Adapting Hospitals to Face the Future

A hypothetical study of Raigmore Hospital, testing strategies for hospital renewal to meet the needs of the 21st century.
Introduction

Hospitals have always been the flagships of healthcare, their design capturing the ethos of the care model of their time. From Victorian statements of patronage, where the public were the lucky recipients of care; through 20th century municipal machines for healing, where the public were the objects of care, these older hospitals are now ageing and becoming less easy to operate, and the services provided in them and standards they must comply with are also changing.

In some instances new hospitals will be needed; however, do we always need to build anew? Communities and transport networks have grown up around our hospitals and these connections cannot be readily rebuilt. Therefore, this study tests the premise that the current healthcare and physical challenges facing Scottish healthcare facilities may, with a bit of skill and care, be tackled together through adaptation and renewal to provide an economic and sustainable way of developing hospitals now and in the medium term.

A new facility needs to support the changing model of care by reducing inappropriate admissions, treating emergency and elective cases differently, and facilitating earlier discharge from acute care back to community care. It also needs to improve the performance of the physical estate through the creation of better quality environments for both patients and staff through factors, improved wayfinding and enhanced energy performance. If this can be achieved through the adaptation of an existing facility, then there may be a valid case for adapting rather than disposing of existing hospitals when they no longer meet the current requirements of the service.

The study looks at the topic of regenerating existing hospitals and was tackled through research into the current and predictable future conditions and needs of NHS Scotland, and the development of a hypothesis on how to tackle these needs through adaptation. This is then tested through a live case study, the Raigmore hospital in Inverness.

Contents

Introduction p. 3

Section 1 Direction of Travel

1.1 The Changing Clinical Strategy p. 4
1.2 Changing Acute Care Facilities and Networks p. 6
1.3 Physical Hypothesis for the Adapted Hospital p. 8

Section 2 Test Case for Adaptation

2.1 Design Test – Raigmore Hospital p. 12
2.2 The Adapted Hospital p. 14
2.3 Phased Implementation p. 16

Section 3 Conclusion

3.1 Appraisal of the Adapted Raigmore p. 21

Appendix A Opportunities and Watchpoints p. 25
Appendix B Glossary p. 31
1. Direction of Travel

1.1 The changing clinical strategy

The starting point was to review the current understanding of the future direction of healthcare in Scotland and its implications for the healthcare estate. Colleagues in three health boards were specifically consulted on the topic, but recent acute strategy documents from other health boards were also reviewed.

The NHS Boards consulted were:

- NHS Greater Glasgow and Clyde, which represents a largely urban population with teaching hospitals and tertiary referral services.
- NHS Forth Valley which is a medium sized health board with urban and rural populations and short and easy transport links to tertiary referral centres
- NHS Dumfries and Galloway, which has a relatively small, mainly rural population and is more isolated from the urban teaching centres.

This consultation outlined the key drivers for change, the direction of travel taken and how this is now informing the changing clinical strategy and is summarised further through the rest of sections 1.1 and 1.2. Lessons learned from this consultation have been integrated into the hypothesis in section 1.3.
Drivers for change
What factors are changing the direction of healthcare provision in Scotland?

Demand factors driving change
• Demography – increased life expectancy combined with declining fertility birth rates are leading to an ageing population
• Increased expectations within the population of what health care can provide and increased patient involvement in decisions
• Increased range of available treatments and technologies
• Variations in demographic factors – although the population of Scotland is declining as a whole, there are regional variations with areas such as Edinburgh and Falkirk experiencing population growth.

Organisational factors driving change
• Pressure on funding from the both the UK and Scottish Governments due to UK economy
• Staff pressures including:
  - Long-standing pockets of relative under-staffing
  - EU Working Time Directive – it is still difficult for some NHS Boards to reach targets and anomalous situations of relative over-staffing have been created
  - Morale issues – there have been significant changes in Terms and Conditions and others are expected - e.g. Agenda For Change, reform of the NHS Superannuation scheme
• Delivery of National and Local Strategies – “Quality Strategy” (eliminating harmful variations) “Equally Well” (Tackling Inequalities in Health) and “Better Health Better Care” (NB – There is no move to GP-led commissioning in Scotland)

Environmental Factors driving change
• Patient safety agenda including management of HAI
• Evidence-based preference for single-rooms
• Requirement to include evidence-based practice in design and interior design (natural light, connection to nature, use of art, etc.)
• Equality and diversity - Inclusive design including DDA compliance and cultural respect
• Compliance with statutory and other regulations
• Building and energy performance targets

Summary of the Drivers for Change
• Demand for, and expectations of, healthcare continue to rise
• Healthcare has to be delivered more efficiently
• Healthcare buildings have to change

The Strategic Services Direction
What is the strategic service direction in response to these pressures?

