The King's Fund

Ideas that change health care

The reconfiguration of clinical services

What is the evidence?

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November 2014

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1 Key messages

The reconfiguration of clinical services has attracted public and political controversy over the life of the NHS. Financial and workforce constraints, now and in the future, suggest that the pressure to reconfigure services will continue to grow.

This paper provides new insights into the drivers of reconfiguration and the underpinning evidence. It builds on a major analysis, commissioned by the National Institute for Health Research (NIHR), of reviews of service reconfigurations conducted by the National Clinical Advisory Team (NCAT). Here, we set out the main findings of the analysis and discuss their implications for the NHS.

The evidence base

- The reconfiguration of clinical services represents a significant organisational distraction and carries with it both clinical and financial risk. Yet those who are taking forward major clinical service reconfiguration do so in the absence of a clear evidence base or robust methodology with which to plan and make judgements about service change. In particular:
  - Evidence to support the impact of large-scale reconfigurations of hospital services on finance is almost entirely lacking.
  - Evidence on the impact on quality is mixed, being much stronger in relation to specialist services than other areas of care.
  - Evidence on the importance of senior medical and other clinical input to care is strong, particularly for high-risk patients; however, there is uncertainty about how many senior staff are needed, of what type, and for what time periods.
  - Evidence suggests that some services can be provided safely through the use of non-medical staff.
  - Technology offers opportunities to sustain local access to some services that previously might have been centralised, although the evidence on this is still developing.

  - Gaps in the evidence will often lead to different and sometimes conflicting views on the best way of providing safe, high-quality services within available budgets. This is particularly the case for non-specialist services where the evidence on the net benefit of centralisation is often lacking.

- Clinical senates and those leading local research such as academic health science networks (AHSNs) should be encouraging evaluation of service reconfigurations and sharing the learning that emerges. For any major service change, there should be a routine post-project financial and clinical evaluation, conducted independently where changes are particularly innovative or complex.

Implications for the NHS

- Reconfiguration is an important but insufficient approach to improve quality. It should be used alongside other measures to strengthen delivery of care and to instil an organisational culture of improvement.
- There are new and evolving opportunities to sustain local access to services, particularly for lower-risk patients, with more flexible use of current staff and greater use of non-medical staff and digital technologies. However, shortages of key staff, for example, midwives and specialist nurses, may limit this approach as a solution. It is also anticipated that there will be a significant increase in the consultant medical workforce, and proposals should take this into account or risk designing tomorrow's services within today's constraints. Workforce planners need to work with service planners to support the development of staffing for these new models of care.
- The local context and the specialty-specific balance between access, workforce, quality, finance and use of technology need to be the deciding factors in determining how local services are configured, recognising that there is no 'optimal design'. To maximise the likelihood of success, proposals should be underpinned by detailed workforce and financial plans with supporting service improvement strategies.

- The balance between access, workforce, quality, finance and technology will play out differently for patients with different levels of clinical risk and complexity. Systems and processes to accurately triage and rapidly transport patients should be a key part of any proposal.
- Any proposal needs to have come out of a process with strong engagement from clinicians, public and politicians.
- No hospital is an island. Hospitals are part of an interconnected web of care stretching from the patient's home to the most specialist tertiary-level service. Clinical networks and new technologies offer opportunities to strengthen that web and deliver more co-ordinated care, but those planning services need to look across that web to ensure the most efficient distribution of services, to remove duplication, and to ensure that patients receive the right care, in the right location, at the right time.

2 Introduction

Our aim in this paper is to help those planning and implementing major clinical service reconfigurations ensure that change is as evidence-based as possible. We summarise the key evidence, policy and professional guidance available in the following service areas:

- whole trust
- community services (as a substitute for hospital care)
- mental health inpatient services
- accident and emergency (A&E) and urgent care services
- acute medical services
- acute surgical services
- elective surgical care
- trauma services
- stroke care
- specialist vascular surgery
- maternity services
- neonatal services
- paediatric services.

