Contents

Executive Summary

The seminar focused on developing a vision for the design of environments for health care in the next century. The event resulted from a continuing collaboration of two organisations that share an intense interest in hospital and health care buildings, MARU and the Nuffield Trust.

MARU, the Medical Architecture Research Unit, has expertise in research and development of the design of environments for health care. With over 30 years experience in UK and internationally, MARU has promoted interdisciplinary thinking through research studies and graduate study programmes for professionals from design and health. The Nuffield Trust is a key patron of research and publications on environments for health care which have already had significant impact on the thinking of health care planners and designers this century. This synergy along with the desire to forward think the implications of the predicted radical changes in society, policy, medicine, technology and construction encouraged the two organisations to collaborate in developing a forum for discussing, analysing and visualising implications and innovations for the design of health care environments in 2020.

The seminar began with John Weeks, author of the original studies on hospital design published by Nuffield in the 1950s, launching the publication of a book entitled '50 years of ideas in health care buildings' produced by MARU for The Nuffield Trust. From this informed position, delegates were invited to turn their attention from past to future scenarios.

The seminar set out to develop a vision for health care environments addressing the needs of the 21st century from our current recognition that we are on the verge of a huge technological change in health care due to developments in genomics and info-matics. This gave an exciting opportunity to set up a forum for interdisciplinary discussion about the future. Key note speakers set the scene for the discussions by drawing out the latest thinking from four key aspects:

- Policy Initiatives and Socio-cultural Trends.
- Medicine.
- Communications Technology.
- Architecture.

About 100 delegates drawn from a range of disciplines in health and design were invited to participate in round table discussions at which a vision for a network of health care centres emerged.

Exploring key questions about the vision, 3 themes were identified:

- The visualisation of a network of health care environments as a strategic plan.
- The definition of specialist and local hospitals.
- The articulation of strategies for design and construction.

Central to this vision for 2020 is the concept of a network of health care environments with the patient at the centre of modern and dependable services, customised to local health and environmental needs. Linked data and intelligence packages will support a strategic plan that will no longer be reliant on physical adjacencies for speed and ease of communication. Patients will have wider access to expertise and information facilitated by these developments in communications technology. The shift from industrial age to information age knowledge in medical science will fundamentally impact on care and change the nature of the relationship between patients and

Primary Care	Healthly Living Centres Kiosks
Intermediate Care	Local Community Hospitals
Acute Hospital	Specilist Clinical Services
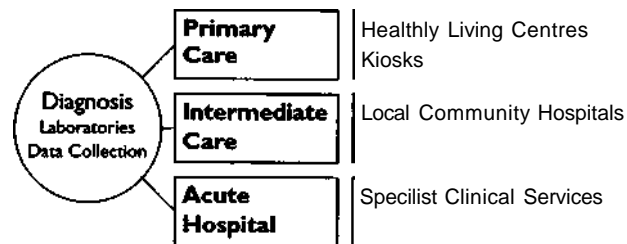
A Health Care Network: 3 levels of care linked to Diagnostic Services

clinicians. Strategic planning for entire communities across the spectrum from hospital to home will be an essential ingredient in realising the vision.

Health Care Network
A scenario for a network might take the form of a collection of linked centres at three levels: at primary care, healthy living centres and kiosks will integrate health with social, sports, leisure and retail activities to provide front line information and care; Local community hospitals will be developed close to patients' homes; Regional hospitals will provide specific specialist clinical services. These three levels will offer step up care supported by a remote and centralised hub of laboratories for diagnostic testing and data collection. Care, skills, equipment and environment will vary at each level. Patients will be encouraged to take more responsibility for keeping healthy. Regional variations and the retention of existing hospital sites will be a key factor in realising local variation responsive to health need within a strategic framework.

Hospitals
Within this network there might be two levels of hospitals that will be linked to provide care for local and regional catchment populations. Electronic networks will not only determine new protocols for diagnostic testing and record data but they will facilitate collaborative working partnerships. Staff will have different working patterns and multi- skilling will be the norm. The concept of the specialist hospital as the last resort will be underpinned by the accessibility of day services at the local hospital. The integration of community and hospital services at

a local level will be imperative to efficient and responsive care provision.

Design and Construction Strategies
With quality of patient experience rather than rationality of procedures as the focus, designing environments for health care will develop to be more accessible, adaptable, sustainable, affordable, therapeutic, functional and buildable. This will require improving the quality of briefing and design to make informed decisions at all levels and throughout the process. The implications of fundamental changes to the construction industry articulated in Egan's 'Rethinking Construction' will need to be assessed for both the design of the product and the process of construction.

The Way Forward
Addressing the way forward, John Wyn Owen highlighted the benefit and need for 3 future developments that would put the UK back into a leadership role in the global health world:

- The creation of a forum bringing together policy, research and practice to formulate a strategic planning approach in the future
- The development of a research agenda to generate evidence of quality of design for the health care environments.
- The availability **of** information for the public good.

Introduction

The aim of the seminar was to gather a range of views from a wide range of participants, on the future direction of health care buildings. We hope that these discussions will inform professionals in the field on current ideas, influence strategic thinking and begin to identify a research agenda.

Aim

The Nuffield Trust played a key role in generating the research approach to the planning and design of modern health care buildings soon after the establishment of the NHS. MARU was established some 30 years ago to continue this development of ideas. These two organisations come together to celebrate our combined achievements in the development of ideas for health care building over the last 50 years and to discuss key ideas for the next 50 years. This was achieved through the organisation of a seminar Health Building for Tomorrow held at the British Medical Association in May 1999.

The aim of the seminar was to gather a range of views from a wide range of participants, on the future direction of health care buildings. We hope that these discussions will inform professionals in the field on current ideas, influence strategic thinking and begin to identify a research agenda.

Objectives

The objectives of the seminar were to

* Launch a publication to celebrate 50 years of achievement in health care building with a presentation and comment on key historical ideas.
* present and discuss design and research ideas for the future on 4 major themes:
  - Health care policy and cultural context.
  - Medical developments: clinical practices and organisational changes.
  - Communications technology
  - Architectural design trends
* Involve participants, both clients and designers, engaged in the planning and design of health care buildings, to discuss key questions about health care buildings for tomorrow in round table discussions.

Methodology

Meetings between MARU and the Nuffield Trust were held to develop the programme and agree the presentations. Four distinguished speakers were invited to deliver a Vision for 2020: Prof Morton Warner, Dr Ronnie Pollock, Dr Jeremy Wyatt and Mr Richard Burton.

MARU also hosted a series of focus groups prior to the seminar to identify issues and questions for the round table discussions. Participants in the focus groups were selected to represent a range of interests and experience in both health care service and design of the built environment. These included policy, medicine, nursing, management, statistical/economics, architecture, engineering, project management, planning and research. At the first focus group a series of ideas were presented to the group for discussion.

From a potential 8 or 9 questions the group identified four key questions for the round table discussions. It was agreed that each question would be addressed by two tables and each table was to be supported by a facilitator and rapporteur to guide the discussion and report back at a plenary session.

Each table was given just one main question to stimulate a

broad ranging discussion. A number of sub questions were prepared for the facilitator of each group to ensure that the ground of the subject area was well covered. These were based on the five themes that had been identified as the key drivers of change: socio-cultural issues, health care policy and developments in medicine, communications technology and architecture. They also include an economics perspective. In developing a vision for future health care environments it was suggested that ideas and concepts could be usefully classified as certain, likely, would like, dislike.

The suggested main questions were:

What is the likely role of hospitals in the future health care system? What will be the determinants of this?

Where will hospitals be located in the future? What will be the determinants of this?

What are the likely organisational models for hospitals in the future? How will they relate to other organisations?

What are likely or possible future building strategies for hospitals?

It was envisaged that the plenary session of the seminar would enable each focus group to report back and that comments from the presenters and questions from the groups would stimulate a debate.

About 100 delegates to the seminar were drawn from a wide range of disciplines and each table was organised to represent a cross section of professionals from health and design interests.

Introduction to Health Care Building for Tomorrow
Developing a 2020 Vision

John Wyn Owen, CB, Secretary Nuffield Trust

The Nuffield Trust has had a long interest in hospitals and health care buildings. One of the earliest initiatives of the Nuffield Provincial Hospitals Trust following its establishment in 1940 was a survey of hospital services. Reports of the survey were printed and published as Blue Books by HMSO. Gordon McLachlan, in his History of the Nuffield Provincial Hospitals Trust, claims that the Blue Books, which together became the Domesday Book of Hospitals, were the basis on which the regionalisation of hospitals was provided for in the 1946 National Health Service Act. The Trust followed its initial interest in the hospital survey in the 1950s by sponsoring an investigation jointly with the University of Bristol of five years' practical and theoretical research into the design of various departments in hospitals and into the ways of organising work in them. The work was predominantly architectural and included observations on how much the physical circumstances were helping or hindering the provision of hospital and health care. So without doubt the Nuffield Trust, since its early days, has been concerned with the built environment for health care. Studies in the Function and Design of Hospitals published in 1955 made a significant contribution to the organisational and design thinking for the first 30 years or so of the NHS. It also provided a multi-professional approach to the question of what is a hospital in what was, in the 1950s, the new NHS.

Raymond Moss writing the obituary of Howard Goodman, former Department of Health Chief Architect who died on 22nd April 1999, said that Goodman had been deeply affected by the publication of the Nuffield Provincial Hospitals Trust book Studies in the Function and Design of Hospitals as a result of which doctors, nurses, managers and other personnel were brought into design deliberations. Moss claims that Goodman's radical ideas for hospital design were more influential than anyone's since Florence Nightingale - "...the most influential hospital designer in the country, with arguably more effect on British hospital design than anyone since Florence Nightingale."

