centuries, may reflect the much more rapid recent evolution of clinical medicine, rather than deficiencies of architecture or building. The more intense pace of life (no farms now in hospitals treating respiratory cases), turnover of patients (none expected to stay more than a few days) and pressure on beds (reduced by around half in the past 20 years) have all put paid to the concept of the extended hospital community. The Future Hospital Commission recognised this implicitly, by including a workstream looking specifically at the built environment, led by the RCP treasurer, Professor Linda Luxon. The debate within that group was intense, and brief summary answers to the questions raised could not be easily incorporated into the Commission's final report. We therefore devote the focused section of this edition of the *FHJ* to this theme, and Linda has selected experts involved in the original work to record their ideas. I hope that these are complemented by contributions from figures with significant national and international reputations in this field.

It therefore seems clear that as clinicians we need not only to nurture the natural environment in which we are privileged to live, but also to influence the design of the built environment in which we work. The way in which we feel about ourselves as medical practitioners, and our ability to carry out our tasks to the satisfaction of our patients, depends upon such engagement. This concern can and should extend to the buildings within which we try to improve our standards of practice. As far as I know, we are not seeking new RCP premises to replace those so ably created by Lasdun, but our new president and senior RCP officers are rightly questioning how we should use them; should we for example be promoting their commercial exploitation merely to sustain them in their current location? The beauties of Regent's Park are, in the words of a former distinguished registrar, '..a long way from the realities of the Midlands and North of England…' where many of our fellows and members spend their professional lives.

We are heavily influenced by the circumstances within which we work. We know that fellow professionals can and are achieving wonders in helping patients in the most primitive accommodation and circumstances around the world. I suggest we should not only be grateful that most of us are not trying to practice under conditions of open warfare, flood, fire and famine, but should also make the very most of our (for the most part) privileged clinical and professional environments. I hope that the contributions contained in the current issue of the *FHJ* reinforce this message and broaden our thinking. ■

Timothy W Evans

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Infrastructure – the key to healthcare improvement

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Introduction

In this issue, we focus on the infrastructure workstream of the Future Hospital project, and notable figures provide their perspective on the built environment and specific elements of healthcare infrastructure, including architecture, design, commissioning a new hospital, sustainability and information technology, both in the UK and overseas. Particular thanks are due to Tom Downes for editing this special section.

Infrastructure must integrate the hospital, as the centre for acute and inpatient care, into the broader health care system,[1] and should facilitate the seven domains of quality[2] – patient experience, effectiveness, efficiency, timeliness, safety, equity and sustainability. Infrastructure includes the built environment and supporting elements: equipment, access, information technology (IT), systems and processes, sustainability initiatives and staff. Overall these interwoven facets should enable patients to move seamlessly, with their privacy and dignity maintained at all times,[3] from initial referral through local hospitals to specialist tertiary centres and discharge to appropriate care (home, care home, or community hospital with intermediate care), whatever the age, disorder or social circumstances of the patient.

Infrastructure is a key pillar supporting the fundamental aim of promoting improved standards of care and wellbeing for all patients, together with a good experience of the health

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care system. In parallel, the healthcare system and staff must support effective health promotion, prevention and self-care of the whole population. 'Every contact counts' (www.makingeverycontactcount.co.uk/) and, in this regard, hospitals have a key role in providing contact for disadvantaged population groups, such as the homeless, the abused and addicts, who do not access primary care. In addition, a secondary aim must be to improve the wellbeing of staff, as this is integrally related to ensuring improved care for patients.[4]

The built environment

Healthcare sites, including hospitals, should be integrated into the broader community, wherever possible, to promote accessibility, societal 'buy-in' and well-being. There should be easy access, car parking and transport facilities and clear signage within the hospital and hospital grounds to ensure patients and families can easily navigate all hospital services.[5] New hospital buildings should be constructed to a high standard, reflecting certain principles in their design, specifically flexibility of usage of space to keep services adaptable and revenue costs down, as exemplified by the Procure21+ programme[6] (www.procure21plus.nhs.uk/standardshare). Wards and patient areas should have space, light and good views wherever possible, to promote a patient-friendly and healing environment.[7] In addition there should be adequate space between beds for procedures, clinical activities and infection control.[8] Co-location of related services serves efficiency and timeliness of services, as do separate access routes for staff, patients and the public to wards and services. These clinically led design features are exemplified in the South West Acute Hospital in Enniskillen.