The paper builds on evidence gathered for a major piece of research, funded by the National Institute for Health Research (NIHR), entitled *Insights from the clinical assurance of service reconfiguration in the NHS: the drivers of reconfiguration and the evidence that underpins it* (Imison *et al* forthcoming). This takes as its starting point all the reviews conducted by the National Clinical Advisory Team (NCAT) between 2007 and 2012. To our knowledge, this is the first review of such a large number of reconfigurations, certainly in the United Kingdom.

NCAT provided an independent clinical assessment of local reconfiguration proposals. The request for NCAT advice came predominantly from the project team leading the reconfiguration, sometimes at the prompting of the strategic health authority or Gateway (which provides independent assurance for the Cabinet Office on significant programmes of change). In most cases, NCAT reviewed key local documentation, including the case for change and the supporting business case/ strategies. A team of two or three clinicians would then make a one- or two-day visit and meet key stakeholders, including local clinical and managerial leaders as well as patient and public representatives. NCAT would then produce a report laying out its assessment of the proposals. NCAT has now been superseded by clinical senates in its role of clinical assurance of service change.

The NIHR research looks in depth at the process of clinical assurance, including the degree to which it was guided by evidence, while this report focuses on the evidence available to help guide reconfiguration. The majority of the proposals reviewed by NCAT – and, indeed, much of NCAT's advice – relied on professional guidance as the prime source of evidence rather than peer-reviewed research. In this paper we have pulled together some of that research, but more evidence is needed. Significantly more national and local resource needs to be invested in evaluating the impact of service reconfiguration and undertaking more comparative analysis of different models of care, particularly their impact on quality and cost.

Our evidence review, while extensive, is not a formal systematic review and does not carry the weight of guidance from the National Institute for Health and Care Excellence (NICE) or a Cochrane review. The specialties covered by the review also reflect the areas that were the core focus of NCAT's work and are therefore not comprehensive, especially with respect to more specialist services. We identified relevant literature, reports, guidance and clinical guidelines using an iterative or emergent approach, employing a range of strategies that included hand-searching, citation-searching, and online keyword-searching of health care databases, electronic resources and websites. We also sought advice on relevant evidence from key clinical and academic experts and asked them to highlight missing evidence.

Which services were subject to reconfiguration?

Between 2007 and 2012, NCAT reviewed 108 reconfigurations involving one or more specialties. The most commonly reconfigured services were accident and emergency (A&E) and supporting urgent and emergency care services (31 per cent), often as part of a whole system reconfiguration. Specialist services featured in 28 per cent of the reconfigurations, but they included reconfigurations of distinctly different services, particularly vascular surgery, stroke and major trauma. The next most common was mental health services (23 per cent). In contrast to the others, these services were always reconfigured on their own, with just one exception. Maternity services (22 per cent) were mostly but not always reconfigured at the same time as paediatric services. Paediatric reconfigurations comprised just 15 per cent of all reconfigurations.

What were the key drivers of clinical service change?

As part of our broader NIHR research, we investigated the drivers of clinical service change. Earlier analysis by The King's Fund (Imison 2011) argued that workforce, quality, cost and access are the key interlinked factors that need to be taken into account when reconfiguring services, and that the challenge is arriving at a configuration that optimises all four elements. A striking finding from our research was that cost and workforce far outweighed the other two factors in driving service change. Finance featured in 62 proposals (57 per cent of the total), while workforce featured in 53 (49 per cent). Twenty-four reconfiguration proposals (22 per cent) were driven by both workforce and finance (*see* Table 1 below).

Workforce drivers were predominantly medical. Doctors are a constrained and expensive resource. The drive to extend senior medical cover out of hours and at weekends, and the limits to the working hours of junior doctors imposed by the European Working Time Directive, have made traditional medical cover arrangements hard to sustain. Improving outcomes and safety was a subsidiary driver, although local proposals often equated improvements in staffing with improvements in quality.

Cost pressures were expressed in a number of ways. They included the need to achieve specific savings targets, addressing anticipated gaps in resources as demand increased, and seeking to shift activity (and costs) out of hospital to deliver 'care closer to home'.