The purpose of the Nuffield Trust's seminar "Health Care Building for Tomorrow - Developing a 2020 Vision" was to put the United Kingdom back into a leadership role and in the international arena by defining and setting out main policy questions, starting a debate on what health buildings are needed in the future - an important issue from an NHS and building perspective; jumping over the current controversy over PFI and approaching health building need more strategically and from first principles. The aim of the seminar was to inform on current ideas, influence strategic thinking and initiate a research agenda. This complements the Trust's Health Policy Futures project - a policy assessment and a forward look to 2015. The Policy Futures project asks the questions "What should policy do now to take account of trends? What should inform UK health policy?" and recognising that we need new ways of thinking and priority setting in health. The Trust believes that we encourage thinking about the health service in a different way, promotes the idea that new, innovative and long-term strategic thinking needs to take place with the issues that will determine the future of health. The settings for care will have to reflect what are considered to be 6 central issues:

- **meeting people's expectations and financial sustainability**
- **demography and ageing**
- **the impact of information, communications and information systems as well as knowledge management**
- **the impact of science and technology and its impact on the location of care. Fewer and more concentrated centres of specialist expertise contrasting with a shift towards care outside hospital including self-diagnosis and home care.**
- **workforce education and training**
- **systems performance and quality: the four Es - Efficiency, Economy, Equity and Effectiveness**

Healthcare Policy 2020:Towards a Hospital Free NHS

Professor Morton Warner

There have been significant developments in near-patient testing, tele-medicine has been given a policy thrust by the Government, and the internet will bring about an involvement of individuals and patients in ways not thought of until now.
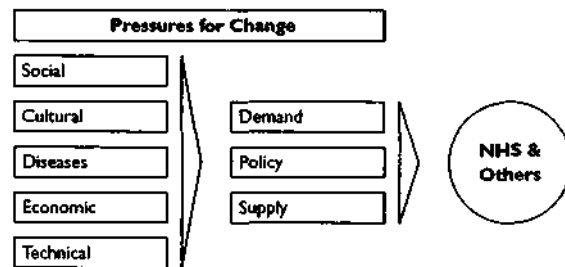

Figure I: Pressures for change

Introduction

The thrust of this short piece, as the title implies, is that as we move further towards the future the less healthcare will be delivered in hospitals as we know them. The immediate task is to look forward to the year 2020, and the early part of this paper does that. In the final section, however, a view is taken of how the healthcare world might be in 2050, to give some inkling of what will face the planners and policy makers as they arrive at 2020.

Pressures for change

Figure I demonstrates the variety of pressures that are on the NHS and others that are attempting to deliver care. In a complex weave they effect the demand and supply sides as well as the policy that is put in place, but recognise the need for change.

I will deal with just two of these - the likely future disease patterns and the most obvious changes in technology.

Future Disease Patterns

The World Bank, in conjunction with WHO, globally has undertaken an important piece of work to make estimates of the burden of disease in 2020. This is shown for developed countries below and is measured in terms of disability adjusted life years (DALYs). This term is made up of a combination of the potential years of life lost through premature death before the age of 65 and the amount of time that people will spend away from doing those things which are normal for their age and stage, as a result of a wide range of morbidities.

By and large the list is unsurprising both for men and for women; but using the DALY approach highlights a number of important areas. Heart disease, stroke and cancers appear as they would be expected to do. Similarly those diseases associated with an ageing population also come into play - osteoarthritis and dementia, and other degenerative disorders. However, for men there are problems associated with alcohol use, road traffic accidents and self inflicted injuries; and for women the additional outstanding feature is the arrival of unipolar major disorders (depression) at the top of the list. In all, the thirteen items listed in this table are anticipated to represent nearly half of all the DALYs in 2020.

Technology Advances

New technologies as they emerge are major drivers of change. There is an imperative on the part of the companies that produce them to ensure their absorption in both the NHS and other healthcare systems around the world.

Whilst there is a tendency to associate hi-tech developments with hospital care, and therefore to assume a centralising tendency, this is far from the case. There have been significant developments in near-patient testing, tele-medicine has been given a policy thrust by the Government, and the internet will bring about an involvement of individuals and patients in ways not thought of until now. Even it might be said the humble incontinence pad which is so much more effective now than it was ten years ago has only come about as a result of hi-tech R&D on the part of the production companies that have led to the introduction of new types of fibres and gels - the majority
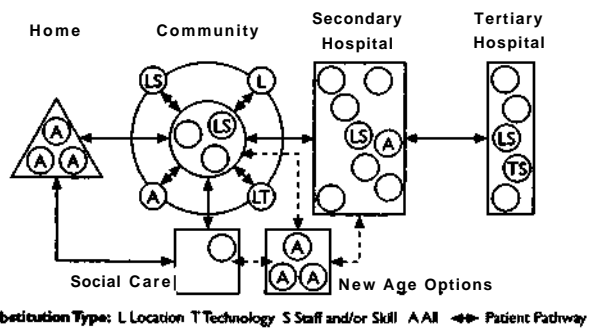
Substitution Type: L Location T Technology S Staff and/or Skill A All ◄►• Patient Pathway

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Substitution Type: L Location TTechnology S Staff and/or Skill A All -**• Patient Pathway

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figure 2: *Health and Social Care Substitution - Evidence-based Management*

Rank	MALES			FEMALES		
	Disease or Injury	DAYS	Cum. %	Disease or Injury	MLYS	Cum. %
	ALL CAUSES	95.1		ALL CAUSES	65.4	
1	Ischaemic heart disease	12.3	12.9	Unipolar major disorder	**6.4**	9.8
2	Cerebrovascular disease	5.6	18.8	Ischaemic heart disease	**5.7**	18.5
3	Trachae, bronchus & lung cancers	5.5	24.6	Cerebrovascular disease	4.3	25.1
4	Alcohol use	5.2	30.1	Osteoarthritis	**3.4**	30.3
5	Road traffic accidents	4.8	35.1	Dementia, and other degnerative and hereditary CNS disorders	**3.4**	35.5
6	Unipolar major disorder	3.4	38.7	Road traffic accidents	**2.0**	38.7
7	Chronic obstructive pulmonary	3.2	42.0	Chronic obstructive pulmonary	1.7	41.3
8	Serf inflicted injuries	2.9	45.1	Trachae bronchus & lung cancers	1.7	44.0
9	Osteoarthritis	2.2	47.4	Breast cancer	1.7	46.6
10	Dementia, and other degnerative and hereditary CNS disorders	2.1	**49.6**	Diabetes mellitus	1.4	48.7

Source: Murray and Lopex, 1996

Top ten leading causes of DALYS given in millions in 2020 (baseline scenario).

of these incontinence pads will be used for people who are being treated at home, and often transform their quality of life, whilst reducing complications which might otherwise have meant them being in hospital.

The Drive for Greater Efficiency
Many of the changes which have gone on and which will shape the future can be seen in terms of a variety of health and social care substitutions. These relate to changes in location of care, personnel or workforce mixes and technology. The model below illustrates what has been happening over time.

A number of observations can be made here, using the example of the approach to the problem of peptic ulcers. Some 25 years ago people suffering from these arrived at the DGH to be treated by the surgeon. Some 15 years ago the arrival of the H2 antagonists meant that peptic ulcers could be prevented or controlled through prescription by general practitioners. Nowadays many people self-treat through the purchase of over the counter drugs of a similar nature. In the meantime the discovery of the existence of helocabacter pylori and the eradication of this by a cocktail of antibiotics has brought new substitutions through further activity in the primary care setting. In summary there has been locational and workforce substitution as a result of a change in technology, a further substitution in itself.

Another feature to point out on the diagram is what is referred to as the new age options which fit neither directly into community or secondary hospital care. They include such things
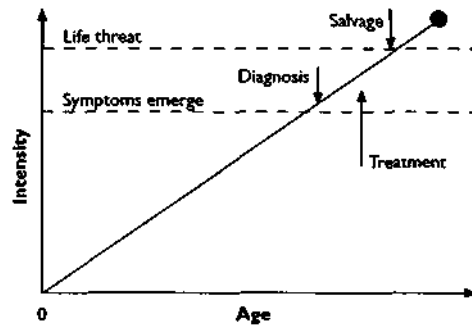
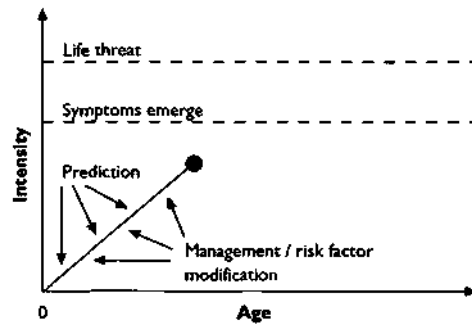*Figure 3: Old Paradigm - Chronic Disease Management*

Figure 4: New Paradigm - Chronic Disease Management

Year	Predicted Development
2000	Artificial blood Full electronic records on smart cards
2005	Personal wearable health monitors Determination of whole human genome
2010	Artificial heart
2012	Artificial sense Robots extensively used for routine hospital tasks
2015	Genetic links to all disease identified Individual's genome is part of medical record
2017	Artificial brain cells
2020	Artificial liver Extension of human lifespan to 100 years

Source: BT Technology Calendar 1997 - 2045

A prediction of technological progress by 2020

as direct access endoscopy and radiology by general practitioners and free standing cataract treatment units.

There has, in recent times, been the identification of the need to shift services towards tertiary or specialist centres. This was the subject of the Calman-Hine Report which identified the quality advantages of treating rarer cancers in clusters where the medical team could provide a greater concentration of experience. But generally the shift has been towards community and home care, with support through both primary and social care staff, and the drive for further efficiency alongside a wide

range of emerging technologies is likely to see this continue with further intensity.

The adjacent table illustrates one view of predicted developments in a variety of technological fields.

There is a heavy weighting towards the development of artificial organs linked to sensory abilities; and had the calendar been produced later it might well have included towards the end of the time span developments in nano-technology, which have now been included in the World Health Organisation's futures thinking.