The key strategy is to provide an Integrated Healthcare system, with patient care taking place in the most appropriate health facility and with a smooth transition between different levels of care. This means that the nature of care provided by hospitals is changing. There is no longer such a thing as a “typical” hospital. The requirements will vary depending upon the purpose of the hospital and on locality and geographical factors.

Shifting the Balance of Care – moving activity from acute hospitals to primary and community care so that what is best done locally is done locally. A few examples of what this means in practice are:
• Developing patient self-care and facilitating the management of the patient at home whenever possible.
• Develop patient pathways with better assessment and more options for non-hospital treatment.
• Develop pathways for patient discharges that are planned and supported.
• Develop patient pathways for the management of long-term conditions particularly pro-active care to prevent hospital admission.
• Develop different means of communication such as Telemedicine for remote consultation and diagnosis.

The Strategic Direction also includes the introduction of modern efficient systems. A few examples of these are:
• Managed clinical networks
• Electronic patient records
• Centralised laboratory services
• Shifting the balance of the work done by medical staff, nursing staff and other appropriately trained staff, for example nurse endoscopists.

NHS acute hospital care is therefore being organised differently to support an integrated strategy with the acute hospitals (where specialised expertise can be adequately supported) providing more acute, more specialised and more targeted care.

Regional specialities such as neurosurgery, cardiothoracic, specialist paediatrics and so on are effectively becoming organised on a national basis and so the requirements in any one acute hospital are likely to vary.
1.2 Changing Acute Care Facilities and Networks

The changing requirements and needs and updated best practice have resulted in a new set of service and building design considerations for the Acute Hospital.

Separation of Urgent/Emergency Care and Elective Care

These patient flows have very different needs. Separating patient pathways leads to reduced in-patient admissions, more efficient staff use, increased efficiency of planned care, better patient outcomes and improved ability to respond to pressures.

A key driver in separating elective from acute care is protecting activity levels in elective care in order to achieve high utilisation rates that are not disrupted by emergencies, and to achieve increased efficiency. The key strategic directions are:

- Increased day and short stay procedures especially surgery
- Maximise “one-stop” outpatients and day patient treatments – assessment, investigation, diagnosis and treatment in one visit. Breast cancer clinics have been delivering this model effectively for some years now.
- Use surgical pre-assessment to determine risk and manage care appropriately. (on-site HDU/ITU or not)

Urgent/Emergency Care: Reform of the Emergency “Front Door”

To reduce inappropriate admissions and supply better care for patients, Emergency Departments now include an Immediate Reception Area (similar to an old-fashioned A&E department), a Common (or Acute) Assessment Unit and an adjacent acute admission ward. Examples of this in practice are Forth Valley Royal Hospital, Glasgow Royal Infirmary and Edinburgh Royal Infirmary. If possible, patients are assessed, treated and discharged directly from the Emergency Department. Admission to the short-stay (4-12) hour CAU or to the AAW (48 hours) allows more patients to be accurately diagnosed, treated and discharged. Those who need further care can be directed to the most appropriate ward e.g. stroke ward. This reduces the number of emergency admissions and patients admitted inappropriately resulting in more efficient treatment and shorter stays.

“Whole Hospital” Support for Emergency Departments

An emergency and trauma department which can handle acute referrals from GPs and emergency ambulance admissions requires 24-hour anaesthetic cover and the presence on-site of emergency surgical facilities, CCU, HDU and ITU back-up and at least emergency lab services. The increased specialisation of trauma services means that it is more efficient and safer to centralise major trauma units, rather than creating multiple smaller units. It is also optimal to have a neurosurgical and spinal injuries service on the same site – hence the rationale for the New South Glasgow Hospital and the project to relocate the Department of Clinical Neurosciences in Edinburgh to the ERI site. The highly trained staff and back-up requirements means trauma services and emergency medical and surgical receiving services are often provided from one department.
Minor Injuries
It is usually more efficient to provide a separate patient flow in the main emergency department for minor injuries and to manage these in separate facilities, at least during the day. There is also good evidence for the benefits of the development of local dispersed minor injuries units in community hospitals and ambulatory care hospitals. Stobhill Minor Injuries Unit is an example of this practice.

Major Acute Hospitals with Emergency and Critical Care
If the hospital is to have a single front door, there should be the following components which allow the concentration of the most highly trained staff in one area - helipad, good road links, trauma service, emergency department with assessment facilities/wards, CCU, HDU, theatres, neurosurgery and spinal injuries.

Once these services are settled, the clinical logic is to have children and maternity services on the same site, to maximise access to these services, neurosurgery in particular. In Glasgow, adult, maternity and paediatric were “co-located” on one-site, referred to in the expert report on Acute, Maternity & Paediatric services in Glasgow as “The Gold Standard” for care. NSGH also argued that there is complementarity in the emergency and imaging departments. The proposed ERI (RHSC/DCN) project will deliver the same set of clinical adjacencies.