Table 1 Summary of key drivers of the reconfiguration proposals reviewed by NCAT

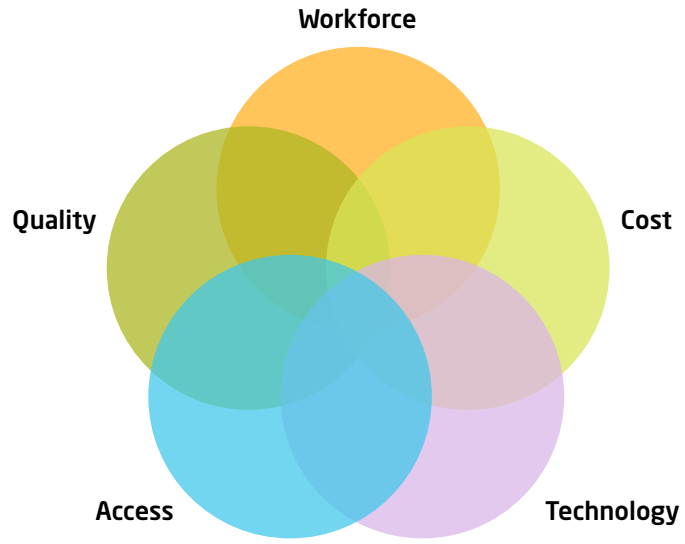
Drivers of reconfiguration	Number of reconfiguration proposals (total = 108)	Clinical services
Finance	62	All except trauma, stroke, vascular surgery
Estates (often linked to finance)	16	Community services, mental health, A&E and urgent care, elective surgery
Workforce	53	All except stroke and vascular surgery
Safety	20	A&E and urgent care, maternity, neonatal, paediatrics
Quality	19	Vascular surgery, stroke, trauma
National policy (linked to quality and access)	14	Community services, mental health, vascular surgery
Access	10	Community services, mental health

Safety featured in 20 proposals of maternity, paediatrics and A&E reconfigurations and was a minor driver in proposals to reconfigure mental health services.

Access was barely mentioned as a driver but loss of access was commonly mentioned (in 34 proposals) as a consequence of change. As Dr Peter Barrett, former chair of the Independent Reconfiguration Panel, commented, access was 'just something that has to be accommodated within proposals' (Barrett 2012). Access was a more positive driver of developments within the community, often referred to under the banner of the 'care closer to home' agenda.

While technology was rarely mentioned as a driver of service reconfiguration in the NCAT reviews, it came through as a potentially significant driver in this evidence review. Digital technologies enable remote monitoring and consultation, which in turn can help mitigate pressures to centralise services arising from workforce constraints. This suggests that there are, in fact, five rather than four key factors that need to be weighed up when considering clinical service change (*see* Figure 1 below).

Figure 1 The five drivers of clinical service reconfiguration



The evolving use of technology in health care means that the evidence and the balance of trade-offs between the different factors is also evolving. The evidence we present should be critically judged with this in mind. It is also important to note that different stakeholders may give different weights to each of these factors (Imison 2011).

The process of change

Many of the reconfigurations reviewed by NCAT encountered public or clinical opposition. For patients and the public, the perceived risks from service reconfiguration frequently outweigh the proposed benefits. The evidence from local media coverage and campaign websites showed that campaigners were often concerned that the proposed changes would reduce access to services, increase waiting times in A&E departments, or that downgrading 'anchor' services such as A&E or maternity would lead to further closures over time. Even the successfully implemented reconfigurations had faced public and political opposition, including use of social media, petitions, rallies and public meetings. These campaigns were

often supported by local MPs and councillors. Overall, 40 per cent of proposals were not implemented as planned; some proposals were revised over a number of years, and had more than one visit by NCAT.

Fulop *et al* (2012) have rightly argued that reconfiguration issues cannot be solved by 'calculations of optimal design', particularly given the political nature of service change. That being said, we would argue that where evidence does exist, it should be taken into account. The current approach and deficit of evidence can result in change that is not only resented by local communities but does not achieve its original ambitions. There are very few evaluations of significant service change, but those that do exist suggest that reconfiguration has often not achieved the desired results (Spurgeon *et al* 2010; Raftery and Harris 2005) – a finding that mirrors the evidence from the merger literature (Gaynor *et al* 2012).