Pervasive Technologies
There are two technologies which need to be highlighted here - genomics and communications.

The field of genomics is a rapidly developing one with the International Human Genome project designed to identify the total gene range expected to be completed in the early part of the next century, ahead of its original schedule. Whilst there will still be a long way to go in terms of identifying multiple gene disorders and the subsequent mechanisms for their treatment, there are already signs that the genomic world is invading primary care. Patients, having sent samples off for testing to various parts of the world, are arriving at their GPs to ask for help in terms of dealing with the results. The almost closed loop of information that the NHS has been able to maintain for so many years has started to be broken.
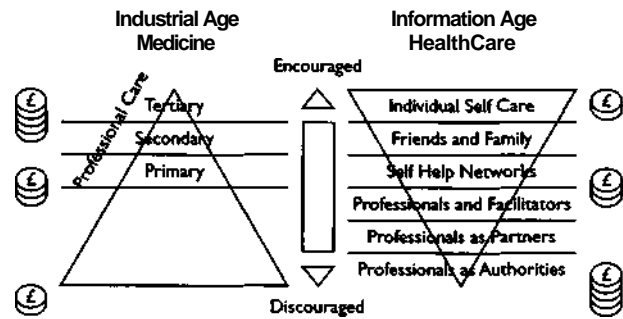
Figure S: Industrial age medicine to information age health care

Of principal importance, however, is that the development of genomics will move us to a new paradigm of disease management. In figure 4 the old paradigm represents the approach taken generally now. Clinicians wait for symptoms to emerge, make a diagnosis, offer treatment, and if there are life threats attempt some form of salvage.

The new paradigm using genomic analysis sees events occur below the line where symptoms emerge.

Here much of the activity will relate to prediction in respect of diseases and the management or modification of risk factors. Very little of this activity will require hospital services as we know them. Indeed the existence of science parks and medi-centres maybe more appropriate.

The second pervasive area - relating to the development of communications technology - is important because it will allow for different modalities of information transfer. In general terms beyond health care we are rapidly moving towards an information age, one in which people remain static rather than organising, and information moves between them.

A model has been suggested as to how this might effect health care and the suggestion is that we will move from industrial age medicine to information age health care. Figure 5 illustrates this.

Clearly at the moment the industrial age model is the one that is supported, and indeed government policy is towards developing further the level related to primary care. The base

of the top triangle represents all that care and self treatment and discussion which goes on currently in perhaps a rather disorganised way amongst people before they approach the formal care system. With the arrival of the internet and the ability to form virtual networks and to obtain information both from formal and informal sources, there comes the possibility of different and more differentiated forms of care at that base. This ranges from individual self care to that provided through family, friends and on to self-help networks. The relationship with the professionals is likely to change to one of facilitation and partnership, with control only being handed over in the ICU or HDU.

This American-derived model also suggests that the approaches towards reimbursement might change, encouraging low cost high benefit treatments where possible. This would certainly bring about changes in the UK also with greater emphasis upon home and community care.

Conclusions: 2020 Towards 2050
What then will face the planners and policy makers of 2020 as they in their turn face the future?

The final model below suggests the sort of pattern that might be contemplated at that time.

It is reasonable to assume that the nomenclature applied to the new system of care will have changed and indeed that most, if not all the activity, which currently takes place in District General Hospitals will have been dispersed elsewhere. Much

Primary Home and Self Care   Secondary Community Care   Tertiary DX and TX Daycare Science Centres
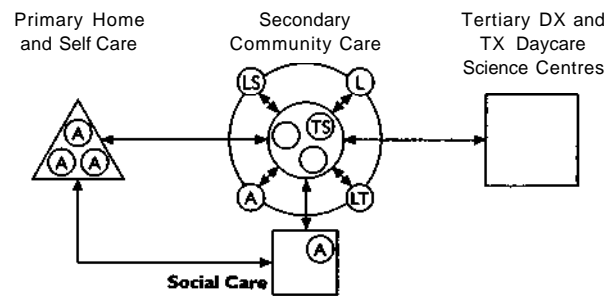
Substitution Type: L Location T Technology S Staff and/or Skill A All ←→ Patient Pathway

Substitution Type: L Location T Technology S Staff and/or Skill A All •#*• Patient Pathway

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figure *6: Health and Social Care 2050*

more will have become possible to treat in the home, with individuals making their own decisions about treatment as a result of interactions with a variety of systems of artificial intelligence.

At the end of the scale even tertiary centres are likely to have changed in character with a high proportion of the work being carried out on a day care basis.

This leaves open for some interesting speculation what will be the nature of secondary community care both in health and social care terms. The cultural milieu may well continue to represent a society in which the care of older people occurs away from family and friends. In addition some form of residential care may well be needed for those who can be treated and supervised at a distance from but linked to the tertiary centres. Both of these facets may lead to quite new thinking about the role of community hospitals in a newly defined intermediate care approach.

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Medicine

Dr Ronnie Pollock

The future is likely to be rife with a wide range of strange and unusual possibilities.

I hope that from the program title - "Developing at 2020 Vision" - and the simple subheading 'Medicine' you will not have concluded that I'm going to present a comprehensive view of medicine as it will be practiced in 2020. That I think would be virtually impossible. I think that when you look back in 2020 over the intervening two decades or so you won't be looking back over a landscape which I will have today accurately mapped out for you. What I hope you'll recognise in that landscape however is a number of stepping stone's, perhaps somewhat irregularly distributed, which mark the pathway between Then and Now.

My moderate level of pessimism about 'Forecasting in Medicine' stems from my early years with the Oxford Region, where my very distinguished and innovative boss Dr JOF Davies. He set up a program of weekend retreats to which he invited the brightest and best young consultants and senior registrars in the Region. They were locked up for the weekend in a comfortable country house with ample supplies of good food and drink, and asked to speculate about the future in their own specialist fields.

These events were very valuable in developing bonding between "the managers" and "the clinicians" and were significant in developing the climate for co-operation and progress for which the Oxford Region became well-known. Sadly, however, as future gazing they were complete failures - for the "brightest and best" failed to predict any of the major changes within their areas of expertise. From this I conclude that we must approach the long view cautiously and without the expectation of being able to create a complete picture

In seeing in the program that I'm going to review "Medicine" within our 2020 vision, you might have assumed that my talk would be about future technological developments in medicine. I will talk about technological issues but they are not the only or even perhaps the most critical of the issues which will influence our approach to Healthcare Building for Tomorrow.

We know from Quantum Mechanics that "Everything will eventually happen that Nature's Laws do not specifically preclude." Unfortunately, our knowledge of Nature's Laws is incomplete, so that we do not even understand what is impossible. As a result, the future is likely to be rife with a wide range of strange and unusual possibilities. This would suggest that although we cannot expect to be precise in our vision of the future, we should certainly be prepared to face the unexpected and the need for continuing change. So rather than drawing the blueprint for 2020, I will review the trends and influences - the stepping stones - which I think will impact on medicine over the next two decades, and consider some of their likely effects.

For convenience in handling the complexity of these issues I have separated Trends into these components: Disease, Population, Manpower, Organisational, Sociological, Molecular Medicine, Technological and, given the limitations of time, will deal fairly briskly with each.

Disease
Here, I have summarised the trends under 5 headings.

Effects of Prevention

We tend to think of vaccination and immunisation as somewhat pedestrian and 'old hat' but it isn't. It has resulted in the total elimination throughout the world of one of the world's great scourges - smallpox. In the future, through improved methods including molecular medicine techniques we are likely to see advances in the development of vaccines against major killers such as AIDS and cancers. Also, we must grasp the importance of public health measures and develop them more vigorously. For example, it is incredible progress that death from coronary artery disease has halved over the last 20 years in males in social class I. But it is abysmal that death rates remain unchanged in social class 5, when we all know that attention to smoking, diet and exercise could achieve the same improvement.

New Treatments

Here I highlight a number of treatments which have particular impact on the built environment e.g. the impact of screening programmes for cervical cancer on the need for additional colposcopy provision; the ability through screening to detect impalpable breast tumours, and subsequently locate them during surgical removal; new patterns in treatment for example in surgery, where improved anaesthesia and pain control has markedly shifted the pattern from in patient to day surgery treatment.

New Diseases

AIDS of course is the most familiar condition, under this heading but perhaps of more significance is the resurgence of old diseases. TB it was thought was going the way of smallpox. Now it is on the increase, and increasingly through antibiotic resistant strains. Malaria too is resurgent. Of particular concern is the emergence of a greater number of antibiotic resistant infections. MRSA (Methicillin Resistant Staphylococcus Aureus) is a major problem in nearly all hospitals, with a huge impact on the need for facilities (Though not referable specifically to MRSA, it is a sobering thought that 60% of patients admitted to hospital, develop an infection while there).

Attitudes to Disease

These have an important impact on the need for hospital provision e.g.
- The acceptance of the desirability of Day Surgery.
- The acceptance of the care of people with Schizophrenia in the community.

The Effects of Travel

These are significant in the problems of spread of disease in the 20th century, a trend which is likely to continue especially in such fields as Malaria and the Sexually Transmitted Diseases.

Population and Manpower

I will deal with the next group of trends, population and manpower, together as there is some overlap, and it will help with the brevity of the presentation.

Clearly the size and structure of the population, especially the changing age structure, has an important impact on the nature and amount of healthcare provision required. Increasing survival

and an increasing number of elderly people will see a change of emphasis towards chronic disease.

We need to be aware too of the healthcare impact of a more mixed ethnic composition of the population, which will require special consideration for specific diseases such as sickle cell anaemia. Also they may have specific cultural requirements which need to be satisfied by the nature of the healthcare provided.