A Hospital Network

Large Urban Centres – Glasgow, Edinburgh
In these centres there is a need to concentrate resources in fewer sustainable emergency departments. This results in two main types of in-patient acute hospital:
- Large hospitals with an extended Emergency/Trauma service + ITU/HDU/CCU + specialist support and gradually accreting more and more specialist services to each site – GRI, NSGH, ARI and ERI
- Hospitals with no trauma unit but possibly providing emergency reception of GP referrals and significant in-patient specialties and HDU/ITU facilities – Gartnavel General Hospital and Western General in Edinburgh are examples of these

The acute sites are complemented in Glasgow by largely elective (and minor injuries), largely ambulatory centres such as Stobhill and Victoria and a growing network of community/primary care facilities

NHS Board Areas with Urban and Rural Populations
Some NHS Boards in Scotland cover areas of mixed rural and urban centres – e.g. Fife, Forth Valley and Lanarkshire. Forth Valley moved to an Integrated Healthcare Strategy or model of a single acute hospital incorporating separation of acute and elective care and including an emergency department and ITU/HDU/CCU. The single-site acute centre is to be supported by a network of community hospitals – Clackmannan, Stirling and Falkirk. Fife has also developed a single Emergency Centre (Victoria Hospital, Kirkcaldy) with Queen Margaret Hospital in Dunfermline changing its function to deliver efficient and complex elective care and also specialties, which do not require access to an acute site.

NHS Boards with Largely Rural, Island or Specific Geographical Areas
In smaller health boards the acute hospitals must retain emergency services because of their isolation, although it is proving difficult sustaining the full range of “DGH” type services. The development of new community hospitals (e.g. Stranraer) is enabling the delivery of new patient care pathways by completing the network of levels of care, such as: community care, acute care and local community hospital care.
1.3 Physical Hypothesis for the Adapted Hospital

Implications of the Changing Clinical Strategy on the Physical Environment
Given the significant changes in healthcare provision in recent years, hospitals need to be fundamentally reorganised themselves to be able to deliver the change in thinking on how care is provided.

Development of Facilities to Accommodate Improved Outpatient, Day-Patient and Short-Stay Pathways to Improve Efficiency and Effectiveness
One of the effects of recent developments in techniques and technologies is the ability for more and more medical conditions to be treated on an outpatient or day patient basis. This suggests the possibility of a significant reduction in bed numbers for equivalent healthcare outcomes. (An often quoted statistic is that a modern Ambulatory Care Hospital or ACAD can do 85% of the work of a traditional general hospital).

In addition, it is possible that further economies/improvements can be made by a shift in the way in which elective work is planned, using a higher proportion of available capacity and with fewer overnight stays. This implies a cultural shift in order to take advantage of technological changes. In building terms this implies through:
- providing multi-purpose consulting rooms in a flexible plan (like one side of Stobhill)
- increasing the number of treatment rooms on the basis that more effective interventions can now be done as an outpatient
- having diagnostic and treatment facilities available to support out-patient protocols that aim to investigate and treat patients on a single-visit if possible

Re-Design of Emergency Departments, Providing Appropriate Assessment and Short-Stay Facilities for Urgent Care
A great deal of practice development has been carried out in recent years to establish more efficient and effective ways of assessing emergency patients and either diagnosing and treating them immediately or ensuring admission to the appropriate treatment location. In building terms additional space may be required for CAU or AAW and improved physical links to diagnostics.

Accommodating Change in Diagnostic and Treatment Techniques such as Imaging
Healthcare technology is developing fast, and the area, which has perhaps the most impact from an estates requirement, is the increasing importance of diagnostic and imaging departments. Hospital design should always include proposals for change of use and extension in such departments. Free space or "soft" space can be designed adjacent to these zones to accommodate future developments. Soft space in this context might be departments that can easily be relocated or that may have a shorter life. Examples that have been designed previously are the inclusion of a records store that was expected to be surplus to requirements within 10 years, or office accommodation that can be relocated when required. The constant evolution of high tech, heavyweight equipment
also implies a need to include the ability for this to be serviced/replaced with minimum disruption.

In remodelling an existing hospital this is likely to mean a significantly remodelled or new insertion with complex adjacency requirements and also requiring room for expansion planned in and access for maintenance/replacement of equipment.

**Ward Planning**

In estates terms one of the most significant developments in Scotland in recent years is the drive towards single room accommodation. This study will assume a target of 100% single bedrooms for adapted hospitals. When taken alongside space standards which have increased by almost 100% since the 1970’s this is likely to imply a reduction of around 50% or more in available bed spaces for refurbishment of a typical 1970’s ward area. This is demonstrated below and indicates a notional conversion of one floor of a ward block at Monklands Hospital to 100% single bed accommodation. In this case the number of spaces would be reduced from 72 to 32, or by 55%.