What evidence is available to guide service change?

Our evidence review confirms longstanding concerns (Posnett 2002; Edwards and Harrison 1999) about the quality of evidence to guide the reconfiguration of clinical services. We found particular gaps around the impact of service change on finance. For hospital services, this evidence was almost entirely lacking, as large-scale reconfigurations are hardly ever tracked and evaluated. For community and mental health services, the evidence suggests that community-based alternatives may improve quality but are unlikely to deliver significant net savings. This is particularly worrying given assumptions – in many of the proposals reviewed by NCAT (Imison *et al* forthcoming) and by national bodies (Monitor 2013) – that service reconfiguration will deliver substantial savings.

A more complex picture emerges from the evidence about quality. The specialist services we looked at (stroke, trauma and vascular surgery) stood out as areas where the benefits to quality from a more centralised model of care were generally well evidenced. However, as in other services, the impact on costs for specialist services was less well documented. Stroke also provides an example of a service where telemedicine has facilitated local access to specialist assessment and decision-making.

There is strong evidence about the importance of senior medical and other senior clinical input to care, particularly for high-risk patients. However, there is little evidence on how many senior staff are needed, of what type, and for what time periods (Sabin *et*

al 2014). For example, we were struck by the recent finding from Bray *et al* (2014) that the intensity of nurse staffing at weekends had a bigger impact on stroke outcomes than additional consultant ward rounds. Different specialties and levels of clinical need will require a different balance of senior medical and nursing staff, which will affect the level of senior input needed throughout the day and night. A notable finding in the evidence we have collated is the recent growth in consultant numbers for many specialties, a trend that is expected to continue. This should be borne in mind when planning future services as it may relieve some of the current workforce pressures.

There is evidence that access to some local services can be sustained using non-medical staff. However, there is a distinction between whether a model is safe and whether it is sustainable. For example, while midwife-led birthing units are a safe alternative for low-risk pregnant women, such units face issues of sustainability given the pressure on midwife numbers and questions around financial viability. Nearly as many units have closed in the past few years as have opened (**Dodwell 2013**). Nursing shortages are likely to play an increasingly important part in reconfiguration decisions. Community nursing numbers have fallen at a time when they should be increasing, thus creating an obstacle to new models of community-based care. There is also likely to be an increasing shortfall in nurse numbers (**Imison and Bohmer 2013**).

New technologies also offer opportunities to sustain local access to services. Simon Stevens, Chief Executive of NHS England, made a compelling case for this in a recent speech. He also drew attention to the changing demography, which creates a greater imperative to sustain local access to services.

> *Just as there's been a push for centralisation there's been a pull for more local and community-orientated services – increasingly feasible as other countries are showing through new technologies including e-consultations, remote monitoring, tele-radiology and even e-ICUs. Let's also remember that treatment approaches are never static – the history of medicine is the history of the diffusion of tests or procedures that yesterday were the preserve of the teaching hospital and tomorrow will be out in the community clinic. Miniaturisation and digitisation are cutting scale effects and speeding diffusion.*
>
> *The changing needs of our patients – often frail, some with dementia, many with comorbidities – and the changing opportunities offered by new treatments*

> *and technologies mean that if we think creatively and if we challenge some of our self-imposed constraints we're going to find we've got some new options.*
> (Stevens 2014)

Some also argue that it is 'what' staff do rather than 'who' does it that is the biggest driver of outcomes (Prentiss and Vinci 2009), echoing the finding that the best way to improve high-risk surgery is through the systematic application of known improvement techniques (Finks *et al* 2011). For example, the use of checklists in surgery significantly reduces the rate of surgical complications and delivers reductions in mortality similar to those achieved by the reconfiguration of stroke services in London (Morris *et al* 2014; de Vries *et al* 2010; Haynes *et al* 2009). As one of the NCAT reports stated:

> *Ten per cent of patients admitted acutely suffer harm and in at least half, this harm is avoidable… It is now clear that the prevention of these service failures depends on far more than the effort and skills of individuals and that organisational, cultural and systems defences are some of the most influential preventative factors. It is also probable that events outside of the main sites of acute care are far more influential in determining the health and wellbeing of populations. Despite this knowledge, the focus for improvement tends to be predominantly on strategic reconfiguration of acute sites. This is an important but insufficient approach.*
> (Imison *et al* forthcoming)