The manpower implications of an ageing population, and a diminishing working age population are obvious. In purely numerical terms there will be fewer people (particularly in nursing and the ancillary professions) to care for more patients. This problem is significantly worsened by the competition for staff, and health manpower is under pressure because, nursing, for example, is less attractive to young women, and because greater financial rewards with less onerous responsibility are available elsewhere. My wife, who until recently was the Director of Nursing at a major London teaching hospital, tells me of one of her senior sisters, very highly trained and skilled in intensive therapy who resigned - to become a bus driver.

Organisational Trends
The next set of trends which I would like to review is the organisational one. Here we can see care being organised: -

• as Community Care - especially for the elderly and die mentally ill

• as Ambulatory Care - with particular emphasis on day surgery and the development of 'One Stop' facilities for consultation, investigation, diagnosis and the initiation of treatment within an ambulatory care centre.

These organisational trends which are still by no means fully developed will have enormous impact on the physical provision required to deliver healthcare.

Again, within the organisational considerations, the locations and distribution of services will fundamentally have to change in response to more sophisticated responses to two issues: on the one hand, the need to group, and thus create a synergy between expert skills and thereby to improve quality and improve outcomes; and on the other hand to maintain, and improve — the accessibility of services to most patients. Many of you will be familiar with various versions of 'hub and spoke' models which seek to ensure consolidation of expert skills in the centre but make the general range of services more accessible by locating them more locally but served by the same network of clinical teams.

Changing Professional Patterns embraces a number of critically important future trends. For example, what will be the future role of trainee doctors? Historically this group of house officers and registrars has carried the bulk of the service load in emergency medical and surgical care (generally about half of all admissions) and also a significant proportion of the elective work. This must change. The nature of doctor's training is changing. Also for a number of reasons such as higher patient

expectations, an increasing risk of litigation, a recognition of the conditions necessary to ensure high quality care, services will become more consultant delivered, from being consultant led.

Also, as changes occur in the roles of consultants and of doctors in training, so, in parallel will there be changes in the role of nurses. There will be an increasing volume of what was historically 'medical' work being undertaken by the new breed of highly trained nurses (but in the context, mentioned above, of competition for manpower, in this section of the female population).

Organisationally too, the future role of GP's - through whatever mechanism - in commissioning healthcare services is likely to result in changes in the hospital's pattern of healthcare delivery.

Clearly, the extensive role changes which I have implied in the foregoing comments, will also have a very substantial impact on medical (and other professional) training.

Sociological Trends
Turning now to the implications of sociological trends, I have highlighted in this slide what I think the key change elements are likely to be under the generic headings - Increased social expectations

I think that these expectations will be manifest through demands for high quality. Patients are now more informed, and more vocal, about standards of care which will impact on their

understanding of the necessary changes to service distribution, and on which will be needed to ensure the delivery of success by experts.

There are demands for more accessible services, as part of the improved understanding already referred to, patients recognise that much of what is required by way of out patient consultation and diagnostic provision can be delivered locally, and similarly, that the great bulk of their treatment requirements can also be made through ambulatory care developments.

There are demands for more Consultant Care, a part of the public's increasing understanding that better outcomes result from expert treatment. As I have already outlined this has huge implications for the role of trainee doctors, the necessary level of responsibilities for nurses, and the need to group or network consultant skills so that expertise is most effectively deployed.

There are demands for privacy and dignity. Increasing social standards and improvements in home comforts and facilities, mean that imposing communal living and dormitory conditions on patients who are, by definition, in a particularly sensitive and vulnerable state, will not be tolerated in the future. The implications for hospital planning are self evident.

There is a demand for a strong patient focus. This is really a part of the broader understanding by patients of their rights, and a more formed view of their reasonable expectations. As a result they expect - I think rightly - to see considerations about

the nature, extent and distribution of healthcare services dealt with from a perspective which places the patient and not the professional at the centre of this consideration.

Molecular Medicine

An immense range of developments is opening up in this field. In the area of diagnostics, DNA chip based screens of blood, urine, stool and breast effusions will allow diagnostic information to be obtained at very early stages in the development of pathologies from areas which are now in the main 'silent'. Breast tumours and colon tumours are rarely detected before they are already well established. Very early diagnosis will have enormously beneficial effects in improving the survival rates from these major conditions. Vaccines, this is an area where molecular medicine promises significant advances and it is through this route that vaccines against specific cancers are likely to develop that is, genetic defects. In this field we are likely to see the development of treatments which target - and correct - specific genetic defects, and in a similar manner, we will see the continuingly developing ability to therapeutically manipulate the molecular structure of tumours.

Much of the popular excitement has been caught by the demonstrated ability to clone animals (Dolly the sheep is famous - but cloning humans is also possible, - and presents major ethical problems).

However, something of enormous impact is the development of the ability - using similar techniques - to construct organs such as kidneys, liver, pancreas, from an individual's own cells.

The potential of this in organ transplantation is of very great importance. Being developed from the individuals own cells , the organs would not be 'foreign' and so would not be rejected. And the ability to 'build' organs specifically for an individual would overcome the problem of organ availability .

Technological Trends

Finally, in this review of trends, I'll turn, as I promised, to technology and illustrate something of the range of technological development - much of it already with us - in this field.

There are three areas of technological advance.

- **Pharmaceutical and the continuing successful development of new drug approaches. For all the humour about it,Viagra is a very clever and effective drug whose use solves a hitherto unmentionable problem. With the increasingly elderly population we can expect to see improvements in the drug treatments of chronic diseases. One important field in this respect is the treatment of asthma which has not delivered very much from a pharmacological point of view for a generation. Now with the continuing increase in the condition we can expect to see major strides.**

- **In the diagnostic field, improvements in imagery are certain, more accessible forms of Magnetic Resonance Imaging (MRI), and probably some completely new image methodologies. The scope for tele-medicine already exists and developments in this field can be expected to gain pace.**

A feature which may have a very wide impact - currently beyond the mere bounds of "Technology" is the development and greater facility of use of the Internet by the public. This will almost certainly change the doctor/patient relationship to some degree — perhaps, very much, for increasingly patients will have become very familiar with the research and advice on their condition - to the extent that they will in many cases know more about an individual topic than the General Practitioner.

The extent to which this might change patterns of practice is at this time a matter of conjecture, but it will!

And finally, there are some major technological changes affecting surgery.

- **Transplant Surgery I have already mentioned: endoscopic surgery is likely to develop much further and become much more sophisticated, perhaps assisted by the increasing capability to deal with deep seated problems more invasively through robotic surgery**

That is my backward look over 'the stepping stones'. Almost certainly when we look back we will see other stones too which we didn't spot at all in 1999. But if I was asked to bet on the area which would bring greatest progress to the practice of medicine and the delivery of health care, I would unhesitatingly nominate molecular medicine.

Implications of Information and Communications Technologies

Dr Jeremy Wyatt
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Improved communications and information technology have ushered
in a new era of knowledge and data processing in health care, leading
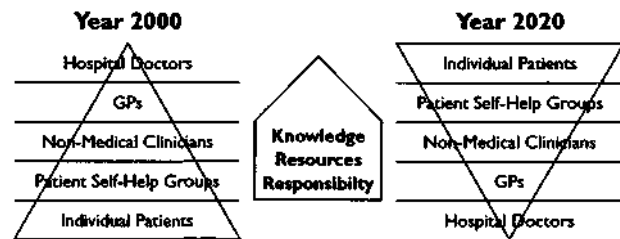to fundamental changes.

figure 1: The *pyramid inversion: likely changes in knowledge, resources and responsibility over the next 20 years (adapted from Smith 1997)*

Pressures for Change

Improved communications and information technology have
ushered in a new era of knowledge and data processing in
health care, leading to fundamental changes. For example,
telephone helplines [I], decision support systems [2], the
National Electronic Library for Health [3] and the exponential
increase in the use of telemedicine [4, 5], will all have profound
implications for health care professionals over the next 20
years. In addition, by 2020 the relationship between patients
and clinicians will change, with individual access to knowledge
developing (Figure I) with use of the Internet and governments
expecting patients and the community to assume greater
responsibility for their own health [6].

Broader pressures will introduce other profound changes which
communications and IT can facilitate. These pressures include
clinical governance, wide variations in patient outcomes,
evidence based practice and the need to improve ease of
access for the elderly, reduce inequalities and lower costs.
Patients' expectations are rising and there is demand for 24
hour access to good quality services delivered in modern, bright
facilities [6]. To assure minimum quality standards for
professional training and accreditation, services are already
being re-organised to guarantee minimum case loads. The result
of these pressures is that the NHS has already started to
implement previously unthinkable strategies, such as substituting
nurses assisted by telemedicine (in minor injury clinics [7]) or
decision support systems (in NHSDirect) for expensive
doctor-led services.

Assumptions 2020

We can therefore safely predict a number of changes facilitated
by communications technology by 2020. Patient data will be
freely accessible by those NHS staff who need to know. There
will also be free flow of knowledge, both around the NHS and
society, as exemplified by NHS Direct. Some diagnosis,
investigation, counselling and treatment activities will be carried
out electronically so will not require physical doctor-patient
encounters. There will be extensive substitution of nurses and
paramedics for expensive medical staff. The current complex
pattern of patient visits to primary and secondary care
providers and indirect data communication (Figure 2) will
be simplified.

Some services will be brought closer to the community, such as
minor injuries units to provide simple front line interventions. At
the same time centralisation of other services will bring benefits
in training, quality and economics.

These assumptions pave the way for the following possible
changes and health care delivery scenarios.