However, this change should also increase the percentage occupancy of a ward or the proportion of beds in use at any one time. 4-bed and 6-bed wards are not able to mix patients of different gender and so tend to have beds unavailable to be used. A high proportion of single-bed rooms has been shown to reduce the average length of stay due to improved patient rest; to reduce the incidence of HIA, and to reduce reportable incidents and so on. The greater efficiency of 100% single rooms therefore offsets the reduction in bed capacity. In terms of the hypothesis to be tested, the assumption is that the number of required rooms are likely to decrease due to changing care modes through reduced stay lengths and the increased occupancy efficiencies possible in single rooms.
Adaptation to Meet Statutory and Quality Standards – DDA, Bariatric, Infection Control

One of the aspirations of any healthcare construction programme is to provide accommodation that complies with modern standards, particularly in terms of access, space, fire safety, cleanliness and infection control. In the design study this will be considered in broad strategic moves such as rationalisation and separation of circulation routes for patients, staff and FM.

NB. Other whole system changes such as developing the primary care infrastructure including community hospitals and the segregation of non-urgent and urgent care are not discussed further here.

These physical and spatial demands can clearly be accommodated in new hospitals, but can older facilities be adapted to achieve the same and what are the implications of doing so? The hypothesis developed is that through the above changes the increased demands of healthcare systems could be accommodated within a similar building by reallocation and re-use of space, by rationalising the hospital in phases, as money permits. This hypothesis is tested in the next section. A list of considerations has also been added in Appendix A outlining some of the key considerations to be aware of when adapting hospitals for future use.
The Raigmore Hospital in Inverness was chosen as the live example to test the hypothesis based on the following criteria:

- The scale of the hospital was appropriate (mid-sized).
- The building base is predominantly mid/late 20th Century (not pre-NHS) and reaching a natural renewal phase.
- The site has been the subject of incremental/infill development over the years.
- The client was considering the long-term strategy and having carried out base work in clinical planning (but not yet developed into considering infrastructure options).

Background

Raigmore is an acute general hospital. There has been a hospital on the site since 1941 with the facilities and services having been continually enhanced over the years. The initial phase of Raigmore opened in 1970 consisting predominantly of single storey accommodation, with courtyards, holding many key acute hospital services. In addition to this, there is a ward block of eight floors, built in the 1980’s, together with other clinical facilities and departments in mainly two storey buildings. More recent developments include a new A&E unit and some additional specialist services and cancer support facilities in new buildings at the side of the existing hospital mass. The majority of the courtyards in the initial phase building have been infilled as more space has been required.

There are a number of current issues surrounding the layout of the hospital. These are broken down and discussed in more detail below.

Condition

A condition assessment was undertaken in 2010 and identified £3.7m of backlog maintenance required in the short term. However, this figure does not include for a more important requirement relating to future repairs. It is expected that more elements within the hospital will deteriorate and possibly fail as time moves on. Whilst the building fabric was noted as being in poor condition in many areas, the major risk element lies in the engineering services, which in many cases were found to be near or at the end of their useful life and potentially difficult and disruptive to replace.

Building Diagram

The building is entered at a number of locations along the front of the building, with multi-bed wards in the tower. Most of the other departments are located in the single storey areas to the front (west) of the building, which is the oldest part of the hospital. In contrast with the current moves towards clarifying and separating outpatient services, these are scattered throughout the plan though there are more distinct service areas provided to the north and the south of the site, providing specialist cancer services. The rear (east) of the site houses hospital services such as the mortuary, labs and underused catering facilities. The hospital is made up of a series of additions and modifications; piecemeal development, encrusting the exterior and filling the courtyards, which has further complicated the plan and made future development more and more difficult. The layout of the departments is not highly linked to key adjacencies,
and change within the current building is hampered by a lack of additional space to accommodate increased demand and changed service needs in both service models and moves to single bed accommodation.

**Circulation**

Partially due to the original design, and partially due to the large number of alterations and additions, which have taken place over the years, the current hospital layout is confusing and difficult to navigate. There are several different entrances, and little in the way of hierarchy of circulation. In order to access many of the areas patients and visitors must travel through several others. Public, staff, FM and patients on trolleys all use the same corridors with resultant impact on privacy, dignity and potential for cross infection. A general lack of outlook offers little for people to orient themselves by and makes the building less pleasant to be in. A recent project to improve wayfinding by introducing a colour coded zoning system is as effective as it could be, but the underlying problem still persists.

**Wards**

The inpatient accommodation is provided in the tower, with Paediatrics in the lower levels. The current wards are multiple bed wards, and as such changing these to single bed accommodation will result in a reduction in total bed numbers. Conversion to single beds will need careful consideration to enable efficient monitoring of the departments by staff. The ward block is some 30 years old and whilst structurally sound, has poor environmental performance by modern standards due to lack of insulation and ageing windows. The whole tower will be in need of refurbishment in the near to intermediate future.
The example solution for an adapted Raigmore seeks to resolve some of the key issues around the current hospital building and create a more rationalised and cohesive solution. The strategy on how this can be implemented through a phased solution is illustrated further in the next chapter of this report.