Content overview

The remainder of this paper sets out the policy and service context within each clinical service area and the key drivers for change evident from our research. We then summarise the broader research evidence and professional guidance (which in the main results from professional consensus rather than drawing directly from research evidence). The research evidence is broken down according to the five key drivers of reconfiguration – quality, workforce, cost, access and technology. We also include the evidence on key clinical interdependencies and relevant college and other guidance. The paper concludes with a table summarising the evidence for each service area (*see* Table A1, pages 95–98) and an explanation of the research methodology (*see* Appendix B, page 99).

3 Whole trust reconfiguration

What changes were being proposed?

All the proposals reviewed by NCAT involved some degree of service rationalisation/centralisation across multiple hospital sites, often within the same trust. In most cases, this involved services moving towards treating patients with less serious conditions or with a lower level of clinical risk:

- accident and emergency (A&E) → urgent care centre (UCC)/minor injury unit (MIU)
- acute/emergency medicine → non-acute or rehabilitation
- acute/emergency surgery → elective inpatient surgery → day surgery
- consultant-led obstetrics → midwife-led birthing unit
- inpatient paediatrics → paediatric assessment unit (PAU).

There were a few examples of service models that did not conform to this general direction of change; instead, they tended to concentrate services through 'swaps' between hospital sites, including:

- a 'swap' of obstetrics for acute surgery
- a 'swap' of stroke for acute surgery
- the placing of a stroke unit alongside specialist elective inpatient with no A&E.

Key drivers

Finance and workforce were the primary drivers of this type of reconfiguration.

Context and relevant policy

Medical advances have led to greater specialisation of clinical staff and equipment in hospitals. As skilled specialist staff are scarce and budgets are limited, hospital services have become centralised to ensure that patients are cared for by staff

with the necessary skills and supporting specialist equipment. These trends have been exacerbated by the limits on junior doctors' working hours imposed by the European Working Time Directive and the United Kingdom's low numbers of consultant doctors compared with other developed countries (World Health Organization 2011). Finally, a key factor determining the configuration of hospital services is the clinical co-dependency between different services. This can result in a domino effect whereby the loss of one service can go on to destabilise the whole acute service provision in a hospital.

The most recent substantive piece of policy on hospital configuration was *Keeping the NHS local – a new direction of travel* (Department of Health 2003b). This guidance aimed to stem the tide of hospital and A&E closures.

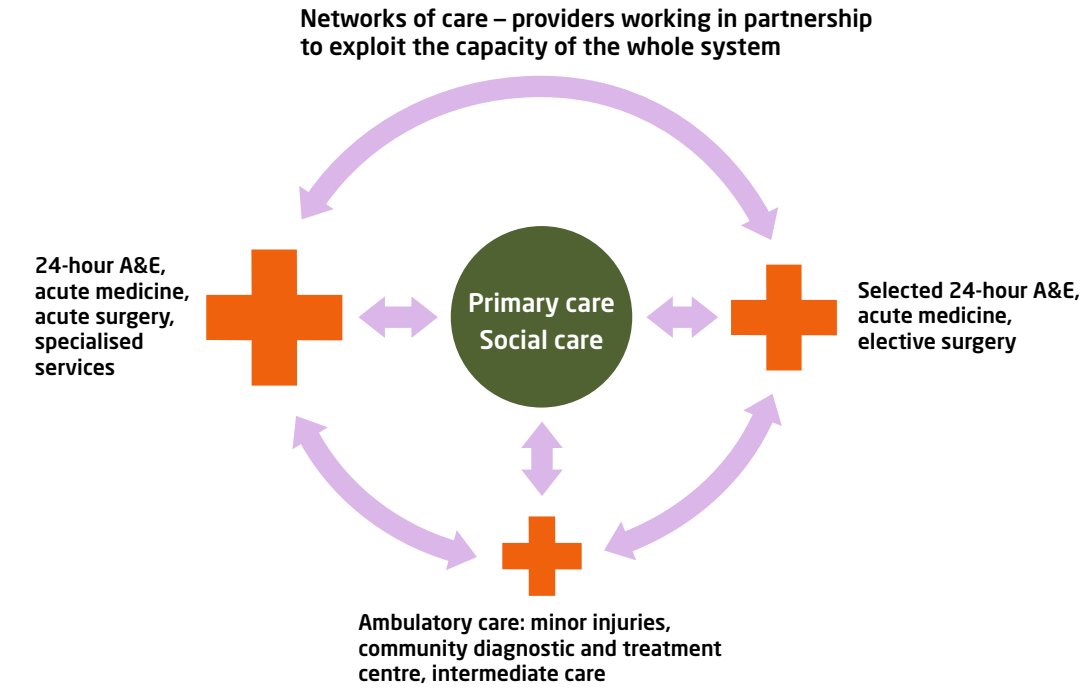
> *The mindset that 'biggest is best' that has underpinned many of the changes in the NHS in the last few decades, needs to change. The continued concentration of acute hospital services without sustaining local access runs the danger of making services increasingly remote from many local communities. With new resources now available, new evidence emerging that 'small can work' and new models of care being developed, it is time to challenge the biggest is best philosophy.*
> (Department of Health 2003b, p 3)