Automated Primary Care

The pressures and technologies described above may lead to
primary care becoming more automated, with home monitors,
implanted sensors and even implanted drug delivery systems
assisting in the care of those with chronic disease. Automation
may lead to un-manned health kiosks (Figure 3, next page)
where patients will access computerised interviewing systems
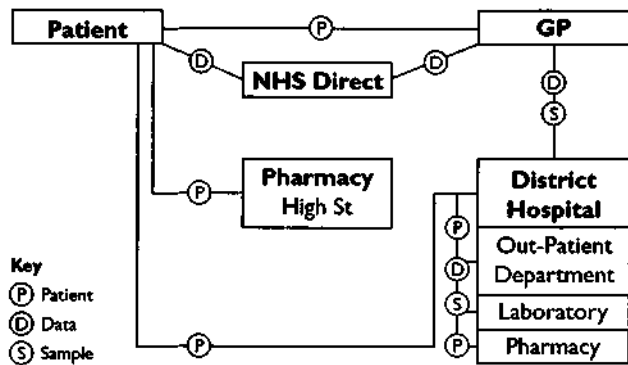[8] which can provide advice on risk factors etc., provide an

figure *2: The current complex path currently taken by patients and information*

automated counselling service [9], carry out "near patient" testing, capture relevant images [4] and transfer data to a remote diagnostic centre for processing. Intelligent systems will filter results and alert remote humans to unusual cases or causes for concern [10]. A computer-driven drug dispenser in the kiosk [II] will deliver common pills or send orders to the High Street pharmacy or a new national "NHS Drugs" agency which delivers supplies direct to the patient's home. All these technologies currently exist and are in use around the world; self-service autonomous health kiosks are being piloted [12].

Changes to Community Hospitals
One result of these changes in primary care could be significant changes to the role of community hospitals. These will provide local non-urgent care for a catchment population of 100,000 people and co-ordination of care between home and specialist services. Typical service provision will include a minor injuries unit, rehabilitation including physiotherapy, dieticians and occupational therapy and day surgery. Diagnostic facilities will be limited to image capture and the collection of specimens for testing remotely. The community hospital will also provide a resource centre and base for community nurses and midwives.

Changes to District Hospitals
District hospitals will provide urgent care for a catchment of 500,000 people including a casualty department and specialist acute services including emergency procedures and surgery. Minimal diagnostic testing will take place at the bedside, with the majority of tests carried out on specimens couriered to a remote diagnostic centre or using images captured and

transmitted electronically to the same centre. District hospitals will provide access to knowledge services and training supported by teleconferencing and data exchange.

Changes in primary and community care may well reduce the outpatient workload by half, with little or no routine inpatient surgery (most being carried out in specialist centres), only emergency near-patient diagnostic services being offered, with a courier bay for transport of the majority of specimens. However, more office space will be needed for nurse & doctor remote consultation sessions.

The implications are that by 2020, some activities will have reduced including theatres, pharmacy, outpatients, medical staffing and training. Others will have grown including communications and IT support, clinical office space, preventative care activity, incident monitoring and quality improvement. Some services will have moved off site altogether including laboratories, radiology reporting, library and drug information. New facilities will have developed including video-conferencing suites and a knowledge management capacity.

New Diagnostic Centres
These centres will be remote from district hospitals and will provide urgent and routine tests for a catchment of 5 million people. They will include specimen reception and handling, image reception and filtering, and emergency and routine 24 hour image and laboratory test interpretation. Benefits of such centres will include improvement in the quality of services, training, guideline production and clinical research as well as
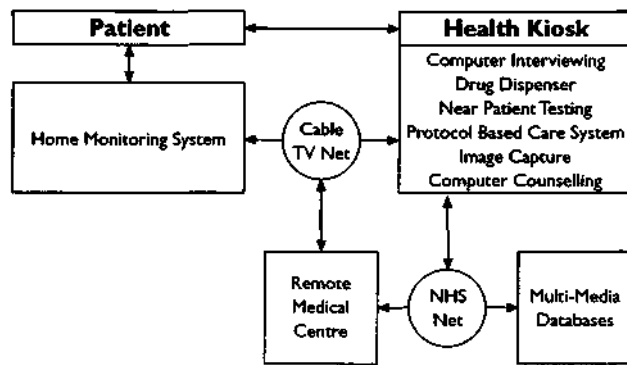
Figure 3: An automated primary care kiosk

support for teleconferenced advice to all parts of the NHS.

Impact on the Medical Profession

One of the major impacts will be changes in the role of clinicians with a greater emphasis on checking clinical findings, making judgements, and talking directly to patients. Overall there may be fewer expensive doctors, particularly in primary care, due to on-line information services and kiosks, where the emphasis will be on patient self-care with support from protocols, decision support systems and paramedics supported by computer systems and remote consultation systems. Doctors will receive more on the job training with remote supervision. Professional performance will be logged and published on the Internet - in much the same way as the performance of individual cardiac surgeons in New York state can be inspected today (13). Some patients and clinicians may react against this mechanistic medicine, leading to a new, perhaps private sector, niche for a "holistic health service."

Less Tangible Changes Due to IT

Some less tangible changes may include greater public involvement in the planning and management of services; more responsive patient services with less duplication; load sharing by time and region; and tighter clinical audit and governance loops, leading to more uniformity of facilities, services, clinical practices and patient outcomes across the UK.

Summary

Communications and IT will be widely embraced by NHS professions and the public. Sharing of patient data will lead to remote diagnostic centres and local health kiosks and improve the quality of care. Knowledge sharing will encourage the rise of paramedics, self care and improved training for all clinicians. For the NHS estate, community hospitals will grow, conventional health centres and District General Hospitals will shrink, and new regional diagnostic and elective surgery centres will develop.

As always, the task is not so much to predict the future but to generate plausible alternative scenarios and identify the one we wish to pursue. The opportunities presented by communications and information technology are extensive but it is society who must decide which options to develop to deliver the best possible health care within the NHS budget.

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Health Care Building for Tomorrow - Architecture

Richard Burton

Our time frame is 20 years, so in my view our strategy has got to be
right first time, since 20 years is only a little longer than it takes to build
a major complex.

I see this paper as an introduction to the four questions to be
addressed by the working groups. It gives points which I suggest
should be considered.

May I say from the start that our activity must be a serious
contribution to what is going to happen for the next two
generations in the field of health care building. The groups will
be warned by this quotation from Alexander King and Bertrand
Schneider's 'First Global Revolution': 'In the thirties, the
American president Franklin D Roosevelt commissioned his
administration to undertake a vast study of the coming
technologies. When the study was published it made a big
impression. Indeed it was enthralling. There was just one
problem: it had not predicted the coming of television, nor of
plastic or jet planes or organ transplants or laser beams, not
even ball point pens.' Roosevelt was a wise man and invented
the new deal. Our responsibility is considerable since we are
well aware that the acceleration of change in computer
hardware and software brought that technology to where it is in
just over forty five years. We know that similar developments
are happening and will happen in the field of medicine. Witness
the crucial effect of day surgery, telemedicine, on medical
building which is our underdeveloped, underfinanced container
for these activities. Looking at the broad picture of health
matters I can foresee the medical brief becoming much more
inclusive of matters educational, cultural, commercial and social.
I can see our buildings responding such that they become a
most important net work of places and spaces, paralleling the
political ones.

Just as there was a re-examination and action in the sixties
onwards we need another burst of activity to re-energise the
situation and probably change or at least influence its direction.

We are seeing in front of us a period of vast investment in our
health buildings, based on the much maligned private finance
initiative tying us into an uncontrollable revenue-funding
position in the future with it seems little control of design
quality and space standards by anyone and now a proposed use
of the general contractor as the initiator of design and contract
organisation and finally the virtual destruction of a central
knowledge base resulting from feedback and research.

But what are we trying to do? In question one, 'what is the
likely role of the hospital in the future health care system,' what
will be the determinants of this? Ronnie Pollock in the past has
outlined a coherent option which in my view should be referred
to and maybe it touches all four questions. The concept of a
hospital not so much being one building but a network with a
hub in the form of an acute and trauma hospital linked to
locality hospitals which in turn are linked to health centres
together which form a network of health care for about
500,000 people.

It is a concept which gets over the centralisation-
decentralisation discussion elegantly; it has enormous
economies built in for staffing and, having carried out a study
for northeast London, it has the potential for reducing the
amount of building and so freeing major brownfield sites for
other uses and releasing hidden financial resources in the land

values, at present tied up by derelict or semi-derelict buildings.

Further at a social level instead of destroying the local district hospital it transforms it into a locality hospital providing day surgery, limited casualty and maybe some specific other specialisms. For instance with our King's Cross proposals which followed this pattern a central site was needed of 26 acres which became a health care campus providing a home for the important institutes who could keep their identity such as tropical medicine, neurology and their own front door as well as a major acute and trauma centre; such hospitals as the Whittington would become locality hospitals releasing two thirds of their land and the Hospital for Tropical Diseases site would also become free. It seems little realised that old hospitals are the major brownfield sites of the future. Our figures showed a considerable contribution to the capital cost of the new network could come from land sales. All this could lead to less building not more and would be complemented by considerable savings in revenue.

So, running questions one and two together, what are the determinants of the role and location of our health care buildings? It must be policy and a policy based on the enlightened use of present resources, i.e. buildings and land and being well related to the community, thus their accessibility. I would add not only for patients but also for staff.

The third question is properly not architectural. The fourth, however, is central to architecture and it is on this question I wish to spend the rest of my time. The question 'what are the

likely or possible future building strategies for health care buildings?'

'Commodity, firmness and delight' are always key objectives of architecture and distinguish it from building. Commodity covers the numerous functional requirements of the users, ranging from physical/social to spiritual. Firmness covers all matters pertaining to shelter from structure and enclosure to materials, services, energy use and suitability for the climate. Delight covers those aesthetic matters which range from space, form and texture to art and decoration. The important aspect left unsaid is that all this is within a time frame and relates to available knowledge and the effect of perceived change of that knowledge in the future; it relates to present and future technology, finance available on the basis of money for value, i.e. lifetime costing, as well as value for money and social and cultural understanding. I wish to examine each of these issues in turn.