A range of amenities, such as a choice of food, shops, a restaurant, postage, IT facilities, telephone, TV/radio access and chaplains, improve patient and staff wellbeing, while regular childcare services support seven-day staff working. Importantly, neither patients nor services should be constrained by the physical environment, but the environment should be configured to be fit-for-purpose, with a high degree of cleanliness,[5] and should be sufficiently flexible to serve all patients, including both the physically and mentally disabled.

Existing buildings may require reconfiguration to promote seamless and efficient healthcare, with specific services in specific sites; for example, acute care services on one site, with intermediate community care, outpatients, mental health, rehabilitation, integrated therapy and social services, together with day care and hospice care, on another. Such provision across the whole healthcare pathway should be supported by integrated medical, nursing and multi-professional healthcare services. In the community, this cross-cutting approach is highlighted by the Bromley by Bow Health Centre (www.bbbc.org.uk/pages/health-centre), which provides a holistic approach to helping people towards a healthier lifestyle.

Medical equipment

A comprehensive, corporate approach to managing medical equipment, overseen by a responsible lead, ensures that appropriate medical equipment is available and fit-for-purpose, as required for the delivery of high quality clinical services. This requires scrutiny of every element of the life cycle of a device from specification of requirements, through evaluation of competing products, decontamination, procurement, introduction, maintenance and quality assurance to disposal and funded plans for equipment replacement. In addition, the responsible lead should evaluate and introduce appropriate new technologies and ensure that requirements for medical equipment are factored into service development proposals.[9] The management of risks associated with medical equipment, including responding to adverse incidents, should also be undertaken within a corporate framework.

Access

The term 'access' refers to patient access to all healthcare services, including mental health support,[10] physical access to healthcare facilities and all relevant hospital information, including clinical service statistics, in electronic, written or audio formats.

Access to information should be recognised as an effective way in which to promote both patient and staff wellbeing. There should be equity of access irrespective of age (eg published age cohort statistics for interventions/procedures to ensure equity), gender, ethnicity, sexual orientation and disability. Regular review and flexibility of all aspects of access are required to ensure continual development and optimal provision.

Information provided should include clinic times, appointment arrangements allowing linked appointments across different disciplines/levels of healthcare, named doctors in clinics, the nature and role of multidisciplinary teams, transport facilities and costs. Patient-centred services benefit from easy access to information about disorders, investigations, treatments and medicines, together with healthcare education advice providing both prevention and self-care information. Good housekeeping information may relate to visiting hours, shops (goods and opening hours), religious contacts/services, telephone arrangements and, for inpatients, hospital activities, such as exhibitions, music, and radio and television programmes.

Technology

Fully integrated information technology systems should support the delivery of information to ensure patients, carers and health professionals can access information they need, when they need it. In addition, technology could support improved healthcare efficiency both in outreach provision of care[11] and by reducing travel and healthcare visits and in inpatient provision. At the South West Acute Hospital in Enniskillen, each bed has a television with clinical information and data displayed for the clinician and health promotion messages displayed to the patient. Hospital efficiencies could be achieved by supplying multiple terminals around the hospital, allowing real-time access to an interactive database of inpatient admission and discharge information, with referral details, patient information and location (kept up-to-date), the name, grade and contact details of the clerking doctor, the time of medical assessment, and details of investigations (including outstanding results) and specialty reviews. This should also include a capacity and activity management system, linked to the wider health and

social care providers and personal communication devices detailing contact details to each member of the clinical team in each shift. Provision of apps with NICE guidelines, national and local protocols and the BNF would reduce errors and improve care.

Governance and organisational infrastructure

The challenge here is to develop better, faster, cheaper ways of providing healthcare by promoting and supporting core processes, using technology to enable flexible and adaptive delivery. This is achieved by the development of organisational processes focused on providing high quality, sustainable, patient-centred services, with coordination of both planned and unplanned care, so that neither impacts upon the other. Modelling and simulation of systems and proposed changes, as exemplified by the work of the Cumberland Initiative (www.cumberland-initiative.org/), can underpin such activity. Regular meetings of social and healthcare facilities within a locality allow outcomes to be reviewed, bottlenecks identified, limitations and concerns shared and interactions to be evaluated, ensuring that services are collaboratively and effectively delivered to provide cost-efficient healthcare across the entire pathway.

Administrative and organisational arrangements, with leadership informed by managerial, clinical and patient inputs, should be in place to ensure appropriate staffing structures, technology and equipment management. There should be recognition of the value of education and research, with processes to ensure dedicated, adequate time for research, continuing professional development, and managerial and national contributions at all levels of clinical professional careers, with, where necessary, incentives for trusts to promote the development of improved care.