**Overall Approach**

In line with the purpose of the study, as much of the existing usable estate as possible is shown as retained. In order to facilitate a more intensive use of the site, together with improved connections and adjacencies, the demolitions are mainly of the older, single storey blocks of accommodation that are the least efficient both spatially and thermally. The ward tower, being the most valuable piece of the estate, is shown as retained, refurbished and adapted within the proposals. Refurbishment could bring it to a standard equivalent to a new building both in terms of the accommodation provided and the building performance; though this would be likely to involve the complete re-cladding and re-servicing as well as a complete internal strip out. The newer, two and three storey buildings in the southeast corner (less than 10 years old) are also shown as retained and no upgrade work would be likely in these.

The aim is to provide a hospital with a similar life expectancy and environmental performance of a new building, in particular improvements to the building envelope, u-values, air tightness, natural ventilation, all of which will bring increased energy performance.

**Building Diagram**

The new diagram separates the hospital into clear zones, with patients only travelling into the building as far as they need to.

The east (front) portion of the plan contains the Outpatient areas, which combine with Radiology, Theatres, Endoscopy, Angiography and Renal Dialysis to provide an effective Ambulatory Care Hospital.

The emergency treatment cluster contains all A&E functions, in delineated areas, and links directly to Acute Admissions on the first floor, and through to the new Maternity and Paediatric area. The reconfigured Radiology element links the ACAD, the Emergency Assessment Unit and also through to Maternity and Paediatric Care.

Inpatient ward accommodation is located in the upper portion of each tower – from Level 1 in the new tower and from Level 3 in the existing. The lower levels are used by ICU/ITU and specialist accommodation, which provide close access to key departments and the new and refurbished theatres.

**Circulation**

One main entrance is described for the main acute hospital, giving access to all departments including Ambulatory Care and Outpatients, which is separate from emergency care.

For emergency patients, an Assessment Unit is suggested adjacent to the existing A&E, allowing emergency admissions to open off a common arrival court and to be controlled in line with current practice. This arrival court is
remote from the main entrance but could be used for an out-of-hours entrance to Maternity.

The Highland Breast Unit Services may be accessed by a separate entrance if desired, reducing the impression that a visit to these facilities is a visit to hospital.

The main entrance is shown leading into a two storey space which is the first part of a public route leading straight through the plan to a new ward block at the rear, rising up by one storey within the arrival space. Two public routes are shown leading off to each side of the arrival space providing access to all departments. Principal vertical circulation cores are indicated, associated with the existing tower. Access to the first floor could be provided within the arrival space.

**Ward**

The extensive service modelling needed to accurately predict the number of beds required in the adapted Raigmore was not available, however the Board had carried out an initial assessment where a similar number of beds (used more efficiently than currently) would be required to meet the anticipated demographic change in the area.

The new acute Admissions Ward is therefore assumed to contain 24 beds and ICU/CCU 13 beds. This leaves 540 to be accommodated within the ward towers. It is assumed that all wards will be 100% single bedrooms. The preliminary study undertaken indicates that one floor of the existing ward block is capable of providing a maximum of 30 beds in single rooms; this could therefore provide 150 beds. A new tower attached to the old building is shown to accommodate 390 beds, providing rational and workable floorplates in terms of bed per floor as well as progressive evacuation.
2.3 Phased Implementation

The following illustrates how the adaptation of the Raigmore Hospital could be achieved through a phased implementation strategy. The four-stage process (which could be broken into further smaller stages) seeks, where possible, to minimise disruption to other parts of the hospital whilst trying to rationalise the proposals into a feasible sequential strategy that could be delivered as capital allows.

Phase 1
The first step in such a major redevelopment is often the most difficult. In the first phase we believe it is possible to clear a site for a new ward tower by moving/re-providing the cafeteria, pharmacy and some storage facilities to another location within the hospital. Whilst there would be costs involved with this we believe them to be necessary to unlock the site and brings immediate benefits in terms bed use, HAI, etc.

The next part of the phase will involve the construction of a new ward tower and associated primary circulation route. This will allow linkage of the circulation back into the existing building whilst allowing for development/rationalisation of this at a future stage. After this the existing eight-storey tower will be adapted and refurbished once the additional space has been released after completion of the new tower.

Phase 2
The second phase seeks to improve surgical and diagnostic capacity in the hospital through the demolition of the north ward block and construction of a new theatre block on the recently cleared site.

The surgical theatres will move into the new accommodation, while the existing theatres are refurbished to provide facilities for Day Surgery in that location. At the same time, the lower two floors of the existing tower will be refurbished to create facilities for Angiography, Renal and ICU/ITU if this was not already achieved in an earlier phase.
Phase 3
Phase three will involve clearing out the site area around the existing main entrance and behind the existing maternity building, all of which will have now been vacated. This is followed by the construction of a new Outpatients area (by refurbishing the existing maternity, and creating a new atrium and OPD block parallel to it), cafeteria and radiology will be undertaken.