It set out a future for small hospitals as part of a wider whole system of care (*see* Figure 2 below). Since then, the focus of government guidance has been the process of change rather than the model of care. The most recent guidance (Strategy Unit NHS England 2013) reiterates the four key tests for any proposal, originally set out by David Nicholson (2010). These are:

1. strong public and patient engagement
2. consistency with current and prospective need for choice
3. a clear clinical evidence base
4. support for proposals from clinical commissioners.

As our report highlights, meeting the third of these tests is far from straightforward.

Figure 2 A whole systems approach to model of care



Source: Department of Health 2003b, p 19

Since 1962, the number of acute hospitals has reduced by 85 per cent, and the number of sites at which elements of highly specialist care is delivered has reduced even further. In England, general acute care is now delivered in just over 200 hospitals and the average size of hospital has grown from 68 beds (Ministry of Health 1962) to just over 400 beds (Imison 2011). The average acute hospital in England serves a population of 300,000 compared to an average 'general hospital' in the European Union, which serves a population of 54,000 (World Health Organization 2011). ('General hospitals' are defined as establishments providing diagnostic and medical treatment, both surgical and non-surgical, to inpatients with a wide variety of medical conditions.)

As Simon Stevens, Chief Executive of NHS England, said in a recent speech: '…partly as a legacy of tightly controlled NHS spending from the late 1970s until the late 1990s, England now has quite concentrated acute services, with a stronger degree of regionalisation than in many other western nations' (Stevens 2014).

Nearly two-thirds (65 per cent) of people admitted to hospital are over 65 years old (Imison *et al* 2012). There is increasing recognition of the interdependence between hospital and community-based health and social care services, particularly for those who are frail and/or suffer from long-term conditions.

What evidence needs to be taken into account when reconfiguring services for a whole trust?

Summary of evidence

There is little evidence to guide whole hospital reconfiguration, and much of the evidence that does exist is out of date.

The available evidence suggests that smaller hospitals in England are not inherently less safe or less efficient. However, there are good arguments on quality grounds for centralising some local hospital services or at least providing them on a more networked basis (*see* later sections). Active participation in clinical networks can help ensure that patients receive the best quality of care as close to where they live as possible while at the same time addressing workforce pressures.

A major challenge for small hospitals is to move from a consultant-led to a consultant-delivered model of care. The use of a national tariff disadvantages smaller providers. The current pressures to expand the number of consultant staff to provide higher-quality, consultant-delivered care will increase their fixed cost base and magnify this problem.

Quality

The limited evidence on hospital size and quality shows no clear link between size and outcomes.

- There is no clear evidence that smaller hospitals (turnover of less than £300 million) consistently perform worse on indicators of quality (Monitor 2014).
- There is some evidence that greater volumes of care are associated with better outcomes. But for most procedures, the volume at which optimal results are achieved is generally below that at which most hospitals operate (Posnett 2002).

