see Table 1. (14).

Table 1. Annual increase in public funding of hospital expenditure in France

1970-1975	1975-1980	1980-1985	1985	1986	1985-2000 (estimated)
9.3%	8.6%	5%	3.3%	3%	0-2.5%

### Non-hospital Practitioners

In most countries expenditure on non-hospital medicine is not undergoing such a violent change. There are two reasons for this:

- This expenditure is not regulated (except in systems where non-hospital doctors are paid salaries or remunerated according to the number of patients on their books).
- The health insurance schemes often cover only part of such expenditure.

#### Unregulated expenditure

Fees are paid according to the procedure and reimbursed in the same way. International experience shows that none of the conventional regulating mechanisms have much effect on overall expenditure (proportion of cost paid by the insured, agreements fixing unit charges). The volume of consumption is continuing to increase everywhere, especially where the unit prices are controlled.

#### What can the health insurance system do?

It is unlikely to do nothing. Its expenditure, if left unchecked, increases faster than its income. What can it consider doing? There are four possible approaches:

- Restrict private hospitals to a total budget or a flat rate per patient depending on the diagnostic group to which the patient belongs. But the latter system does not solve the

problems of appropriateness of medical treatment.

- Restrict the medical profession to a total budget for out-patient expenditure. This calls into question the fee for service and what we call liberal medicine.
- Negotiate with non-hospital practitioners a flat rate for expenditure per patient (as in the Republic of Germany).
- Allow the proportion paid by the patient to increase gradually and partly privatize non-hospital expenditure.

Experience (in France and elsewhere) shows that it takes about five years after the introduction of a new mechanism before the effect is felt. What solution is possible?

#### Pressure of medical demography

In many countries the number of doctors will certainly increase. This raises two major questions:

- Where will these new doctors set up their practices? Density varies widely from one region to another, so some areas are likely to reach a virtual saturation point.
- Will density stimulate consumption? It will increase the proportion of specialists and practitioners of alternative medicine (acupuncturists, etc.) and the charging of fees in excess of the reimbursable limit, i.e. the privatized sector. But on the other hand, the more doctors there are the less they will have to do. Consumption will not grow as fast as the number of doctors. However, a large body of private practitioners will be prepared to accept patients who used to be treated in hospitals; this kind of transfer from the hospital to the non-hospital sector seems to be already under way in countries (such as France) where a total budget has been set (in France it was introduced in 1984) - see Table 2. (14).

Table 2. Annual increase in volume of health services in France

	1970-1975	1975-1980	1980-1985	1985	1986	1985-2000 (estimated)
Outpatient care	7.2%	5.4%	6.4%	7.4%	7.5%	6-8%
Medical purchases (drugs, spectacles, etc.)	10.5%	4.7%	8.3%	10.7%	8.4%	

### The New Needs

New needs will have to be satisfied: artificial procreation, organ transplants, compensation for the deficiencies of old age, etc. These needs are shifting the borderline between medical demand and social demand and are liable to endanger the different types of collective funding of care: some categories of care would no longer be regarded as medical and would involve households in additional expenditure, if indeed they could afford such care at all. The idea that social coverage should increase indefinitely has turned out to be a "mass delusion", but no clear vision has developed of the process whereby major gaps will open up in social protection.

### Bleak Future, Cheerful Future and Competition Between Public and Private Hospitals

Two quite different situations are therefore appearing as we approach the twenty-first century:

- A dwindling market for the hospital, which virtually has to deal with only one buyer, the social security system. Free hospital care cannot be called into question if the hospital's mission does not change, because its clientele is not well off. Its resources will be rationed. Its only way out seems to be to exploit untapped resources of productivity.
- An increasing market for non-hospital medicine: increasing because it is expanding, diversifying and because patients'

expenditure will be covered by social security, by themselves or by their insurance.

These future prospects are throwing the organization of health care and the relationship between hospitals and non-hospital medicine into the melting pot. In an expanding market, it is the producer who offers the best quality/price ratio who should grow the fastest. This is true with or without the involvement of private insurance. Advances in productivity will play a central role.

The public authorities might seek partners with whom they can renegotiate the outdated terms of financing (private hospitals, biomedical laboratories). This would mean the public hospitals losing some of their clientele.

The universities might turn to the private sector (private hospitals and private practitioners) to find more varied training grounds for students. This would mean the public hospitals losing resources associated with teaching.

Non-hospital practitioners might become associated with hospitals through interfaces that improve the arrangements for care (casualties, local hospitals, networks of coordinated care). This would mean the hospitals losing a lot of bed days and perhaps admissions.

The contrast between a hospital sector whose traditional market is shrinking and a non-hospital medicine bursting free of the financial constraints of the post-crisis period could render obsolete the old contest between "public and private" and replace it with a new contest in which the best would win, regardless of its legal status. Here the only way out for the public hospitals would be to become more professional and effective and to extend their services towards expanding "markets".

#### PRODUCTIVITY AT THE HOSPITAL

Increasing productivity means improving the ratio between the quality produced and the factors of production used. In a hospital this ratio is measured by:

- the improvement in the health status of patients; and
- the hospital resources used.

In the future, if financial resources increase by from 0 to 2.5% at constant prices), increases in productivity will be the main means of engaging in new medical activities and keeping up with technical progress.

A clear and original view of the sources of productivity is needed, perhaps based on the nature of hospital costs.

**Variable costs and structural costs (the figures relate to Assistance Publique-Hôpitaux de Paris)**

The variable costs are the tip of the iceberg: at most 15% of the total, covering medical expenses, food, labour. They increase quickly (more than 5% per annum). These are the only costs that can be reduced in the short term. It would seem desirable to avoid certain types of wastage in medical examinations (duplication between hospital and non-hospital medicine) and to develop consensus on diagnostic and treatment strategies and on systems for assisting with medical decision-making.

The structural costs, which are fixed (85%), are mainly staff costs (75%). They comprise: general hospital departments (27% of expenditure and 19% of staff), technical departments (where part of the variable costs arise: films, medical equipment, transfusions, etc.) and medical departments for short, medium-term and long stays. The structural costs change more slowly, but it is here that progress in productivity lies in the long term, through adaptation of the structure to needs.

In general hospital departments, analytical book-keeping can be used to identify the cost prices. It is known that these cost prices (for meals, cubic metres heated, tonne of laundry washed) vary widely from one establishment to another and are often higher than those for comparable industrial or commercial establishments. The question then arises whether to transfer some functions not directly related to care to outside contractors.

In specialist medical departments the practitioners suggest the general application of less expensive formulas that cater for the needs more effectively. A day hospital costs only 40-50% as much for the same disease, while scheduled admissions always cost less than emergency admissions (15). The change has got off to a good start with domiciliary care and above all with the day hospital, which between them account for one patient in nine (one admission in three). Day-case surgery, on the other hand, although common in the United States of America and accepted in Sweden, seems more controversial.