Phase 4
The final phase sees the demolition of the remaining part of the 1970’s hospital with the removal of the existing outpatients departments. The completion of the adapted Raigmore is then complemented by the construction of a new A+E and associated departments.
3. Conclusion

3.1 Appraisal of the Adapted Raigmore

The Board agreed that the test strategy was a promising approach to the issues they were currently facing at Raigmore. The testing of this was seen as one that will inform a more detailed exercise to be undertaken at a later date. Below is a brief appraisal of the sketch strategy against the objectives established in chapter 1.3 and tested in 2.1.

Potential Clinical benefits
The Board agreed that the benefits aimed for in the hypothesis could all be achieved by this scheme

- Single bed accommodation contributing to: reduced rates of HAI, higher bed occupancy rates, greater privacy, improved amenity and a reduction in reportable incidents.
- Combination of the above, together with changes in clinical protocols to reduce the requirement for acute beds.
- Ambulatory Care philosophy giving reduced overnight stays with consequential reduction in bed numbers.

Additionally, there is the possibility of placing a helicopter pad on the roof of the new tower, enhancing the service, complying with current code of practice and releasing a considerable site area for parking, expansion or sale.

There may be a preconception that the re-use of an existing building automatically implies compromise in the accommodation provided or in the adjacencies achieved. This need not be the case. The adjacencies described in the test diagram would, no doubt, require adjustment once a proper programme of consultation is embarked on, but the strategy describes a structure with promise of delivering a hospital that meets current standards for development. The quality of the spaces in clinical terms need not be compromised at all.

Potential quality of environment
The diagram, which has emerged, has potential to be developed into a hospital that is a positive environment for patients and staff with good daylight, access to green space, natural ventilation and simple and intuitive wayfinding. The basis of this has been demonstrated in the proposals by:

- Rationalisation of the entrances resulting in a single main entrance, and a separate emergency entrance.
- Creating a centralised entrance with an atrium connecting the main routes and providing a place for gathering.
- Revising the circulation strategy to arranges the main routes around a few key corridors rationalising the relationship between the different blocks of accommodation.
- Clearing out courtyards and removing extraneous buildings, offering opportunities for views and access to the outside.

Potential material savings
Around 70% of the existing estate is shown to be retained or refurbished,
representing about 47% of the floor area of the final scheme as drawn. Whilst
the refurbishment and decanting costs would be significant, there would be
material savings in structure, etc. and environmental savings through reducing
waste and demand for new materials.

Environmental Considerations
With a large proportion of single storey buildings being removed in the
suggested proposals these can be replaced with new build that can at least
meet, and potentially exceed, current technical standards in terms of thermal
performance. As the majority of the exposed façade shown to be retained
will be on the existing tower, it could be comprehensively re-clad to improve
its visual appearance, airtightness and thermal performance. The net effect
is that a large proportion of the built fabric within the hospital will be able to
meet current energy performance requirements and those that do not will
have been built in the last 5-10 years and are therefore likely to be a significant
improvement compared to the older estate.

Given older hospitals struggle with services that are ineffective, environmental
performance will be a key driver in any future detailed design. Future
development will be able to tap into the relatively recent advances in sustainable
technology to design systems that are efficient and adaptable for the future. As
the hypothetical refurbishment strategy is proposed on a block-by-block basis,
the disruption and isolation issues caused by working in an existing building can
largely be avoided particularly if the works are phased carefully.

Community benefits
Adapting rather than replacing the hospital can ensure that its position within
the community is retained. One of the key benefits to this is that the existing
networks already servicing the site can be maintained, hopefully with only
minor upgrade required. This means that changes to areas such as transport
infrastructure and pedestrian access may not be required.

The scale and integration of the hospital, in its current location, would make the
process of building a new hospital elsewhere quite challenging. Adapting the
building while retaining the qualities that make it successful appears a practical
solution.

Deliverability
Adapting an hospital is not as easy as building a new hospital on a clear,
accessible and available site, however, where alternative new build solutions
are not deliverable within the foreseeable future due to financing or land
availability issues, there may be no sensible ‘do nothing’ option. The existing
estate requires investment in the building fabric to prevent failures. Carrying out
significant investment in the estate without improving services introduces similar
disruptions and therefore it makes sense to carry out such necessary works
within a strategy for improving service functionality and the patient experience.

