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Exploring the 3E+3S approach to planning

The world's population is rapidly increasing and is expected to reach over 9.1 billion in 2050. To meet greater demands, healthcare buildings will be expected to comply, in terms of architecture and engineering, with three "Es" and three "Ss". These are "Effectiveness", "Equity", "Ecology", "Sustainability", "Security" and "Self-reliance". Facility management of healthcare buildings will become increasingly important.

The healthcare environment, especially that in hospitals worldwide, is in the process of transition. Modernisation and maintenance of up-to-date medical technology require access to information and experience from around the world.

The aim of this article is to consider the key issues related to the healthcare environment which have been discussed in GUPHA (Global University Programs in Healthcare Architecture) activities since 2000.

These activities aim at fostering international and interdisciplinary competition and exchange, and to promote the education of health facility design programmes in universities worldwide.

The conclusion in the report of GUPHA which was published in 2004 is described

'Telecommunication technology is developing fast and will change working methods in healthcare.'

under the following five sets of critical items for discussion on the healthcare environment in the year 2050 (Nagasawa *et al*, 2004).

- Network/variety.
- Sustainability/flexibility.
- Environment/nature.
- Independence/self-reliance.
- Safety/security.

In this article, the author tries to summarise them into the three "Es" and three "Ss".

Effectiveness

Acute care environment

The modern Japanese hospital began to grow in the 1950s. New functional units emerged, such as radiology departments, clinical laboratory units, CSSDs, and medical records centres. These departments were technologically intensive and required physically centralised locations in order to avoid the duplication of expensive medical equipment. A compact hospital block for 800-1,000 beds was developed and searched for were economical efficiency and full utilisation of professional resources.

On the other hand, centralisation of hospital functions created various complicated traffic systems for people and

materials inside the building. Hospital staff and patients may have needed to travel long distances through various departments during the day and wait in each place for prolonged of times for tests or other reasons.

With such obvious shortcomings, hospital designers began to search for more compact building shapes in order to reduce costs by reducing external wall to floor ratios. The aim was to shorten distances between relevant departments. The result is that the modern hospital building looks more like a factory building than a human environment.

New procedures will continuously change the space requirement. New methods implemented by medical teams will require a compact department with inpatient ward, outpatient department and diagnostics rooms with possibilities for procedures. The supporting services will receive more attention. The central sterilisation systems, storage areas and material supply facilities departments will work more on industrial principles. The importance of logistics and process control will increase.

New automatic control technology is needed for detection of hospital infections. The technology should detect the potential epidemics before they start to spread.



How buildings will be used in the long term must be understood.

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‘example of cost-effective inpatient accommodation with a positive ambience.’

The trend is towards an intelligent building where basic technical networks allow fast and easy reinstallation of inside walls, piping and equipment.

Expected is a global reduction in large acute care facilities, a process now already well known in Europe and in USA. The idea of integrating medical and social services is being increasingly considered.

Medical processes

Present boundaries in staff work may be reorganised. This will directly influence the programmes in design and the shape of hospital buildings radically (Vauramo 2003).

Clear distinction between acute and chronic care hospitals will re-arrange large nursing units into appropriate sizes depending on particular nursing requirements. High-tech medical technology will be more rapidly and more sophisticatedly developed in the 21st Century and applied to critical care/life saving hospitals. On the other hand, more holistic and low-tech medical treatments should be also developed – for example to care for the terminally ill in hospices or in their own homes.

Network of medical services/hospitals

The hospital complex can be formed not of one building but of a network of buildings from different ages that have different technical standards and conditions. Trends in the design and utilisation of acute care hospitals are beginning to suggest that large centralised facilities can become inefficient and costly. As various medical technologies

have become more widely distributed, networks of smaller facilities have become more efficient and created the concept of rationalisation. It is this rationalisation that will add a human element and permit systems to be adapted more to the culture of areas or regions served.

Paths forward

Telecommunications

Telecommunication technology is developing fast and will change working methods in healthcare. The hospitals, clinics and primary healthcare units will network themselves. Networking will enable transfer of diagnostic images in real time between facilities. Online consultation may solve the patient's problem without the patient having to travel to a health centre. Outpatient visits to hospitals may be reduced.