Prevention and a sensible sharing of the market with non-hospital medicine would make it possible to reduce the number of patients and the severity of some cases (example: structures such as the Association for Properly Coordinated Diagnosis at the Hôtel-Dieu and the Centre for Emergencies and Rapid Diagnosis at the Necker Hospital).

Measures to reduce queuing times (for performing technical medical tests whose results are required for taking case management decisions) can reduce the period between admission and initiation of treatment.

The teaching of patients and their relatives and friends has the same effect (such as "cooperative care" in the United States of America). Part of the responsibility for this is borne by the patients' associations, which at present are not sufficiently developed.

In order to exploit these untapped seams of productivity there is a need for restructuring, for getting rid of some beds (10-30%), for creating facilities for rapid diagnosis, for day care, for weekday care ... and for coordinating this action with non-hospital medicine.

In surgery the approach is similar. It seems certain that competition with private hospitals will play a cardinal role and stimulate advances in productivity.

In internal medicine the problem is very different. Some departments receive or keep between 20 and 40% of patients who do not belong there. Either they are awaiting admission to a specialist department or to a medium-stay or long-stay hospital, or they are admitted by the casualty department because there are no social structures to meet their needs. Advances in productivity will be achieved by converting a lot more "acute" or short-stay beds into medium-stay and above all long-stay beds and by reorganizing casualty departments.

Adjustment of work timetables; the weight of staff costs is partly accounted for by the traditional organization of work, whereby staff are constantly in attendance on the patient. But hospital tasks are now changing: they are more concentrated in the daytime, a trend that will become accentuated. Adjustments to timetables should make it possible to adapt staffing levels to the "peaks" and "lows" of daytime activity. Substantial increases in productivity will be possible. The development of part-time or "selected time" work is a step in this direction.

To sum up, advances in productivity can be expected in the short-term from the control of variable costs. However, most such advances will come in the long term from a restructuring of the pattern of care between hospital and nonhospital medicine, and within the hospitals themselves, whereby the means will be strictly adapted to the needs. Taking the available techniques into account, a substantial part of these advances will come from fresh thinking about the borderline between the hospital and non-hospital medicine and about transfers of responsibility from the hospital to ambulatory medicine. The public authorities have expressed the wish to develop these "alternatives", and in France the national health insurance scheme is preparing to contest the presence in hospital of patients whom its medical inspectors describe as "inappropriate" (16).

## MEDICINE AND SPECIALIST SURGERY

### What Patients and what Needs will Change at the Hospital?

#### Within 10 years

Depression, everyday diseases of childhood, respiratory insufficiency, asthma, arterial hypertension and common haematological complaints should be treated in day hospitals, in outpatient clinics or by appropriate non-hospital care. On the other hand, admissions for severe dementia in the very old, immunodeficiency disorders, viral diseases, care associated with reproduction and frequency and transplants will all increase.

#### Within 20 years

Cases of senile dementia will increase in number, but it is not impossible that the symptoms will be limited. The cerebral ageing and dependence of old people will gradually occur later as new generations reach the age of 80 years and over. But the effect of prevention will be delayed: this is a question structure. Acute cardiovascular diseases could be greatly reduced if they are correctly managed, and if the possible preventive activities are well organized and followed up. Competition from the private sector could increase. Cancer will increase as a proportion of severe diseases. The effect of prevention and detection techniques will become evident only slowly, because it will concern the younger generations. Competition from private hospitals will remain low. Major changes are not expected until after the year 2000 or 2010. Retrovirus infections could lead to admission to hospital of a great number of severely ill patients.

### Hospital Activities Will Become Increasingly Specialized and Diversified

This is the historical trend. New specialties arise through the fragmentation of disciplines. For example, haematology has given rise to haematological oncology, immuno-haematology and the study of blood clotting disorders. The gynaecology/obstetrics of the post-war period has been transformed in the last 10 years into gynaecological oncology, obstetrics, fertility and assisted reproduction, and non-surgical gynaecology. Finally, paediatrics is splitting up into paediatric nephrology, paediatric oncology, paediatric dermatology and so on.

The specialists expect the traditional tasks of the hospitals, principally curative, to be extended to certain aspects of prevention and information.

In the next 30 years, progress in molecular biology and genetic engineering will transform prevention, which will become based on the evaluation of risk factors and on a genuine predictive approach.

Molecular genetics can already detect pseudohypertrophic muscular dystrophy, soon it will be able to detect cystic fibrosis of the pancreas, followed in the not-too-distant future by common polygenic diseases, "pre-disposing genes", the risk of cancers developing, etc. These discoveries will lead on to predictive medicine and to gene therapy. Here highly specialized and expensive techniques are involved, which initially will not pay their way. Such techniques will be developed in research laboratories and - quite apart from the ethical problems - before they can be made available to the population it will be necessary to integrate molecular biology with clinical hospital medicine, evaluate it, then provide training, and organize relations with industry, other disciplines and prevention agencies. The expansion of molecular biology and the attendant needs for training and evaluation could be very considerable indeed.

A passive hospital medicine is likely to devote all its resources to expensive equipment (surgery, transplants), whereas a simple effort to reduce the waiting periods for specialist departments would lighten its workload. An active hospital medicine could devote more resources to speeding up the transfer of laboratory technology to non-hospital medicine and to prevention, instead of the costly and complex present-day methods. This activity would be more effective and in the long term less expensive as well. Active hospital medicine ought to play a leading role in the two-way transfer of technologies, a role that could extend to providing information for the media and the general public. Failing that, everyday medical practice could fall a long way behind the optimum practice as defined by the rapid and widespread use of the best available technology. And this backwardness would be expensive. The hospital must continue to take part in developing therapeutic procedures.

The example of cancer is often mentioned, as is the example of "terminal" care. It is known that some forms of care do not lengthen the survival period of patients. How should we confront this reality? Should we spend money on his kind of care? Is it up to doctors or society to take the decision?

#### Specialist Activities Will Need to be Rationalized

Here, the experts describe what in industry is called management, analysis of the production process, total quality (17).

The rapid growth of genuine prevention, the increased efficacy of drugs and ways of distributing them, and the increase in less expensive facilities (day hospital) will to a very large extent replace traditional hospitalization. A specialty is likely to be defined in future as a cohesive set of skills, human and technological resources, which if need be can call upon accommodation and catering facilities, close - in terms of access and time - to technical facilities, and flexible enough to permit frequent regroupings. In this area, a large number of changes are foreseen.

Specialties could regroup or become increasingly interdependent - for example, psychiatry, neurology, gerontology and internal medicine - or again, paediatrics, obstetrics, neonatology and specialist surgery of the foetus. Less invasive cardiological and radiological procedures would increasingly replace the traditional heart surgery techniques.