The essential skill of the many parties involved is to realise that, although each part is important in itself, undue emphasis will upset an harmonious result. The beneficiaries of this approach, an holistic approach, will be society and specifically the doctors, nurses, patients, staff and visitors.

Our time frame is 20 years, so in my view our strategy has got to be right first time, since 20 years is only a little longer than it takes to build a major complex.

Our available knowledge is scattered but exists and in my view

it is not too late to gather it together again but in a few years' time the people who have it will not be available. Continuing feedback and research are essential.

The effect of perceived change in the future is what we are addressing today.

Present and future technology the advent of two issues have had a fundamental effect on health building and indeed their location. Telemedicine and day surgery.

Further we have also already identified the importance of energy use in health buildings. In the future in the larger complexes self-generation of electricity is a clear direction linked with energy harvesting that is exemplified by the recovery of waste heat and by techniques of harvesting solar power, using the roofs and cladding, recovering vapour and wind generation, the enhancement of daylight and mechanisms which allow natural ventilation without noise intrusion, heating and cooling by eutectic salts.

In maintenance terms we will all look for the reduction in cost. There could well be some systems of self-maintenance evolved and certainly more sophisticated BMS systems will reduce manpower requirements with their self-diagnosis and even self-correction. In services terms there will be a trend towards factory-engineered products, pretested and precommissioned and designed to be easily maintained but also changed and replaced. This will affect the form of our building.

The choice of site for major health buildings in cities is a fundamental issue. Obvious considerations are transport and land availability; less obvious is the assumption that these are satisfied by developing in and around existing institutions. What must be faced is the disruption to these institutions and their occupants over long periods of time, disruption over long periods which does not benefit the activity of health care or the environment around such activities. However, in terms of building they will inevitably lead to a much greater use of prefabrication to avoid disruption but also to facilitate speed. Siting choice also must finally relate to policy.

Miniaturisation of equipment could be seen to be another fundamental technical change which could facilitate more local diagnosis and treatment and thus reduce the need for central buildings.

I wish to leave finance to the group. Suffice to say that the container, medical buildings, will always be the poor relation until 'money for value' can be demonstrated simply enough for the Treasury to understand. Reduction in staff requirements being the largest cost in lifecycle terms seems to be an area for consideration. However, it is essential that adequate finance is perceived as a requirement for research and a knowledge base.

Social and cultural understanding as it relates to medical policy and thus medical buildings is an important ingredient in future considerations.

A number of things are looming, the advent of a better

educated society demanding health care before and not only after getting ill. By before I mean a society that demands decent housing, a decent unpolluted environment, one in which 'make do' is questioned and one in which the standard of building often symbolises the efficiency and ability of the institution. One in which it will be understood that a muddled unclear plan represents a muddled unclear setup. One in which clear planning can liberate the users from the tyranny of 'making do' and inconvenience leading to stress and anxiety.

Further we are entering a millennium which by observation is one where we will be trying to bring disciplines together, cross boundaries of thought and avoid blinkered actions. Maybe for too long health care buildings have been at the treatment end of health care. Caring for those who wish to remain healthy is left to other agencies. I am suggesting that health building will become much more multi-functional and not just with commercial shopping but health education, the arts, gyms, sports will all be included. All these leading to a healthier way of life with less need for facilities at the treatment end.

Let me just make a mention of the movement of Arts in Health, which is a very active and in my view a relevant movement, which again bridges into medicine.

Finally I want to end by emphasising the absolute essential need of research, as well as the development project and feedback. If these aren't part of the future building strategies we will be lost. For instance we need to know and quickly the effects of PFI on time cost and quality and what standards are being achieved.

We need to research and know where planning flexibility is required and what kind, thus changing space requirements. The effect of fast tracking on procurement methods. Electrical generation and its potential for sales. Energy harvesting and its potential. How can we best use existing buildings? In the quality of the environment we really need to know much more about the effect of sensory deprivation, air quality and what is the benefit of good design. We really do need whole-life costing at our fingertips. We need feedback from projects and development projects. We need to have an ongoing knowledge base. For all this we will require an organisation and finance; in the past it has been within Government. How can this be re-established and should it be inside or outside Government?

My view is that our architecture must be informed by the users; it is our responsibility to make sure we are able to access that information.

2020 Vision: Round Table Discussions

One of the key concepts that emerges from the presentations is the notion of the health care network with the patient at the centre. For policy, this has management and organisational implications concerned with how patients access expertise and information. It relies on a new relationship between patients and medical and health care professionals. It can be facilitated by developments in communication technology which support linked data and intelligence packages no longer reliant on physical adjacency. For the buildings, it implies an interconnected system of environments dispersed to give ease of access for patients with a concentration of expertise in specialist centres.

The context then, for our discussion for developing our 2020 vision is that patients will take more responsibility for keeping healthy and managing ill health. As a society we may need to re-define illness and disease with corresponding ethical issues raised about genetic therapies, euthanasia and intervention. The boundaries between health and social care, leisure and fitness will be more fuzzy and there will be greater emphasis on self help and education. The shift in emphasis from the organisation of services will be from concerns with delivery to issues of patient access.

Already there are changes in surgical and diagnostic procedures enabling clinicians to work in new ways. But, in the future, greater intelligence about disease profiles and individual health status will mean a potential shift from responding to disease to managing better health.

Technological developments will enable wider access to information for patients and expectations will rise; procedures may be less invasive; diagnostic testing and records more remote; day care more common than overnight admission.

All of these suggest new ideas for planning and designing health care buildings; planning the integration of health into other daily routines and places for leisure, fitness, shopping and work. For design, a responsibility for sustainable designs that incorporates for example, energy harvesting; a cultural dimension brought to the buildings through art and performances; a sensitivity in which spaces respond to the feelings and emotions of vulnerable and fragile people; an emphasis on putting the patient first and devising ways to effectively support health care professionals in doing their jobs.

Framework for Health Care Networks

The vision is based on a network of linked care centres and community hospitals in local settings supported by highly specialised hospitals at the hub. These will provide 'step up care' for patients with appropriate care, skills, equipment and environment in each place.
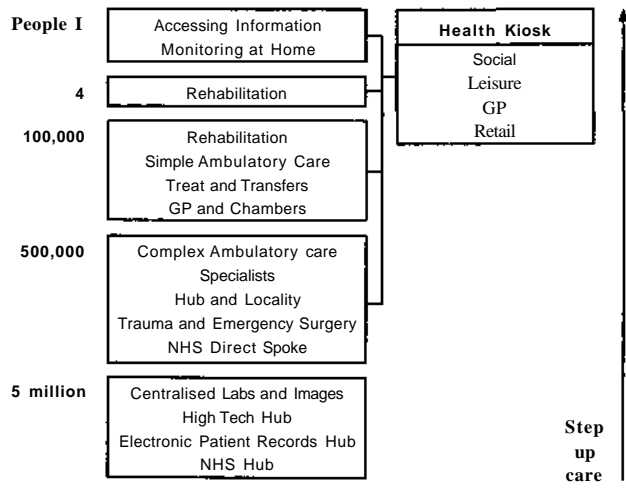
People I	Accessing Information Monitoring at Home	**Health Kiosk**
4	Rehabilitation	Social Leisure GP Retail
100,000	Rehabilitation Simple Ambulatory Care Treat and Transfers GP and Chambers	
500,000	Complex Ambulatory care Specialists Hub and Locality Trauma and Emergency Surgery NHS Direct Spoke	
5 million	Centralised Labs and Images High Tech Hub Electronic Patient Records Hub NHS Hub	Step up care

figure 1: *Framework diagram*

Primary care settings will offer integrated health and social care in a variety of places including healthy living centres and health kiosks in retail developments, community centres and sports and leisure centres.

These will all be serviced by a centralised hub involving laboratories for diagnostic testing and data collection on records, remote from patient contact.

Location

The location of all these facilities will most likely be based on reforming existing sites for new care rather than complete relocation. So, existing site location may remain constant whilst the size and distribution of services will change. This will positively respond to public pressure to maintain health services on existing sites. Some specialist hospitals will become smaller and more specialised whilst community buildings will become bigger.

This network of facilities will accommodate regional variations with no standard models for services or designs. There is a perceived need for different considerations in urban and rural locations although there is a growing interest in developing methodologies for a universal measure of transport time rather than distance. Transport, and public transport systems in particular, will be a key issue as patients and staff are unlikely to walk to any of these places.

There will be a general trend towards centralising support and diagnostic services and locating them away from care centres.

At the same time patient contact will be decentralised with greater integration of health, social and leisure services. An emphasis on prevention through education and promotion will be met by a more holistic approach to healthy living.

Three main levels of health care environments with patient contact are envisaged:

Healthy living centres will be multi-purpose centres emphasising prevention rather than cure. They will be based on the integration of a network of health and social care buildings, possibly linked with retail developments. There will be more home and continuing care. New roles for community pharmacists will emerge.

Community hospitals will provide intensive nursing bases supported by local communities offering mostly ambulatory and rehabilitative care. These will be located on existing general hospital sites and will be closely linked with primary care.

Regional specialist centres will provide centres of excellence on the outskirts of conurbations with technical links to other sites including diagnostic and administrative support. These will be highly specialist hospitals for acute care.

Hospitals of the Future

We can anticipate that there will be two types of hospitals in future: one will provide highly intensive care for life threatening cases and the other will be community based for intermediate and elective cases.

The local hospitals will serve 100,000 people and will be closely associated with community and primary services.

The specialist hospital will be the centre of the greatest expertise and skills. It will provide highly specialised services for 500,000 people.

There are already two recently developing models for location and organisation of hospitals: firstly, the concept of the hub of core acute services with spokes far away in community settings; secondly, the concept of villages with one stop shops within the hospital. A third, which is now emerging, is the idea of a network of care centres, some of which are in local community hospitals and some in regional specialist hospitals. This network will be linked electronically to facilitate communications whilst minimising travelling between centres.