Integrated healthcare network

The “Integrated healthcare network” will have increasingly important roles in the future. Such a network will feature care providers, systems and settings involving both hospital-based care and the delivery of primary care and preventative care in a wide range of settings. There will be an underlying need to provide an ever-increasing quality of care, at lower overall cost, to a wider range of populations.

Developing areas

In developing areas, the difference in healthcare provision between social classes will increase. The upper class will have

Western medicine in well-equipped hospitals and physicians trained in universities abroad. However, for majority of the population, the lack of clean water and the risk starvation are realities.

Elderly and handicapped persons

About 400 million people will be over 80 years of age in 2050. Around 200 million of them will be in Asia. At the same time the old family structure is changing, and the requirement for welfare is very demanding. Implementation of community care has started in Japan. There are intensive developments of better design for the elderly care facilities. China also has raised similar problems.

Ecology

Global environment

The importance of a healthy environment must be emphasised, and the planning of healthy urban areas is, perhaps, the most effective preventative medicine tool available. We are the first and foremost biological beings: our health is vitally, and now precariously, connected to the natural order of the planet.

Needed when natural disasters strike will be quickly mobilised healthcare teams.

Man-made environment

Some modern buildings exclude sunlight and fresh air. Greater consideration must be given to creating healthy buildings with appropriate connections to the outside, natural world.

CO₂ reduction

Benchmarks for environmental sustainability have included the setting of a target of a 20% reduction in CO₂ emissions by the current time. The move to greater sustainability is increasingly reflected in new projects.

Sustainability

Continuous refurbishment/modernisation

In Nordic countries most of the hospitals in 2050 will be on the same sites as today. In the coming 50 years they will be refurbished several times. In Nordic acute care hospitals, 3% to 5% of floor area is refurbished in any one year. Continuous modernisation is for many hospitals the only way to modernise.

Refurbishment is an expensive process and will be in the future more so. Therefore, the management of the refurbishment process is important. Some hospitals have successfully carried out modernisations with satisfactory results, while others have implemented relatively costly programmes which have not achieved the hoped-for results. The reason is often a missing master plan or an unclear concept. Managers need to have high-quality conceptual plans for the future. With the expectation for continuous change, buildings of the future must be able to accommodate periodic economical reconfiguration without major structural change.

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Sustainable master plans

New, innovative cost-effective solutions in hospital design are needed. They can be systematically explored. Often the vision of a single hospital is limited. The present situation and existing buildings dominate the human mind. Therefore working together at a conceptual level may open minds for new ideas. (Weeks 1986)

Hospitals working together can produce together the medical programmes for a future facility. The theoretical acute care hospital will be sketched at the master plan level.

By doing this, new innovative solutions can be expected. Medical technology is developing fast but the hospital technology industry needs to be stimulated.

Often, in hospitals, enlargements or large refurbishments are done without analysing effects on the total function of the hospital complex. Changes may generate new problems that could be avoided with better master planning.

Sustainable design

The concept of sustainability addresses the need to develop a more long-term understanding of how buildings will be used and perform. Taken into account must be meeting the changing needs of society, whole life costing of premises and best value, and comprehensive meeting of environmental criteria at three levels – global, local and internal.

Security

Disaster mitigation

Problems associated with natural and man-made disasters require interdisciplinary cooperation between architects, engineers and medical faculties as well as psychologists in some cases (Wapner 2002).

Research on disaster management has produced a shift of focus from the structural

strength of materials to the elasticity in human living. The purpose is to enhance sustainability (synonymous with recoverability after disasters).

It is important to provide pathways and squares for people to walk and stay in a city in the event that most buildings are destroyed. The reservation of such vacant spaces in urban areas is more meaningful if they can be used to full advantage in non-disaster situations. Understanding gained from disaster experience needs to have more impact on future planning.

Mobile hospital

The provision of mobile/temporary healthcare facilities to deal with casualties of large-scale emergencies needs to be fully addressed. Aspects relating to effectiveness and efficiency need to be comprehensively covered.

Safety and security in architecture

Safety and security are basically different concepts, and by 2050 healthcare environments must meet criteria for being both safe and secure.

Self-reliance

'Total Institutions'

In 1961, Erving Goffman gave the name "Total Institution" to facilities which control a person's life for 24 hours a day, 365 days a year. As a psychiatrist in an "asylum" he discovered that the institutional environment itself prevented "inmates" in psychiatric

hospitals from recovering from illness.