A new kind of organization should make it possible to integrate the work of the horizontal disciplines: immunology, molecular biology, invasive radiology. The technical facilities will become more resource-intensive and specialized, and at the same time some miniaturized and less expensive equipment will make its appearance in the clinical departments. In 15-20 years, automation will lead to a tremendous increase in biogenetics laboratories, which will be used to deal with polygenic diseases.

According to the experts, rationalization should lead to the elimination of about two-thirds of specialist beds. The majority of beds in psychiatric hospitals will disappear in the next 20 years, to be replaced by a few psychiatric departments within polyvalent hospitals and by more open facilities such as day or night hospitals or half-way houses.

In paediatrics and common haematology, most of the present beds are expected to become unnecessary. In pneumology and cancerology, a large number of beds will also be eliminated.

Many common procedures in conventional radiology and functional explorations should be performed outside the hospital, at lower cost, more quickly, with no waiting. These changes should be accompanied by constant measurement and optimization of the quality of care.

#### New Tasks for the Hospital

The hospital ought to create friendlier environments to cater for those of its clients who are not ill (those admitted for childbirth, preventive care, etc.), improve its staff recruitment and update its image for chronic patients (psychiatry, long-stay) in order to motivate its staff. These "friendly environments" should halt the deterioration in relationships between the general public, the hospital staff and the hospital management. Some experts analyse them in terms of "image and product". They see them as a way to escape from the image of the hospital as a place of disease and death, a source of anxiety, and transform the hospital into a place that meets the needs of the "major stages in life": birth, procreation, acute diseases in adulthood, ageing and death. This approach already exists in the areas of paediatrics and maternity and ought to be applied more generally. The experts believe it is vital for the public hospital to change its image in this way.

The hospital may develop epidemiological statistics centres, which are a novelty and a necessity. The epidemiological approach will lead to a better understanding of the risk factors and subsequently to ad hoc

preventive attitudes. It calls for rigorous method, trained staff, and data processing facilities.

The hospital should have flexible outpatient departments, in very close touch with general practitioners. It might almost be said that these departments should no longer be used to fill hospital beds but to empty them. They should be highly specialized, organized on the principle of programmed examinations as in the day hospital, and should make specialist skills and technical facilities readily accessible. The presence of private practitioners who work part-time in the hospital will improve communication and the spread of information. The running of outpatient departments will call for well organized appointment systems.

The hospital could define diagnostic and therapeutic strategies. Evaluation of the efficacy and cost of new treatments will be essential. The spread of new strategies will be a necessity for hospitals. This will raise ethical problems, for in medicine it is difficult to reach a consensus on "a" strategy, which often remains valid only for a short time. Evaluation of protocols ought to make it possible to give preference to the strategies with the best cost-efficacy ratio. Once defined, these strategies should be disseminated and their everyday application should be evaluated.

In conclusion, the description of the experts is striking on account of its resemblance to the traditional analysis of economic innovation by Schumpeter (18): a never-ending process of creative destruction. They describe permanent progress, which should lead to regroupings, combinations of skills, relating either to new equipment or to a new need (AIDS). This view of the matter presents two problems:

- It conflicts with the rigid structure of hospital departments. The medicine of the twenty-first century will be a matter for multidisciplinary teams, not for individuals working in isolation in their own fields.
- It leads to rejection of the concept of "specialty" and its replacement by the concept of "performance".

All the experts stress the need for flexibility - in human relations and information. Medical teaching and the assignment of practitioners to hospital duties should be organized in such a way as to be conducive to regroupings, multidisciplinary work and the spread of new ideas. Some aspects of medical studies ought very soon to be redesigned in this direction. All recognize that this is essential for the future. Flexibility is needed in capital expenditure as well. Equipment ought also to be the source of flexible organization.

## Maternity and Paediatrics

These two disciplines have undergone considerable modifications in recent years.

In the last 20 years in most countries the maternity units of public hospitals have been modernized and have gained a reputation for quality. Far-reaching changes have been observed in paediatrics, involving a new kind

of hospital organization that is better suited to the needs of paediatric patients - consultation, functional exploration, daytime hospitalization and weekday hospitalization. Substantial efforts have been made to make the children feel more at home - architectural adaptation, appropriate decoration, development of cultural and recreational activities. This should lead to better acceptance of the hospital by child and family. The future introduction of family accommodation in paediatric hospitals should strengthen still further the concept of "home at hospital".

Parents want the best guarantees of good health for their children. This leads to a formidable demand for prevention. Preventive approaches will become increasingly refined. With the general improvement in living standards, and with the availability of vaccinations and antibiotic therapy, activities to prevent infectious diseases will probably be carried out at an increasingly early stage. The prenatal diagnosis already performed in many situations will extend further as a result of technical progress, understanding of the mechanisms of genetic diseases, and the discovery of new early indicators of anomalies detectable in the gene or gene product. Prenatal diagnosis will be performed by non-invasive methods or methods that entail the least risk for the woman and the foetus. Detection of certain malformations by echography or by other imaging methods applied to study of the foetus will become widespread. Some forms of treatment in utero and some reparative surgical therapies (for congenital cardiopathies) and the application of complex techniques such as bone marrow transplants will be introduced. Molecular biology techniques applied to the diagnosis of genetic diseases, or even treatment of these diseases by "gene transplants", will develop in the centres with the best design and technology. All these developments will call for multidisciplinary approaches covering genetics, immunology, biology and modern imaging techniques. Some hospital maternity units and some paediatric departments will be designed so that they can benefit from all these technologies that are a direct outcome of research.

Paediatric activities for the older child could be dominated by setbacks in prevention and by as yet unpredictable diseases. Paediatric departments will devote the majority of their efforts to severe or complex diseases requiring increasingly precise care administered according to a strict protocol. These include cancers, infections with an immunological component, and genetic diseases not diagnosed during intra-uterine life or infancy. The therapies will generally be expensive, as in the case of marrow or organ transplants which will increase in number up to the year

2000, then level off and diminish as prevention improves. New kinds of transplant can be expected - bone marrow transplants after manipulation of cells in vitro to permit the replacement of organs affected by malignant disease (leukaemia and cancer), or genetic (stress diseases and haematological conditions) or acquired disorders (medullary aplasia). Up to now these organ transplants have rarely been performed on account of the difficulties in ensuring survival of the transplant.

This kind of highly specialized medicine will require a large number of doctors, multidisciplinary organization, and teamwork whereby general practitioners and specialists will work in harmony paying great attention to diagnostic and therapeutic requirements, to human relations with patients and their relatives, and to ethical issues.

### Psychiatry and Gerontology

For these two disciplines the present structures are poorly adapted and the needs will change:

In psychiatry, agreement on the alternatives has already been reached.

The psychiatric hospitals will complete the process of giving way to district psychiatric services, sheltered accommodation, half-way houses, etc.