- The link between volumes of care and outcomes does not necessarily demonstrate a causal relationship – there are small units with good outcomes and vice versa. Volumes should not be used in isolation as a justification for centralising care (Harrison 2012).
- 'The existing research provides little support for concentrating care in very large hospitals… This leads to a more complex pattern of care with concentration of some functions but possible dispersion of others' (European Observatory on Health Care Systems 2002).
- The precise relationship between inter-specialty links and patient outcomes is poorly understood. In most countries, guidelines are based on the opinions of the medical profession rather than research evidence. Better research evidence is needed in this area (Posnett 2002).
- Large studies from the United States show that 'critical access hospitals' serving rural populations, with an average of 18 beds, had slightly higher mortality rates for acute myocardial infarction (7.3 per cent), congestive heart failure (2.5 per cent) and pneumonia (2 per cent) compared with other hospitals with an average of 82 beds (Joynt *et al* 2011). Key factors were lack of access to critical care and poor clinical processes rather than volumes of care. Another study of surgical care showed that for low-risk procedures, the outcomes at critical access hospitals were the same as for other hospitals (Gadzinski *et al* 2013).

Workforce (including the impact on quality)

- Lack of consultant presence is a threat to safety (Cullinane *et al* 2005; Callum *et al* 2000).
- Acute providers are finding it difficult to recruit to a range of consultant roles. Meeting guidelines on consultant-delivered care would be near impossible with the current numbers of consultants. Providers are increasingly working in partnerships/networks with other providers to address workforce shortages (Monitor 2014).

Finance

- Economies of scale in hospitals are exploited at around 200 beds, and diseconomies become evident at more than 650 beds. However, economies of scope may drive larger units to facilitate links between related specialties, to strengthen multidisciplinary teams, to ensure optimal use of expensive equipment or to support the hospital's training role. Decisions on size of hospital therefore need to be context-specific (European Observatory on Health Care Systems 2002).
- There is no clear evidence to suggest that NHS organisations benefit from economies of scope (ie, a reduction in unit costs when the number of services delivered rises). The literature around scope of hospital services is dominated by clinical/expert views on what services need to be connected to deliver safe care; there is little economic evidence of impact on cost (Frontier Economics and The Boston Consulting Group 2012).
- There is no clear correlation between hospital size and financial performance. While size of hospital may be an increasingly important factor in explaining financial performance, several other factors are likely to be influential (Monitor 2014).
- The use of a national tariff can disadvantage smaller providers, where smaller volumes of activity are not able to fund the level of consultant presence recommended by professional guidance (Monitor 2014).
- The main financial benefit of seven-day services for hospital trusts is reducing length of stay. But in our sample of trusts, the savings did not cover the extra costs involved. Costs are usually highest in smaller or more rural trusts (Healthcare Financial Management Association and NHS England 2013).

Access

- Average distance from (next) nearest hospital with A&E:
  - 26.8km (trusts with turnover of less than £200 million)
  - 23km (trusts with turnover of between £200 million and £300 million)
  - 21km (trusts with turnover of more than £300 million)
  - 45 sites are located more than 30km from the next nearest A&E
  - five sites are more than 60km away (Monitor 2014).

- A few studies suggest that greater distance to hospital is associated with an increased risk of mortality once illness severity has been taken into account. Nicholl *et al* (2007) found a 1 per cent increase in mortality risk for each 10km increase in distance, an effect that was amplified in people with respiratory distress.
- Some authors have described a 'distance decay' effect under which distance from hospital services reduces patients' utilisation of them (services are taken less often or later). This impact is disproportionately felt by those with low incomes, poor access to transport, and by elderly people and people with disabilities (Mungall 2005).

Technology

- Telehealth can offer a number of potential benefits such as reducing the need to travel to outpatient clinics, providing quicker diagnosis, and avoiding referrals to hospital for diagnosis or treatment. It also has the potential to deliver clinical services more efficiently (Audit Scotland 2011).