Staff structures

Staff structures have changed, with the emphasis on multidisciplinary teams and the emergence of new healthcare roles, including physician assistants,[12] consultant healthcare scientists[13] and advanced nurse (clinical) practitioners.[14] Staff planning should focus on optimising quality patient care, irrespective of professional label, and ensuring cost-effective and resource-efficient use of all staff. Key principles include:

- provision of a seven day service
- integrated team of professionals, who are trained, competent and equipped in line with local/national standards
- each discipline spanning the entire patient pathway and integrated at all levels to promote quality of care, seamless transition and cost efficiency
- individuals not practising in isolation
- teams being engaged with admission assessment, with planned discharge assessment on the day of admission to promote efficient patient flows.

Sustainable health care

There is evidence that sustainable systems and processes provide both patient benefit and save costs, quite apart from reducing the carbon footprint. These key principles lie in a diverse range of approaches.

Primary and secondary prevention should be a goal of every patient encounter, with resource centres providing patient-centred family education, which promotes better health. In addition, the early identification of patients who would benefit from proactive management has demonstrable patient and economic value. For example, in Birmingham, systematic kidney disease management, in a large population with diabetes mellitus, led to significantly improved patient outcomes, increased the productivity of a specialist service and reduced healthcare costs.[15] In rehabilitation medicine, early involvement of rehabilitation physicians in the acute setting reduced length of stay and complications.[16]

Systems reconfiguration, as exemplified by the US model of vertical integration,[17] reduces waste and duplication, and improves efficiency and care co-ordination with reduced costs and energy consumption. In the UK, an integrated budget across a hospital and primary care trust/clinical commissioning group would share financial risk and ensure that a hospital visit would add value, not provided by a phone call or visit from a district nurse.

Reconfiguration of services may improve healthcare efficiency; flexible models of care – for example, care closer to home via telephone consultations and tele-medicine,[18] or acute care at the front door of a hospital, supported by dedicated core services – would avoid the disruption of inpatient/planned investigations and treatment. Multidisciplinary electronic discharge protocols can be initiated on the day of admission and linked to care provision on discharge.[19] Another mechanism, as exemplified at the University Hospital of North Staffordshire, is the introduction of a patient flow bundle reducing the length of stay.[20]

The NHS accounts for 5% of all road traffic in England and travel is responsible for 18% of the NHS carbon footprint in England.[21] Initiatives to promote active transport for both patients and staff, such as bicycle lanes, secure bicycle racks, free parking for multi-occupancy vehicles, and, for staff, bicycle purchase schemes and facilities to change and shower, improve health and reduce costs and the carbon footprint. North Bristol Trust now sources all food within a 50 mile radius wherever possible, at no increase in cost.[22]

Sustainable initiatives such as motion-sensitive light detectors, low energy lighting, automatic switch-off of office computers and solar panels for heating will reduce energy expenditure, as exemplified by the TLC initiative at Bart's Healthcare Trust, where £100,000 has been saved – extrapolated to the entire NHS a figure of £35 million has been estimated.[23] A culture change – *buy less, use less, re-use more and recycle* – would rationalise procurement and reduce costs, for example with respect to re-prescription and poor compliance with drug prescriptions.

A major change in culture and accountability can be achieved by initiatives such as

- public reporting of sustainability targets and achievements – for example, US Health Hospitals Initiative (www.HHI.org) and Global Green and Healthy Hospitals network (www.greenhospitals.net)
- staff education and awareness-raising events, such as 'Sustainable Action Planning' for clinical teams at http://sap.greenerhealthcare.org
- incentives such as ward contests and gain sharing, as exemplified by the Whittington Hospital in London, the

Green Ward Competition 2012: http://sustainablehealthcare.org.uk/sustainable-operating-theatres/news/2012/06/green-ward-winners-whittington.

Importantly, regulatory financial incentives such as the introduction in April 2012 of a duty on hospital trusts to report on sustainability as part of their financial reporting mechanisms[24] and obligations related to the carbon reduction commitment energy efficiency scheme and the EU emissions trading scheme[25] will further drive the sustainable healthcare agenda.

Conclusion

Thus, multiple infrastructure systems, processes and personnel arrangements are key to the Future Hospital project aims and objectives, underpinning a new approach to healthcare that will ensure efficiency, cost reduction, sustainability and a reduced carbon footprint, and most importantly improved patient care. ■

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