In gerontology, the deterioration of physical and intellectual capacity is occurring later and later with each generation. Old people will become dependent at a greater age. The "risk population" will be the age group over 85 years, 20% of whom suffer from senile dementia. Fewer old people will be admitted to hospital, but those admitted will on average have more serious conditions. They will require specific case management, and will no longer be able to remain in departments for "acute" patients as is still often the case. It will be necessary to train geriatricians, offer them career prospects and organize suitable structures in which facilities for diagnosis, intensive care, reeducation, rehabilitation and long-term care are all present.

In both these disciplines "friendly environments" of human dimension should avoid concentration, promote sociotherapy and the "real life" approach, initiate the return to independence, and encourage the use of alternatives to the conventional hospital.

### Pneumology

This is a fast-developing discipline; whereas in 1960 it was close to cardiology, it is now much closer to cancerology, haematology, infectious diseases and clinical immunology.

### Diseases on the increase

Bronchial cancer is mainly associated with tobacco consumption. Its frequency doubles every twenty years. It will take forty years before the effects of any reduction in smoking are felt. Rationalized screening should make it possible to recognize cases earlier and increase the indications for surgery, which will long remain the most effective treatment. Chemotherapy will become more costly and resource-intensive. Within ten years, active and/or selective immunotherapy could produce prolonged stabilization of cases.

Severe pneumonopathies of immunodepressive origin (chemotherapy, AIDS) will increase dramatically.

Transplantations of both lungs and above all of one lung will increase substantially, and should reach 500 cases per year in France within 15 years. They will be used in cases of emphysema and severe pulmonary fibrosis in subjects aged 20-60 years.

### Conditions in decline at the hospital

Although asthma is on the increase among the population (it has doubled in 20 years), patients will less often be admitted to hospital since their condition will be controlled outside by prophylactic drugs. Mortality could be greatly reduced through better education of doctors and patients and through more appropriate facilities for care.

With the reduction in smoking and in occupational exposure to pollutants, chronic bronchitis and emphysema should follow the same trend, with a reduction in the number of patients and less severe disease that can be attended to outside the hospital.

More effective screening for thromboembolic conditions, which are still a cause of death on account of late diagnosis, should reduce cases by half. The genetic defects that lead to them are beginning to become known. It can be expected that physicians will receive better training in diagnosis, in prevention, and in ten years' time in the control of thrombolysis.

### New structures

Pneumologists will work in three directions: cancerology and severe immunodepressive disorders; asthma and allergies; respiratory insufficiency and occupational diseases. Pneumology units should be linked with the units for neoplastic blood disorders, clinical immunology, infectious diseases and intensive care. One-third to one-half of conventional beds should disappear, as should pulmonary surgery as an independent and exclusive entity. Laboratories for exploratory function tests should largely be replaced, at lower cost, by automatic devices. Non-hospital

doctors well informed of the new protocols could attend to cases of asthma, chronic bronchitis and cancer screening.

### Neurology

The neurosciences have been developing since the 1970s. It is hoped within the next 10-20 years to identify the genes and/or molecules responsible for many diseases. A preventive approach would then become possible.

Neurologists essentially treat five types of disease:

- Genetic diseases, which are rare. They will be detected in utero within ten years and may be treated by genetic manipulation after the year 2000. These possibilities will present serious ethical problems and treatment will be resource-intensive.
- Degenerative diseases. Some will be given symptomatic treatment (Parkinson's disease). Others (Alzheimer's disease) will be improved within five to ten years. We may hope to know the causes by about the year 2000. The effect of any preventive techniques would not be felt for 30-40 years! Priority therefore needs to be given to developing symptomatic treatments.
- Inflammatory diseases of the nervous system (multiple sclerosis) could become preventable at the same time as the diseases just mentioned.
- Cerebrovascular accidents require resource-intensive emergency care followed by functional reeducation. Hope lies in prevention and in the long-term treatment of atherosclerosis.
- Knowledge of cancer has been improved by widespread use of the scanner and of nuclear resonance imaging. But the therapeutic protocols are still resource-intensive and not very effective. Hope lies in selective chemotherapies. More specific treatments are expected within ten to twenty years.

Hospital neurology will be resource-intensive, and confined to diagnosis or to treatment of short-lived acute phases. It offers possibilities for rationalization and for protocols well suited to the day or short-stay hospital. It will need to be practised in continuity with care by the family or by the patient himself (associations, hotels). A heavy demand will develop for structured organization of post-hospital care (postgraduate teaching, secretarial services, communication with the hospital, etc.). This demand could be met by external facilities or domiciliary care. Severely handicapped patients and their dependants

require special skills (psychological attitude, availability, presence). Hospital departments respond poorly to their needs.

To optimize the methods of care it will be necessary to encourage closer contact with geneticists, cardiologists and haematologists. Neurologists should be given the resources to practise rapid and resource-intensive medicine in areas where this has proved its efficacy. Finally, where medicine is powerless, places where the patient can live and be looked after until death should be created.

### Specialist Surgery

The decision-making approach will in future lead to two types of protocol and should provide a better cost/efficacy ratio:

- reparative surgery and symptomatic medicine for old people or those who cannot receive transplants; and
- preparatory medicine followed by transplant for younger people.

In this scenario, a separation between medical and surgical departments would be regrettable. The trend should be towards a small number of departments dealing with one organ or several organs (kidney, liver, pancreas), which would include an internal medicine unit, a surgery unit and a bioimmunology unit.

Day-case surgery could develop substantially along the American lines (30% of operations). With this system the patient's family bears part of the cost of care. The prospects depend on the attitude of the medical profession and on the social category of the patient. The more welfare cases and old people the public hospital receives, the less it will be able to develop this kind of surgery.

The future of organ transplants raises three questions:

- Little is known about the cost/efficacy ratio. It is easy to list the advantages of this technique (life expectancy, quality of life) and to measure its cost. This ratio ought to be a good indicator of future trends.
- The supply of organs is still inadequate in quantity (kidney) or in quality (lung) compared with demand. If xenografts should become possible (grafting of organs of animal origin), the prospects would be greatly improved.
- A risk of over-equipment in twenty years' time, when progress in prevention may well lead to a decrease in the use of this resource-intensive technology.

Transplantation could increase substantially over 15-20 years, then undergo some regression. In any case it will only be carried out in a small number of specialized centres in the rich countries.

### Heart and blood vessels

During the last four decades cardiology has benefited greatly from advances in electronics and information technology, together with the development of invasive techniques and increasingly effective imaging techniques.

However, epidemiology is undergoing a transformation, and conditions requiring post-rheumatismal valvuloplasty are becoming less common, to be replaced in part by degenerative valvular conditions. Congenital cardiopathies will decrease as a result of advances in prenatal diagnosis. Myocardiopathies, primary muscle diseases, will undoubtedly become more common. Indeed, the cardiology of tomorrow will be dominated by coronary ischaemia, i.e. atherosclerosis and thrombosis. Prevention may reduce the frequency, but there is no prospect of a genuine regression without effective research on atheroma.