Both kinds of hospitals will be served by a highly automated and electronic hub which will cover a catchment population of 5 million people. Centralised laboratories and diagnostic testing, an electronic hub for patient records and the NHS Direct advice line will be located in this hub.

The community hospitals will provide ambulatory, elective treatment and rehabilitation. These will be closely linked to other primary facilities including healthy living centres and health kiosks.

The regional and specialist hospitals will be the highly intensive hub linked to local community hospitals. These specialist hospitals will be centres of excellence and may provide selected specific services rather than a full and comprehensive range.

The precise configuration will vary from region to region. 24 hour access to services and expertise will be sustained by electronic and physical means. This network model will facilitate acute care support through high tech links to patients at home.

The concept is founded on the principle of the continuum of design solutions for seamless care. Crucial to its concept are the notions of collaborative working, partnerships between hospitals, specialists and the primary care team working together with other agencies such as social services, schools, voluntary organisations, a more dynamic exchange between health care professionals and between clinicians and patients. The buildings may provide a sense of identity but not necessarily territory for patients and staff.

Services
Patients will be able to contact NHS Direct that will provide patient assessment, triage, advice, referral and intervention packages.

The specialist hospitals will have a quota for emergency cases. The role of paramedics will increase to provide a greater raft of services and treatments outside of the hospital. Some primary care services will be needed in A & E for localities where other primary care is lacking.

Planned services will involve a predicted 90% day surgery. For

acute care, patients may expect to be in hospital for several days with step down care to a community, rehabilitative setting or home afterwards. Some patients may stay only for weekdays enabling a change of working patterns for nurses and paramedics. Staff will have different working patterns, and multi-skilling will be the norm. We expect to see further development of community / hospital integration such as are currently practiced in cancer, maternity and orthopaedic services e.g. one stop shops, hospital at home and specialist out-reach care.

Several teams will be required to provide the step down service which will need to be carefully managed to provide continuity of care for patients. A concern about whether home support for ambulatory care can work in deprived areas with poor physical and social networks is being raised.

The Impact of New Information Technologies
Whilst technological change is certain, the pace at which this will be realised is uncertain. There is the potential for IT to generate new forms of communication involving linking, informing, monitoring and feedback in a support mode.

Communication networks for IT, industrial services and data processing will be out-sourced to a centralised electronic hub.

Patient information and records will be integrated and stored on electronic cards reducing reliance on paper.

Diagnostic sites will have centralised data and interpretation

where reporting will be automated requiring humans only to examine the exceptional cases.

Communication networks will facilitate links from centres to local facilities. The miniaturisation, mobility, faster, more specific and multi-faceted nature of equipment will mean the spaces required for diagnostic and testing equipment will change.

The Patient Experience
In 2020 most people will be able through internet access to ask the right questions and find out who the expert is that may not be locally based. Patients will regard hospital as the final resort. Travelling to centres of expertise for care and treatment of specialist, rare or complex conditions will be acceptable but for routine, follow up, rehabilitative services patient will expect to attend local community centres.

Future hospitals will be shaped principally by patient care needs and not by procedures. Patient will be offered a date for intervention at the time of decision that will relieve the current rationing by waiting lists. Patient care episodes will be managed by care managers who cross over boundaries between specialist, community and primary care i.e. people based power management. A new structure focussed on patient processes and outcomes and team performance will supersede conventional currencies such as professional status, beds and space.

Staff and Skills
There will be generic working based on multi-skilling. Services

will actually be reconfigured to create possible new staff roles such as specialist nurses or other non-medical clinicians. There will be an increasing role for PAMS who may be sub-contracted to the NHS. Consultant expertise will be available electronically, meaning that they may be distributed in different ways from now. It is likely that there will be a need for completely retraining people for these new frameworks.

Design and Construction Strategies

There will be a fundamental shift in how health care buildings are planned in the future in that the primary focus will be on the patient not the procedure. This is a departure from conventional planning principles.

Services

Length of stay will have the greatest influence on environmental need. The intensity of treatment and environmental awareness of patient are other factors. For those patients who are environmentally aware, individual choice and control will be key issues. There will be a need to recognise that individuals within categories have different needs e.g. some patients prefer single rooms and others like to share rooms.

Buildings are likely to be less specific accommodating greater change of use and adaptability. Design may need to allow for more change over time where the whole building may even take on other uses such as becoming a hotel. The concept of universal or generic room types will prevail with as few as 6 room types for hospitals.

Paradoxically, innovative design that responds to the specific nature of the site and its context will be paramount. There will be an emphasis on standards rather than standardisation with an acceptance of the need for regional variations.

The pre-fabrication of whole components or a shell and fit out approach to design and construction may allow for future change.

The provision of adequate single rooms for increased incidences of barrier and reverse barrier nursing will be needed which may also help with cross infection. There will be a trend towards the decentralisation of engineering services and catering which may reduce the risks of cross infection but lead to conflict and compromise with other design aims such as energy saving.

New Technologies

Considerable changes will take place not only within one building or site but significantly in terms of dispersal of functions across different sites where physical distance will no longer be an obstacle to efficient operation. The worldwide internet with no physical boundaries, real time instant scenario perhaps demonstrates this. The concept of networked information connections will be more important than planning spaces adjacent to one another.

Sustainable Design and Life Cycle Costing

Health care facilities need to be located close to users and public transport routes to improve access and reduce car travel, energy consumption and damage to the environment. These will need to be in line with government thinking in recent planning guidance and the White Paper on the future of transport.

Broad construction industry developments particularly related to energy harvesting are already working and well advanced. Two low energy hospital projects have provided energy targets along with methods of achieving these. This is probably the main contribution hospitals can make. Coordination between local energy users to minimise waste energy and share surplus energy output may be more achievable in community than in specialist hospital environments.

Life cycle costing refers to the cost of a facility over its expected lifetime and includes the economic relationship between a number of factors including initial costs, running costs, future benefits, costs of money, price escalation and life of the investment. The life cycle of a facility is traditionally based on 60 years as normal life expectancy of basic fabric of permanent building with lesser periods for various elements such as engineering services e.g. 15 - 20 years. This raises the question whether life cycle costing should assume shorter life for facilities or parts than the norm because of changes in healthcare strategy. This would mean writing off these assets sooner as a matter of policy and design. A key decision at the start of a project will be who will determine the proposed life for the various parts.

This raises the question as to whether it is worth investing more in building design to make adaptable space that can change in future. This will be more significant in the context of joint development with retail companies and developers than in relation to an 'add on' income generation scenario. There is potential for a symbiotic relationship which can be used to improve access to healthcare facilities although there is a need to agree opening times and security systems.

In relation to facilities management, more of the clinical and support services will be contracted out reducing the number of services concentrated on one site and generating the need for transport and dispatch points for goods.

Alternative funding routes for capital developments may impact on building design strategies such that joint developments and ownership may lead to the need for clearer instructions between elements of a facility to enable a clear separation of ownership and use in the future with the possibility of sale.

Effective Procurement

There will be a need for a special breed of health care developer who is conversant with the health care industry and culture.

The implications of the Egan report 'Rethinking Construction' are two fold: that design must address ease of construction and maximise use of standard components and pre-assembly; and that competitive tendering will be replaced with long term relationships with one team of designers and contractors. 'Lean thinking' will improve the design and procurement processes to facilitate site construction and to reduce construction costs and times.

New treasury guidelines are reported to be sidelining designers in the procurement process. There is pressure for public bodies to use the design and build route or prime contracting with a direct link between the client and contractor. This is being challenged by RIBA and others.

Improving Environmental Quality and Briefing

There will be a need to present hard measurable evidence that environmental quality is a 'good buy' in order to convince clients of the importance of environmental quality. This will include cost/benefit analysis to prove that good design:

Need be no more expensive in capital and running costs

- Is good for business.
- Is healthier.
  Benefits outweigh the costs of any discretionary
  environmental elements.

Sponsors will need to become patrons and will require an
induction course on briefing, planning, design, construction,
commissioning and operation that includes environmental quality.

Designers need to show clients examples of best practice along
with benefits. This could be supported by an award backed by
exemplar projects and case studies.

Briefing will become more systematic using techniques of
simulation to communicate designs and management
consequences to clients. There will be a move towards an
evidence based architecture.

Summary and Next Step

John Wyn Owen

There is no doubt that the seminar created a buzz - the benefit of bringing a multi-disciplinary group of people together - health services as well as architects. It was agreed that for the future we should:

1. Create a forum so that diose in authority meet with diose with ideas, strengthening die bond between policy and practice, particularly planners and designers of settings for care.That the forum should seek to share the benefit of research, development and evaluation.

2. Develop a research, development and evaluation programme, emphasising objectivity and measurement in the built environment and find new ways to cope with aspects which were difficult to measure.

3. Make a case for research and prioritise funding towards the built environment, including ensuring this becomes part of mainstream research and securing custody of information to ensure that information and experience about die built environment is available for the public good.