Concluding remarks
Although the costs of this proposal, in comparison to a full new build, were not
tested, the ability to carry out the work in a phased manner means that access
to the relevant funding may prove easier given the fact that smaller amounts of
capital will be required at any given time. As such, this may make this approach
to modernising an ageing healthcare service more viable in the longer term,
particularly for larger projects. Further to this, an option that is responsive
to sustainability agendas which encourages waste reduction and sees the
retention of public services could be seen as an overall benefit.
Appendix A

Opportunities and Watchpoints

In addition to developing an understanding of common and emerging clinical issues the study developed a list of building based issues commonly experienced in such projects – drawn from the summary experience of the consultants and others. These combined issues have been drawn together for reference and are noted below. Some of these form the basis of a risk/benefit assessment of the developed test scheme, whereas others are included for broader information and reference for those carrying out more detailed work.

A1. Preparatory Stage

A1.1 As-Built Drawings
Up to date as-built drawings are essential when considering major amendments to existing hospital fabric. It is often the case that historic information can be out of date if it is not maintained adequately. It is likely that a complete building survey will be required as part of any major redevelopment to avoid any impact on cost and programme.

A1.2 Condition Survey
The existing hospital fabric has an inherent worth contained within both the existing structure and the services. To get the best out of the building a detailed understanding of these conditions is essential in opening up the possibilities for future adaptation and upgrading. Project teams should make relevant assessment of the building and where existing information seems to be lacking a full building condition survey should be undertaken.

A1.3 Asbestos Survey
Asbestos is still a significant issue within the building industry and a particular problem in the existing healthcare estate. Project teams should undertake an Asbestos survey, preferably to a type 3 (Intrusive) standard, to ensure that any issues around asbestos within the building fabric are addressed at an early stage of the project to avoid cost, programming and safety implications.

A1.4 Design Quality
Define what the redeveloped estate must do in terms of design quality and ensure this is mapped into the procurement process. As well as human benefits there are likely to be benefits in terms of capital, running and maintenance costs and potential reductions in repeat visits/increase in effectiveness of care.

A1.5 Precedents
Learn appropriate lessons from other projects and building typologies – healthcare design is not an isolated discipline and there are potentially a good number of cross-related issues that can be transferred. Learning from areas such as office spaces, schools, laboratories, etc. could help inform different ways of thinking and working.

A2. Site and Infrastructure Considerations

A2.1 Phasing
A rigorous phasing strategy needs to be developed through supportive dialogue with key stakeholders and clinical departments to ensure a collective ‘buy-in’ of the overall strategy. This will provide a comprehensive framework for the works and will
benefit the design by ensuring that disruption is kept to a minimum. Whilst this will not overcome all issues, it should structure the process and minimise potential risks.

A2.2 Neighbourliness and position in the community
The location of a hospital within a community is important and often valued. Where possible, retention of the facility in its current location should be explored as the amenity this facility might be currently providing to the community cannot be underestimated.

Redeveloping on an existing site can be tricky. Key to unlocking this is early consultation with the planning authority and relevant stakeholders to manage difficulties around retaining the location whilst not undermining the core values of the service.

A2.3 Transport Issues
Appropriate measures need to be taken to ensure that transport issues do not impede the use of the adapted facility. Older established acute sites tend to be in well-known locations (usually within an urban conurbation) with reasonable developed transport links connecting to the wider community. These links can usually be upgraded and adapted to suit the new facility.

Consideration should be given to incorporating other methods of arrival - such as, cycling, public transport, pleasant walking routes, etc. and care should be taken to ensure the predominance of the parking arrangements does not dominate the overall initial impression of the site.

A3. Architectural / Building Related Issues

A3.1 Arrival and entry
Older hospitals can quite often have multiple arrival points established over a long period of time; rationalise these through the use of external spaces and reduce the number of building entrances to make wayfinding routes clear and legible for patients, visitors and staff.

A3.2 Key Adjacencies
Take great care combining functions where the patient groups have different emotional needs (e.g. adult v children, maternity v fertility treatment, etc.). Even in the recent past this has not always been achieved well and building diagram may need to be totally reviewed to avoid any potential conflicts.

A3.3 Internal circulation
Ensure that the ‘readability’ of the building is maximised through a clear and simple diagram that provides short journeys, where possible, with ‘landmarks’ aiding wayfinding for patients and visitors. For some buildings this will require a complete rationalisation of a confusing layout. Others it will be the simplification of an original rational plan lost over time due to a series of interventions and additions.

A3.4 Flexible Accommodation
Standardise accommodation as far as possible, to allow for future flexibility which may involve building spaces that are initially a loose fit. It is quite often the case that hospitals with constructional flexibility are of limited use because even altering light flexible construction can cause major disruption to service provision. Where possible design spaces that can be adapted without significant physical alteration of the space.

A3.5 Waiting
Due to an increased use of day procedures rather than in-patient procedures through changing clinical procedures, waiting areas have now become an key space within the adapted hospital and require special consideration. The design of these spaces should consider views, natural daylight, activity, access to food/drink and
personal needs. Placement of wait/subwait areas should be such that they are located close to services and evenly split throughout the hospital.