Surgery will continue to be a growth area, with new appliances and prostheses. But radiologically controlled cardiological techniques will become increasingly effective at correcting certain anomalies without recourse to surgery. For example, stenoses or coronary occlusions will commonly be treated by angioplasty or by laser, under direct visualization of the lesions by angioscopy.

What treatment will be given for the cardiac consequences of arterial diseases associated with smoking, arterial hypertension, lipids and platelet deposits? Drugs that block interactions are making their appearance. We are beginning to identify the subjects at risk who are more likely to develop a hyperlipidaemia.

In the near future, prevention through drugs is likely to bring about a sharp decrease in cardiology needs as one generation succeeds another.

### Haematology

Non-cancerous conditions account for only a small part of this field. Malignant haematological diseases will continue to be diagnosed in private practice and treated in hospital. A few beds will still be needed for severe haematological conditions (acute leukaemias, lymphomas, marrow transplants). The traditional beds will disappear. All the other patients can be treated in a day hospital or outpatient clinic. A very small number of highly specialized centres could become responsible for all haematology cases, taking over from the internal medicine departments.

## Molecular Genetics

The methodology of genetic engineering first appeared in 1972 and its medical implications are immense:

- In "predictive" medicine
  - . Progress in the prenatal and postnatal diagnosis of hereditary diseases. A highly original aspect will be the development of presymptomatic diagnoses, with screening for predisposition, so that measures can be taken to prevent morbidity.
- In cancerology
  - . Spectacular improvement in the resources for detection and prognostic evaluation of neoplastic and pre-neoplastic cells.
  - . Discovery of treatments designed not only to destroy cancer cells but also to correct cellular maladjustment.
- In diseases associated with invasion by a viral, bacterial or parasitic microorganism
  - . Improvements in detection, eradication and protection through the tools of molecular biology, and particularly through the development of new vaccines.

### In the therapy of genetic diseases

- . Substitutive gene therapy through reprogramming of somatic cells could be made available in certain special cases.

## INTERNAL MEDICINE AND GENERAL SURGERY

### Internal medicine

Unlike specialist medicine, internal medicine does not create a monopoly. It fulfils the function of a "general hospital" in the major hospital complex. A substantial proportion of its clientele could now be handled by non-hospital medicine, social services, long-stay establishments. Its activity and patients' length of stay will therefore depend in future on initiatives by private practitioners and on the facilities available for the old or needy. Medical technology does not seem to be involved very much.

The long-term clientele of internal medicine at present includes subjects who have:

- multiple diseases involving several organs, often young or old people;
- fever, weight loss, pain syndromes, unexplained fatigue;
- diseases involving the immune system;
- peripheral vascular conditions;
- non-localized or generalized cancers;
- disabilities due to the use of drugs; or
- "difficult" diseases that need to be explored and do not at first sight fall under any specialty.

These patients will continue to require care and long-term observation. Their length of stay will be reduced somewhat further, but not much.

The clientele on the decrease include, in particular, patients with:

- diseases associated with psychiatric problems;
- acute cerebrovascular accidents; or
- bacterial diseases.

The new clientele includes patients with:

- viral diseases, with their concurrent and later complications;
- complex diseases of affluence; or
- conditions associated with pollution and accidents.

Two very different pictures are emerging for the twenty-first century, depending on what the relationships will be between internal medicine and the specialties:

Internal medicine will partly disappear through the hyper-specialization process at the major hospitals. This is the view taken by people who have experienced the fragmentation of internal medicine into increasingly refined disciplines. It is clearly foreseen by many internists and desired by some specialists, who see it as a prerequisite for improved performance. Is it consistent with the desire for flexibility expressed by the medical profession as a whole? Or with the desire for personalized care? This development makes it virtually compulsory for

the patient to start with the general practitioner and raises the problem of the training of general practitioners.

Internal medicine would become the focal point for specialties. The breeding ground from which specialists would branch out and to which they would return. It would give up its social function and become integrated with vast groupings coordinated either by a specialist or by an internist. This development would enable the hospital to remain an initial recourse for patients and would assist it in classifying patients. It would probably add flexibility. It would enable specialists whose work is on the decrease to acquire new skills and would enable disciplines that wish to become individualized to do so.

In the United States of America, hospital departments are general-purpose. Each practitioner belongs to a specialty. Mean lengths of stay are shorter than in France (7 days compared with 13 at the Assistance Publique). Beds are not assigned to any particular specialty. Doctors working partly in private practice and partly in the hospital attend to admissions, information and discharges. This kind of organization has proved conducive to a fairly specialized form of medicine. The launching of "family practices", designed to serve as "super-general practices", met with failure.

In the United Kingdom, all patients are seen by their general practitioner before being admitted to hospital and return to him on discharge. At the hospital they see the internist before being referred to a specialist.

There is also the problem of patients in the terminal phase of care. A corollary to society's increasing use of medical care is that deaths more and more frequently take place in hospital, which is becoming the natural place for life to end, a function it is not always suited to fulfil. Death is thus being excluded from the day-to-day pattern of society, and this trend seems difficult to reverse in the medium term. Should units for palliative care be developed? And if so, within which departments?

#### General surgery

General surgery in public hospitals will be subjected to two influences for change:

- medical technology; and
- competition from private hospitals.

Technological progress (particularly in anaesthesia) will make it possible to reduce the length of stay still further.

Some activities are on the decline and whole areas of current surgery could disappear:

- heart surgery (coronary and valvular);
- common visceral surgery (prevention of cancers of the colon by detection of polyps, gallbladder surgery);
- removal of severe tumours; and
- removal of renal calculi.

New activities will include:

- partial organ prostheses (major organs, pancreas, joints, intra-ocular implants);
- transplants;
- intensive care and specific surgery for old people (replacement surgery to improve the quality of life);
- cosmetic and plastic surgery; and
- invasive endoscopy, laser surgery (ophthalmology, cancerology).

Aggressive competition from the private sector could accentuate the decline in some everyday activities and deprive the public hospital of activities that have been growing steadily ever since they became available, especially for well-off or working patients.

Surgeons believe that the quality of accommodation will be a determining factor in this process. Departments will need very few beds, but there should be comfortable and friendly hotels nearby.

Relations with the media, information about the services offered, about quality and performance, about selection criteria will also play a major role in attracting or keeping the present clientele.

Surgeons, like specialists, will need continuing education to keep up with technology and needs.

#### Major strategic options

Internists and surgeons have identified five major options on which their work in the twenty-first century will depend.