The forum should concentrate on

- developing strategic thinking and planning
- developing insights into policy development and practice
- promoting the role of the built environment in health care delivery in the United Kingdom

- bridging professional experience with clinical experience
- encouraging a strategic approach to die built environment to position the United Kingdom as a leader in the global health world
- applying the models developed in the Foresight programmes - bringing together a wide cross-section of clinical and other interest
- supporting an educational approach to rework die skills needed in planning, writing a good design brief - now almost a dying art
- ensuring early discussions widi trainers, alerting them to die need to take more account of creating built environments, helping administrators understand die skills needed in brief writing
- examining where will the new generation of medical and nurse planners come from

Programme

9.30	Coffee and registration
10.00	Welcome John Wyn Owen, The Nuffield Trust
10.15	50 Years of Ideas: the Value of the Legacy Chair: John Weeks Book launch: Rosemary Glanville
I 1.00	Coffee
11.30	Developing a 2020 Vision Chair: Susan Francis Speakers:

Prof Morton Warner	Health Care Policy
Dr Ronnie Pollock	Medicine
Dr Jeremy Wyatt	Communication Te
Richard Burton	Architecture

1.00	Lunch

2.00	Thinking Ahead 8 Round Table Discussions on 4 Key Questions Chair: Richard Burton
3.00	Tea
3.20	Future Moves Feedback and Discussion Chair: Richard Burton
4.30	Summary and Way Forward John Wyn Owen, The Nuffield Trust
5.00	Evening Reception
6.30	Close

List of Delegates

Kit Allsopp	Architect	Simon Henderson	Architect	James Parker	Journalist
Mike Arrowsmith	Engineer	Jean Heyward	Nurse Planner	Duane Passman	Capital Planner
Philip Astley	Architect	Peter Hiles	Project Director	Christopher Paulley	Architect
Richard Barton	Architect	Adrian Hitchcox	Architect	Greg Penoyre	Architect
Janet Bishop	Primary Care Planner	Stan Hornagold	Project Manager	Dr Ronnie Pollock	Medical Planner
Louise Boden	Chief Nurse	Paul James	Architect	Andrew Prill	Capital Planning Manager
Sean Boyle	Health Economist	Tony Jones	Architect	Carole Rawlinson	Health Strategist
Martin Bromell	Architect	Sandy Keen	Health Planning Consultant	Richard Russell	Architect
Richard Burton	Architect	John Kelly	Health Strategist	Peter Scher	Architect
Neil Cadenhead	Architect	Chris Kemp	Health Planner	Christian Schumacher	Management Consultant
Iain Campbell	Architect	Mary Le Q Mitchell	Nurse Planner	Peter Senior	Arts Director
James Chapman	Architect	John Leach	Architect	Nick Shapland	Manager
David Clarke	Architect	Simon Lee	Architectural Assistant	Christopher Shaw	Architect
John Cole	Architect	David Lindsey	Engineer	Geoffrey Shepherd	Chief Executive
John Cooper	Architect	Brian Mark	Engineer	Jane Smith	Journalist
Richard Darch	Health Economist	Trevor Martin	Architect	David Stark	Architect
Lesley Davies	Projects Director	Peter McGinity	Projects Director	Peter Stocker	Architect
Virginia de Vere	Project Manager	Patricia McKellar	Administrator	Derek Stow	Architect
Ann Dix	Journalist	Kevin McSweeney	Quantity Surveyor	Prof Per Gunnar Svenson	IHF
Roger Dixon	Architect	Ross McTaggart	Architect	Pamela Sweetnam	Consultant
Keith Dowell	Architect	Richard Meara	Health Planner	Rob Thompson	Research Director
Nigel Draper	Health Planner	Paul Mercer	Architect	Mark Tinker	Architect
Marie Duckworth	Health Economist	Glynis Meredith Windle	Nurse Planner	Roger Walters	Architect
Susan Francis	Research Architect	Keiran Morgan	Architect	Prof Morton Warner	Health Policy Analyst
Bryan Gilbert	Architect	Raymond Moss	Architect	John Weeks	Architect
Rosemary Glanville	Architect	Daryl Murphy	Architect	John Wells Thorpe	Architect
Deena Goff	Nurse Planner	Ralph Murray	Consortium	Jonathan Wilson	Architect
Kate Harmond	Clinical Director	Robin Nicholson	Architect	Sylvia Wyatt	Health Economist
Anthony Harrison	Health Policy Analyst	Mike Nightingale	Architect	Dr Jeremy Wyatt	Information Specialist
Sue Hay	Research Radiographer	Ann Noble	Architect	John Wyn Owen	The Nuffield Trust
Robert Heavisides	Facilities Director	Richard Nugent	Architect	Judie Yung	Planning Consultant

Biographies of Speakers

Prof Morton Warner

Morton Warner is Professor of Health Policy and Strategy at the University of Glamorgan and Director of the Welsh Institute for Health and Social Care.

He directs a WHO Collaborating Centre for Regional Health Strategy and Management in Europe and is a member of the WHO's Health Futures group.

The first half of his professional life was spent in Canada where he was the Director of the Graduate Programme in Health Services Planning at the University of Columbia. Following this he worked with United Medical Enterprises in the UK and the WHO. He worked in the NHS from 1987, as Executive Director of the Welsh Health Planning Forum.

He holds a PhD in Medical Sociology from the University of Wales and is an honourary member of the Faculty of Public Health Medicine of the Royal College of Physicians.

He has published several books and papers on health policy.

Dr Ronnie Pollock

Dr Ronnie Pollock has been a partner in MPA International Health Strategy and Planning since 1992.

He was Regional Director of Public Health with Oxford Regional Health Authority being principally responsible for comprehensive and strategic planning.

He has been active in promoting the development of research in the UK and has created the Health Services Research Unit at Oxford University.

His personal research has been into the changing patterns of healthcare delivery, and their impact on future organisational structures, and on the hospital of the 21 st century.
His particular interest is in facilitating groups of doctors, especially for evidence-based practice, productivity, and innovative ways of delivering higher quality, patient centred care.

Dr Jeremy Wyatt

Dr Jeremy Wyatt is a Senior Fellow in Health and Public Policy at University College London and Director of Knowledge Management Centre, School of Public Policy, and UCL

He is also senior fellow, centre for Statistics in Medicine, Institute of Health Sciences, Oxford University
Has a doctorate of medicine from Oxford and is a member of the Royal College of Physicians

He was previously a consultant in medical info-matics to Imperial Cancer Research Fund and Medical Research Council visiting fellow at Stanford University

As a practising physician his main interest is developing and evaluating decision support systems and other methods of disseminating and implementing clinical knowledge of use to doctors and patients. He has published widely on the subject of info-matics and tele-medicine.

He collaborates closely with clinical epidemiologists, medical statisticians, psychologists and computer scientists.

Richard Burton, CBE

Richard Burton is an architect and a Director of Ahrends Burton and Koralek.

He has a distinguished career as a practising architect and is well known as the architect for one of the UK's most innovative and humane hospitals: St Mary's Hospital on the Isle of Wight, a low energy R & D project opened in 1990.

His interest in bringing together the arts and science is demonstrated in a number of distinguished public appointments he has held:

- Chair of the Arts Council of England Advisory Group and member of the Visual Arts panel.
- Chair of the RIBA Steering group on Architectural Education.
- Chair of the Arts Council National Steering Committee Report on 'Percent for Art'.
- Co-ordinator of the RIBA Energy Initiative and member of the Science Research Council Building Committee.
- Patron of Arts for Health, Axis and Healing Arts.

He has contributed to many conferences and seminars.

His research Interest is evidenced in his being a founding member of the London Cambridge Environmental Medical group who are actively involved in research into the effect of the Environment on the Patient.

Questions Prepared by the Focus Groups for the Round Table Discussions

What is the Likely Role of Hospitals in the Future Health Care System? What will be the Determinants of this?
- Why do patients need to go to hospital?
- What is the appropriate balance of prevention, promotion and cure in a hospital?
- What is the role of a centre of excellence
- What might be the impact of interagency working on a hospital.
- How far do we expect less invasive diagnosis and treatments, remote diagnosis and developments such as gene therapy to progress.
- How will emergency services be provided.
- What is the role of the hospital in education - medical, nursing and other.
- What might be an efficient balance and mix of skills and equipment.
- What is the need for special high technology and therapeutic environments.

Where will Hospitals be Located in the Future? What will be the Determinants of this?
- What are the drivers for smaller and larger hospitals.
- What constitutes ease of access.
- What are the expectations for public transport access considering the ageing population.
- What is the impact of local loyalty to existing hospitals.
- What might be the impact of interagency working e.g. sharing with other providers.
- How can the hospital contribute to urban planning and the regeneration role.

- How far is the availability and cost of sites a factor of local priorities.
- What is the appropriate scale for a hospital to allow professional support and training
- How extensively is a hospital a centre for outreach work and remote diagnosis.
- How does the availability of a staff labour pool influence hospital location.

What are the Likely Organisational Models for Hospitals in the Future? How will they Relate to Other Organisations?
- How far are new organisational ideas such as "villages" and "care centres" impacting on hospital organisation.
- How will the balance between emergency and planned services be organised.
- What is die role of consumer expectation and participation in developing the patient experience.
- What possibilities are there for future shared use such as art, education, fitness, retail.
- What is the impact of staff availability and skill mix on the future organisation.
- What is the impact of new information technologies (paperless and filmless).

What are Likely or Possible Future Building Strategies for Hospitals?
- How can designers influence clients in developing a belief in environmental quality.
- In providing environments for treatment and care what are the different needs of different groups.

How might changing cross infection risks be accommodated.
How will new information technologies (paperless and filmless) change physical adjacencies and relationships.
How will life cycle costing effect the building strategy.
What might be the impact of accommodating retail roles.
What are the likely impacts of the green agenda and the need for sustainable design.
Are there opportunities for sharing of facilities with the local community e.g. surplus heat.
How might response to future change be accommodated.
What is the likely change in effective procurement methods with the impact of the Egan report.
How might FM become more balanced between clinical and non clinical activities.

Conference Facilitators, Rapporteurs and Organisers

Facilitators
Sean Boyle
Kate Harmond
Nigel Draper
Rob Thompson
Ralph Murray
Louise Boden
Mike Nightingale
Ann Noble

Rapporteurs
Deena Goff
Duane Passman
Daryl Murphy
Andrew Prill
Phil Astley
Virginia de Vere
Chris Shaw
Roger Dixon

Organisers
MARU:
Rosemary Glanville
Susan Francis
Simon Lee

The Nuffield Trust
John Wyn Owen
Patricia MacKellar