Patients in such institutions often feel separated from their emotional and physical support systems. Complicating the impersonality of large healthcare institutions, the development in medical technology continues and no limit can be seen (Ulrich 1987).

There are parallel thoughts about elderly care facilities.

In considering the future prospects of function-orientated hospitals and other healthcare facilities, the recent concept of the "healing environment" provides key words for solving many problems (Nagasawa 1995).

Therapeutic/healing environments

Therapeutic/healing environments are calming by having views of nature and links to outside spaces. Their designs should offer more comfort and variety to patients and staff. A positive ambience can be achieved by the sensitive use of light, colour, texture, aroma and sound, and by integrating art, interior design and landscape design. Some healthcare buildings already benefit from programmes which bring into them visual and performing arts.

From dependence to self-reliance

As an integral part of fostering both better relationships in communities and in improving health maintenance, we need greater self-reliance and opportunities to exercise individual will. This becomes more critical in the case of those, e.g. the elderly or handicapped, who must often rely on others to accomplish daily activities.

The built environment should not restrict but rather encourage everyone to participate as fully as each would like. The blossoming of personal communication technologies allow us more readily to "meet" and have great potential to contribute to forming stronger community ties at the same time as individual independence. Barrier-free planning for handicapped people is needed.

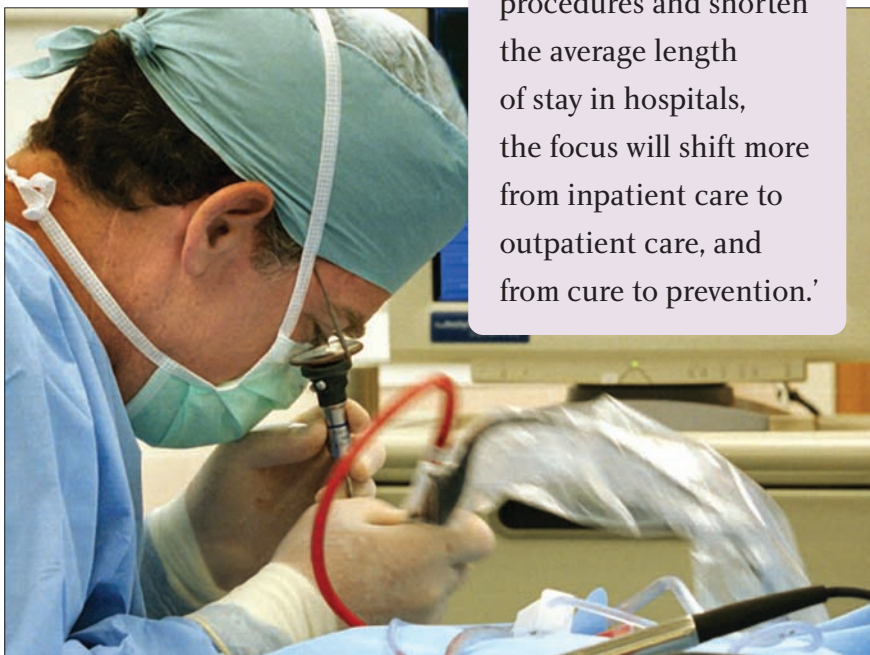
Today the hospital is not only a building but also a complex social institution. One trend might be the provision of healthcare facilities in a mall concept which also includes social services and places for refreshment and entertainment.

Conclusion

The deep megatrends will be identified independently from present administrative limitations. These megatrends, listed below, will have profound effects on how healthcare is provided:

- Ageing population.
- Growing consumer demands.
- Shortage of qualified personnel.
- Changing work processes and work environments.
- Developments in biotechnology, and in medical and information technology.
- Diversification of healthcare financing systems.

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In all countries, the building and renovation of healthcare facilities will require new thinking and new flexible solutions that incorporate the revolutionary developments in information and communication technologies into the processes and structures of the facilities.

Hospitals and healthcare facilities in the future will be smaller and will be supported by sophisticated communication and transportation systems. As medical technology developments continue to support less invasive procedures and shorten the average length of stay in hospitals, the focus will shift more from inpatient care to outpatient care, and from cure to prevention.

A single hospital has only a few persons able to see or to plan for the future. Nationwide visions are also limited by present working methods, education and funding systems. To guarantee better results, international contacts are needed. The GUPHA programme offers a window onto a global view.

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