A national prevention policy

Whether this policy comes from the health insurance funds, from the Ministry of Health, from people who want to take care of their bodies, or from their general practitioners, will profoundly modify the demand for hospital care, especially in the following cases:

- senile dementia;
- road accidents;
- sexually transmitted diseases;
- alcoholism and smoking; and
- cardiovascular diseases and cancer (through the development of knowledge about the HLA (human leukocyte antigen) complex).

This comment raises the fundamental question: if there is no external initiative, should the hospital itself take the initiative, i.e. get involved in providing information, whether alone or in partnership with others?

What will the retirement age be (will it be later)?

Will the "young oldies" aged 60-85 live a "second working life" by seeking voluntary work? Can the hospital find ways of using this working capacity that society does not need?

General practitioners can obtain access to hospital expertise without needing to send their patients to the hospital

The introduction of communications systems could modify the pattern of work of internists and surgeons through:

- data banks, expert systems;
- aids to the monitoring of treatment, message services for the chronically ill;
- training in decision-making, software for computer-assisted teaching of diagnostic, therapeutic and preventive strategies;
- epidemiological studies; and
- teleconferences with general practitioners, doctors in other countries, etc.

### Flexibility in all things and in all areas

This will include premises, staffing, subspecialties, response to clientele, etc.

### Increased productivity

This seems potentially possible everywhere; for example:

- definition of protocols for care, so as to reduce the cost of equipment, improve the organization of work, training and speed of the staff, evaluation of their application;
- teaching of the decision-making attitude;
- improved coordination between specialties (biology, endoscopy, radiology, and surgery; psychiatry, social services and internal medicine, etc);
- improvement of casualty services and the classification of casualty patients;
- programming of admissions to reduce length of stay;
- professional management of accommodation and catering services, personnel and reception;
- use of business techniques for management of services (management secretariat, quality control, queue management, etc); and
- attempts to find appropriate ways of catering for the needs of very old people, patients in the terminal phase, the very poor.

### IMAGING AND RADIOLOGY

This is one of the areas where the spread of technologies is most rapid. Any forecast is therefore hazardous. What is certain is that major advances, unimaginable today, will appear in the next 20 years and will spread rapidly. Here we confine ourselves to listing the new techniques already introduced and their possible development.

#### The technologies of the future

The scanner and MRI will reach the phase of maturity. The very-high-performance scanners will level off in 1990 to make way for small scanners. The unit cost of procedures will drop within 10 years.

Around 1990-1995 smaller and more localized appliances will be available (for the skull, knees, joints, etc.). By the year 2000 three-dimensional MRI will be very widespread.

Ultrasonography and micro-endoscopy. Processing of the image will improve, the appliances will be smaller and will become generally available.

Expert systems, automated interpretation of negatives from banks of reference images, will make it easier to learn and use the technologies.

Digitization of images will lead to the disappearance of films as the resolution on screen and paper improves. It will permit networks for transmitting images within the hospital and between the hospital and external practitioners.

Invasive radiology, already an area of rapid growth, will continue to develop and should really take off from 1990 onward - intraluminal dilatations, transcutaneous biopsies, chemonucleolysis, catheterization and embolization, drug delivery to specific sites, etc.

Automation of surgery under radiological surveillance has prospects which are full of promise and difficult to imagine.

Scintigraphy with specific radio-immunological markers could make it possible to detect and then treat metastases. The first successful treatments could quickly lead to a large number of diagnostic examinations and subsequent therapy.

Some technologies will regress as replacements become available

- conventional radiology, which will survive only for injuries and bones;
- conventional vascular radiology; and
- some functional explorations.

How will activities be organized in the year 2000?

Very costly and resource-intensive equipment (scanner, MRI) has led to centralized and multipurpose structures. Like all disciplines, imaging will specialize. Two factors contribute to this:

- More appropriate and less expensive appliances will appear;
- Examinations are becoming more and more specific to clinical problems. The experts consider three extreme hypotheses:

- . Specialization by machine (MRI, ultrasound, scanner). This is the "imaging departments" option.
- . Specialization by organ (neuroradiology, urinary radiology, etc.), which is easy to develop in organ establishments or clinical departments. Clinicians will increasingly gain control over imaging for their own specialty in order to perform percutaneous procedures (urology, obstetrics). Alongside the heavily equipped centres, miniaturized and less expensive appliances will become widespread in the clinical departments themselves.
- . Disappearance of radiology as a medical discipline; clinicians would confine themselves to asking technicians for images that they would read themselves or read with the aid of a computer (computer-assisted reading). But the experts have shown that progress in imaging comes from the constant interaction of the skills of radiologists and clinicians.

The first hypothesis seems conducive to extending the possibilities of the equipment. It could prevail in an initial phase where research predominates. The second hypothesis would be more appropriate for recognition of and ready access to the technology by patients. It seems more conducive to the extensive spread of these new technologies.

#### Major strategic options

##### Imaging at the service of outpatient clinics

This would reduce length of stay in hospital if there is an improvement in waiting and transmission periods, and could eliminate the need for many hospital admissions.

##### Decision trees, strategies and protocols

The necessary equipment will be expensive, even if its unit price comes down. Health insurance funds, hospitals and patients will demand in return:

- avoidance of pointless examinations;
- reduction in hospital admissions; and
- less aggressive and more effective treatments.

The imaging experts will need to develop decision trees with the clinicians and get general practitioners to comply with them by means of

access criteria or control over the quantity of examinations requested. In return they will have to agree to ensure the optimum use of the appliances, and to supply the requesting physicians with reports in a satisfactory form and within a satisfactory period.

Image networks - a pipe dream?

Such networks are expensive. Clinicians have more need of a report giving reasons and explanations than of a series of images. Proper medical and economic use of imaging calls for permanent dialogue between clinician and radiologist.

Flexibility and the disappearance of strict boundaries.

The analysis is the same as for specialist clinicians and seems to rule out organization into departments in the long run.

Agreements between public hospitals and the private sector

These are sure to develop. High-performance and up-to-date equipment is scarce. The supply of examinations will remain limited by comparison with a highly expandable demand on account of lack of funds, restrictive regulations and bottlenecks in the public sector (limited recruitment, staffing difficulties for week-end or night-time operation). Efforts will need to be made to optimize the use of expensive equipment:

- groupings in order to reach a sufficiently large local clientele;
- private capital to increase funding; and
- joint management of equipment so that it is used to its maximum technical capacity (increase in the number of teams).

**GENERAL OR LOGISTIC SERVICES**

Providing accommodation, heating, laundry services, catering ... these are not the real functions of the hospital. Methods of production are changing very fast from cottage industry to a genuine professional business (accommodation, mass catering). Here again the 1980s have been a turning point. People are becoming aware of the need to modernize and of the possibilities of obtaining better service at lower cost. The extent of the human problems of reconversion is realized. But people often only consider two options - should the hospital do it or get someone else to do it? - whereas the solution for the future is more flexible and more diversified.