A3.6 Inpatient areas
Emphasise creating inpatient environments that offers positive distractions (through views, entertainment, etc.), natural daylight, control over one’s own environment, opportunities for privacy and also social support (from family or other patients).

A3.7 Respite spaces
Respite spaces need to be incorporated into the adapted hospital and should be sensitively designed. These may be places where people receive bad news, hang around and wait for treatment or receive results and maybe even wait for a loved one to undergo treatment. Internal and external respite spaces need to be designed to be uplifting and allow patients or visitors to go somewhere pleasant during these times.

A3.8 External Envelope
Re-cladding is likely to be required on hospital buildings built more than 20 years ago but will depend on the integrity of the structural frame and the difficulty of servicing. By doing this there may also be the option to retro-fit modular en-suite pods as part of the proposals. Re-cladding can also address issues such as ventilation improvements, thermal improvements, safety, maintenance, improved daylight, etc. which are likely to be welcomed as overall benefits.

A4. Environmental Considerations

A4.1 Alterations/Adjustments to an Existing Service Strategy
An sound understanding of the existing services strategy is essential when adapting existing hospitals. Opportunities should be undertaken to introduce flexibility (without disruptive constructions) to allow for any future adaptation to take place easily. Additional space may be created by way of spare duct capacity, additional cable tray runs, etc. This is a similar approach to the ‘nucleus system’, where a 20% over capacity was insisted upon, however, as healthcare buildings are economically driven additional capacity was often not incorporated into the design due to cost limitations.

A4.2 BREEAM
Current guidance indicates that any new refurbishment development will need to achieve BREEAM ‘Very Good’. This should be done through a pragmatic approach to design.

A4.3 Installation of New Services
Any new services design should be developed to have built-in redundancy to allow for future expansion and adaptation.

A4.4 Service Distribution
Existing horizontal and vertical services distribution routes should be investigated at the start of the project. It is commonplace for buildings with large floorplates to have services fed from above and below which can preclude simple amendments without disruption to other floors. In addition to this deep beams running the length of the floor-plate can also prevent crossover of services. The ability of the section to accommodate services may be critical to the viability of some buildings and determine the pattern of development which development that is proposed.

A4.5 Services Isolation
Key to the success of an adapted services strategy will be the ability to effectively isolate services. Valves can quite often be visible but do not always work, through lack of use. To address this issue enabling works (through introduction of local controls/bypass routes, etc.) may be required to allow isolation to be checked.
A4.6 ‘Hot floor’ areas
Where possible concentrate high tech “hot floor” accommodation in areas of the site or building that will make them accessible for maintenance, adaption or replacement. It is more often than not the case that high tech areas of a hospital will require the most work to keep them up to date.

A4.7 Natural Ventilation/Windows
Natural ventilation should be incorporated into the design, where possible, to help reduce energy demand. Define requirements for natural ventilation and test the viability of spaces at a very early stage as natural ventilation can be as onerous as that of mechanical ventilation.

Other items such as windows should be assessed to ensure viability, for example, casement window types may be unsuitable for the purpose of a natural ventilation strategy. Original window system, if still installed, are likely to be nearing the end of their useful life and can be leaky.

A4.8 Alarm system
Look to provide an upgraded and integrated site wide alarm and information services between the new and the refurbished system. Existing systems are often extended and adapted over a period of time and often require renewal. Tackling this may also require renewal of systems outwith the project area involving cost and disruption not envisaged at inception stage.

A4.9 Service hardware
Commonality of existing room mounted hardware with the new refurbished facility requires to be considered – i.e. luminaires, radiators, grilles, diffusers, electrical outlets etc.

Appendix B
Glossary

A&E - Accident and Emergency
AAW - Acute Admissions Ward
ACAD - Abulatory Care and Diagnostics
ARI - Aberdeen Royal Infirmary
CAU - Critical (Common) Admissions Unit
CCU - Critical Care Unit
DCN - Department for Clinical Neurosciences
ERI - Edinburgh Royal Infirmary
FM - Facilities Management
GRI - Glasgow Royal Infirmary
HDU - High Dependency Unit
ICU - Intensive Care Unit
ITU - Intensive Treatment Unit
NSGH - New South Glasgow Hospital
RHSC - Royal Hospital for Sick Children
NHSScotland Team

Many thanks to NHS Highland who informed the above team on the Raigmore test case included within this study. Colleagues with responsibilities ranging from healthcare strategy and service development, nursing, hospital management and estates shared their understanding of the current issues on the site, their understanding of the future demand for healthcare services in the highlands and provided valuable feedback on the ideas developed for the site to ensure strategic fit.

Study Team

The team has been assembled to bring a broad range of knowledge, experience and ability to the project, allowing issues to be looked at from a number of viewpoints.

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The A+DS Health Programme is operated in association with the Scottish Government and Health Facilities Scotland