## Catering

Current advances offer hope of substantial increases in productivity and of improved quality. The new technologies (freeze-dried or frozen foods ready to serve) can eliminate three functions in hospitals:

- shopping;
- preparation (peeling and cleaning fruit and vegetables, preparing meat, pastry-making); and
- cooking.

They could reduce the number of time-consuming unskilled jobs, and staff could be redeployed in the health sector. The service offered to patients could be improved by:

- packaging and reheating; and
- distribution.

The "clients" will become more demanding and the quality of the meals will be an important factor in their assessment of the hospital. If they are to be treated as clients, technology will have to provide them with:

- variety and choice of meals; and
- quality, pleasant service, hot dishes.

People who are old but not bedridden, accommodated in "friendly living environments", will need collective meals that encourage their independence and social life, so they will need dining rooms and self-service cafeterias, and may prefer crockery to disposable packaging even if it means sharing in the washing up.

## Major strategic options

### Central kitchens and ward pantries

The current chain of operations is very long. It includes buying in supplies, cooking in the kitchen, packaging, transport, reheating in the ward pantry, serving, rinsing in the pantry and proper washing-up in the central kitchen. The future chain will be much simpler:

- assembly of dishes in a central kitchen from ready-to-serve products, and transfer to the wards for distribution; or
- assembly in the pantries, whose function will be upgraded.

It would seem that the serving techniques (washable or disposable plates, etc.) should determine how serving is organized. Should the packaged food be transported to the patient while hot or cold, and what will become of the central kitchens and ward pantries?

Should the hospital do its own catering or contract it out?

Is this an outdated controversy? The real question is how to obtain a high-quality service, varied according to the patients' needs, at a competitive price:

- some of the factors of production are already within the public sector: premises, knowledge of the patient; while
- others lie more in the private sector: know-how, organizational ability, capital.

The "all public" and "all private" formulas may well belong to the past. For each problem there can be a flexible and adapted formula:

- mixed investment company, whereby the capital and managerial ability of the private sector are combined with the medical and dietetic skills of the public sector; and
- technical assistance contracts giving responsibility for organization, supervision and staff training to outside professionals. This solution has been tried. It preserves the hospital's independence and is reversible.

### Laundry

Here again a technical revolution has been taking place over the last ten years.

Disposable bed-linen is rapidly becoming common. Various studies have shown that for the incontinent and severely ill it is less expensive. It reduces laundry work, sterilization and sorting. It makes it easier to keep clean and dirty linen apart. It will require increased incinerator capacity, from which energy recovery is possible.

Unwoven fabrics, highly specialized and adapted to needs, will replace cotton. They already account for 60-70% of fabrics used in operating theatres in the United States of America and Sweden. They are 35-40% cheaper and provide much higher quality. They present problems of storage and specific distribution.

**INFORMATION TECHNOLOGY AND COMMUNICATIONS**

The new technologies can be subdivided into four groups:

- home and office information systems - message services, teletext, automated office services, working at home via a terminal;
- man-machine interfaces through use of keyboard, optical character reader or voice recognition, translation of technical texts;
- smart cards, magnetic or laser-read, for storage and dissemination of information, which are becoming widely used in patient management; and
- expert systems, now being tried out, and added value systems.

Some technologies have now become routine in industry and the services sector. The man-machine interface and expert systems are at the experimental stage (19, 20).

**For doctors**

Office information systems already lead to improvements in everyday work - management of the department, access to data banks, epidemiological statistics. They will soon provide:

- "annotated prescriptions" explaining the method of use of the prescription, the precautions, but excluding the contra-indications and drug interactions;
- spreadsheets on which reports of tests and hospital treatment will be directly recorded;
- lists of available beds, waiting periods and criteria for access to medical and technical procedures;
- interactive message services for appointments, reports on hospitalization, exchange of files, test results, etc.; and
- teleconferences with hospital doctors in order to determine therapies or for continuous training.

The expert systems comprise:

- operation of data banks, computer-assisted design, computer-assisted data processing, image processing, etc.;
- consultation of encyclopaedias with memorization of findings, scanning of data banks;
- computer-assisted instruction for initial learning of diagnoses, and especially of the new treatments that will result from molecular biology;
- automatic interpretation of routine technical procedures such as electrocardiograms;
- aid to diagnosis;
- mutual information networks for specialists of the same discipline (e.g. nephrologists), these networks developing around a hospital diagnostic centre; and
- international data banks.

As an aid to diagnosis, the computer should not alter the medical procedure. It will be an "intellectual adjunct". It will remind the doctor of known facts, suggest a list of questions for him to ask the patient, then suggest a list of diagnostic hypotheses and therapeutic proposals. It can improve patient-doctor dialogue but not transform it.

#### For patients

Office automation and expert systems can provide patients with information on their health status that is adapted to their needs and give them a large measure of independence. What else does information technology have to offer?

- a user information service;
- guidance on outpatient clinics, waiting lists, records to be brought by the patient, etc.;
- an appointments system; and
- in the wards, videotex terminals can be used for selection of meals and explanation of treatment.

### In the internal organization of the hospital

Many applications are already operational:

- appointments management;
- circulation of reports on technical examinations by teletext or an added value system that provides an interpretation;
- queuing occurs at the start of the chain of operations (registration, admission formalities) and at the time of discharge (payment), and could be reduced by means of a card system - transaction cards could eliminate some of the tasks of billing;
- PMSI (Project for Medical Applications of Information Systems) and management systems, particularly for stock management; and
- lightening the workload of medical secretariats.

### The strategic choices

The catalogue of "possibles" will grow constantly. The big problem will be the status of information technology in the hospital. Will it spread like a medical technique, rapidly and under pressure from demand, or like an administrative and managerial technique, slowly and on the belated initiative of the management? Who will take the initiative? There are three possibilities.

#### Non-hospital physicians

Networks could be formed for a particular neighbourhood, for a particular specialty, around private clinics or group practices. They would be organized around a central computer linked to the doctors' microcomputers. Each patient would receive an individual card, filled in by the practitioner.

#### The health insurance

It issues "social insurance cards" (France) or laser-read cards providing information on insurance coverage and medical records (eg. Blue Cross or Blue Shield in the United States of America).

#### The hospitals

They choose cards for internal use, of the credit card type, which cannot be used outside the hospital. Microprocessor cards (smart cards) can be read by a microcomputer or by a videotex terminal equipped with

reader. The system can be used for storing and processing information. The cards must be protected. They may contain administrative information, information on social insurance status, and a brief report on hospitalization. These systems will be flexible and inexpensive. They will be very well suited to the chronically ill, old people and pregnant women, who are admitted to hospital several times or are transferred from one department to another.

The information should focus on the patient, so that insurance coverage can be verified, records updated, and prescriptions read, etc.

#### THE HOSPITAL FOR ACUTELY ILL PATIENTS IN THE YEAR 2000

This will no longer consist of hospital wards, attached to which are a radiology unit, laboratory and outpatient clinic, but the opposite. The total number of "conventional" hospital admissions will decrease substantially and some hospitals will close.

The hard core of the hospital will therefore be a set of technical facilities including large departments for diagnostic and therapeutic imaging, equipped with large and very advanced machines, located close to the casualty unit and the operating theatre.

Around these technical facilities there will be large polyclinics with specialist outpatient departments, day beds, intensive care units and only a few conventional beds for certain chronic or disabling diseases and for the dying (palliative care units).

The centralization of expensive and resource-intensive equipment, which is common nowadays, will change, because the equipment currently described as expensive and resource-intensive will be transferred to the specialist departments, whereas new technologies will remain centralized in the technical facilities and will be used jointly by several public and private hospitals.

Architecture will have two characteristics: horizontality and flexibility.

Horizontality will mean no more 1500-bed tower hospitals. Instead, there will be more horizontal 300-400 bed hospitals, more accessible to the outside world, with various shops, cinema and video room, and public transport stopping at the hospital entrance.

Flexibility has become necessary because we do not yet know what the future technologies will be, just as in 1970 we knew nothing of the advent of the scanner, MRI, or the lithotripter. Since hospitals are built of concrete, the whole of the inside will need to be made suitable for extensive modification, for example, by siting all the piping and

cables along the outside walls or above false ceilings.

One floor of the hospital, with virtually no beds or medical services, will be set aside for education in chronic diseases for patients and their families and friends (cooperative care in the United States of America).

A good-quality hotel will be attached to the hospital for patients who live far away or in isolated places, who need to visit the hospital several times in succession but do not require medical care at night.

#### IV. THE LIMITS OF PLANNING

Planning for the hospital is limited in two ways.

There is uncertainty about the forecasts made and of the risks taken on the basis of guesses about the future. Forecasting is a difficult exercise, but not to forecast at all means certain deterioration. So it is important to be able to revise in good time a decision that proves not to be the right one and to avoid all-or-nothing situations. It is most important to evaluate the results of planning at regular intervals and to compare the forecasts upon which the plans are based with the trends actually observed.

The hospital planner does not have control over all the constraints, for example:

- medical constraints, especially changes in the role of the hospital, the speed of scientific progress and the ability of the medical staff to keep up with such progress;
- psychosocial constraints which raise the problem of decision-making at the hospital and the relationships between the various centres of power (staff, trade unions, doctors, management, governing board, political authorities, etc.), together with society's perception of the hospital, disease and death;
- constraints resulting from health policies;
- constraints arising from town planning and local geography;  
and
- financial constraints.

The plan must be adapted to these limiting factors, which means planning without undue rigidity.

It is important to develop "sliding" plans that can be updated and revised annually, to preserve the utmost external flexibility (for example, a reserve of spare land to meet urgent and unforeseeable needs), and internal flexibility (for example, the ability to convert a medical department rapidly into a surgical department or a technical unit, by using systems of movable partitions around a central core).

#### STUDIES ON THE FUTURE OF HOSPITALS

Such studies must at all costs form part of a comprehensive national and regional study of the health system, avoiding the all-too-common split between hospital and non-hospital sectors which is expensive and harmful to the patient.

## REFERENCES

1. R. Pinault, C. Daveluy, La planification en santé. Agence d'Arc éd. 1986.
2. Assistance Publique-Hôpitaux de Paris, L'hôpital au XXIème siècle. Ed. Economica, 1988.
  - Hospitals 2001 and beyond: the hospitals of the future. Hosplan, the New South Wales Planning Advisory Center rapport Sidney, mars 1987.
  - D. Jolly, Le CEDIT et la recherche clinique à l'Assistance Publique de Paris. L'Hopital à Paris, No. 95, 1986, pp. 59-61.
3. S.T.G., The future of the heart, the heart of the future. Martinus Nijhoff pub., Dordrecht, 1987.
4. M Packard, Health status of the new retired workers beneficiaries. Social Security Bulletin, 1985.
5. H. Pequignot, La vieillesse demain. Librairies philosophiques, Paris, 1986.
  - S. Sandier, Le vieillissement en Europe et le coût des soins médicaux. CREDES, 1987.
6. P. Heller, R. Hemming, P.W. Kohnert, Aging and social expenditures in the major industrialized countries. FMI, 1986.
7. Institute of Medicine, Health in an older society. National Academy Press, Washington, 1985.
8. J. Chevallier, La morbidité à l'Assistance Publique. Direction du Plan, Assistance Publique - Hôpitaux de Paris, 1986.
  - Measuring health care, OCDE, 1980-1983, Paris, 1986
9. F. Dubet, K. Orfali, C. Wossmer, La maladie, l'hôpital et le malade. Ecole des Hautes Etudes en Sciences Sociales, Assistance Publique, Paris, 1986.
10. M. Crozier, F. Gonet, Les incertitudes de l'identité professionnelle à l'hôpital. Assistance Publique de Paris, 1983.

11. Perspective de développement économique de l'OCDE. OCDE, déc. 1986.
12. Secretariat for Future Studies, Time to care. Stockholm, 1982.
13. Les français en l'an 2000. Economie et Statistiques, juill.-août 1986, INSEE, Paris.
  - L'économie française à l'horizon 1991. Economie et Statistiques, janv. 1987.
  - Prospectives 2005. Commissariat Général au Plan, CNRS, Editions Economica, 1987.
14. Comptes de la santé en France. SESI, Ministère de la Santé. (Comptes Annuels).
  - G. Schieber, Health spending; its growth and control. OCDE, Observer, 1985.
  - G. Schieber, J.-P. Poulier, International health care spending. OCDE Health Affairs, 1987.
  - La santé, financement et prestations. OCDE, 1987.
15. I. Lesage, Etude sur les alternatives à l'hospitalisation. Direction du Plan Assistance Publique-Hôpitaux de Paris, 1986.
  - B. Majnoni d'Intignano, J.-C. Stephan, Hippocrate et les technocrates. Ed. Galmann-Lévy, 1983.
  - P. Giraud, R. Launois, Les réseaux de soins, médecine de demain. Editions Economica, 1985.
16. Etudes sur les services de pédiatrie. Caisse Nationale d'Assurance Maladie des Travailleurs Salariés (CNAMTS), 1986.
17. C. Archer, H. Serieyx, L'entreprise du troisième type. Ed. Le Seuil, 1984.
18. Schumpeters, Capitalisme, socialisme et démocratie. Ed. Payot, 1963 (parution originale: 1946).
19. L. Dreyfus, L'intelligence artificielle. Ed. Flammarion, 1984.
20. J.L. Funck-Brentano, Les effets socio-culturels de l'intelligence artificielle. (Ronéoté) 1986.