The role of clinical networks

- Networks offer a way of making the best use of scarce specialist expertise, standardising care, improving access, and reducing any 'distance decay' effects that can result from the concentration of specialist services in large centres (Edwards 2002). 'In successful networks of care built around specialist children's hospitals, children will receive the best quality of care as close to where they live as possible' (Kennedy 2010).
- There are examples from stroke, trauma, and neonatal services of clinical networks improving outcomes and quality of care (Morris *et al* 2014; Cameron *et al* 2008; Gale *et al* 2012).
- Clinical networks can take a long time to establish, can present governance challenges, and require effective leadership and shared processes in order to succeed (Ferlie *et al* 2011).

Key clinical and service interdependencies

There have been various attempts to define the core set of acute services required of a hospital, particularly to support local A&E services (Darzi 2007; Royal College of Physicians 2007). In both instances, the model covered A&E, acute medical care, critical care and diagnostics (including computerised tomography (CT) scanning). The Healthcare for London model (Darzi 2007) also included paediatric assessment. However, this model faces workforce and financial sustainability challenges. A similar model was set out in *Keeping the NHS local* (Department of Health 2003b) based on the service model at a hospital called Bishop Auckland. (The A&E department at Bishop Auckland has since closed.) Analysis carried out as part of the Healthcare for London process (Healthcare for London 2008) also suggested that the current tariff structure made it difficult for this limited configuration of services to be financially viable.

Relevant college guidance

> *Big is not necessarily better. Outcome measures for acute care are being developed but, with the possible exception of major trauma, we are not at the stage of providing robust evidence.*
> (Academy of Medical Royal Colleges 2007, p v)

4 Community-based services

What changes were being proposed?

The proposals reviewed by NCAT reflected the policy direction of delivering 'care closer to home' and included:

- developing primary care services and community-based services – often as part of whole system reconfiguration
- changes to intermediate care beds – opening or reopening, or providing on fewer sites
- consolidating primary care services.

Key drivers

Cost, workforce, national policy and access were the primary drivers of this type of reconfiguration.

Context and relevant policy

Utilisation reviews of UK hospitals show that between 50 and 60 per cent of medical inpatient beds are occupied by patients who could be cared for in an alternative setting (analysis by The Oak Group, cited in Edwards 2014).

The 2014/15 to 2018/19 planning guidance encourages a new model of primary and community care that reduces emergency admissions to hospital. The latest Better Care Fund planning guidance assumes that new, more integrated models of care should deliver a reduction in overall emergency admissions (NHS England and Local Government Association 2014).

The areas with the highest bed use had excessive lengths of stay for patients for whom hospital was the transition between home and supported living (Imison *et al* 2012). National audit data (based on returns from 50 per cent of clinical commissioning groups) suggest that intermediate care capacity needs to

approximately double to meet potential demand. The average investment in 2012/13 in health-based intermediate care was £1.9 million per 100,000 weighted population, and re-ablement services £0.7 million per 100,000 weighted population – but with wide variation.

What evidence needs to be taken into account when reconfigurations include primary and community-based interventions?

Summary of evidence

A significant proportion of hospital beds are occupied by frail older people and people with long-term conditions who would be more appropriately cared for in the community. For some conditions, admissions can be avoided with more proactive care, and in many cases, length of stay could be reduced if there were more services to support rehabilitation and discharge. This would deliver a much better patient experience.

However, there is a lot of evidence to suggest that it can be hard for community-based initiatives, including changes to primary care, to significantly reduce hospital admissions. Delivering improvement seems to require new ways of working across a system, including within hospitals, supported by good continuity of primary care. Even with successful implementation, there is little evidence to suggest that more community-based models of care will generate significant savings. Future workforce projections also present challenges to community-based models of care.

Quality

- There is strong patient satisfaction associated with virtual ward programmes (Oliver *et al* 2014) and case management programmes (Ross *et al* 2011).
- Available evidence points to a positive impact of integrated care programmes on the quality of patient care and improved health or patient satisfaction outcomes (Nolte and Pitchforth 2014).
- Evidence from a randomised controlled trial (RCT) indicated that patients were more satisfied with 'hospital at home' than with inpatient care because it was possible to provide a more personal style of care and staying at home was considered to be more therapeutic (Wilson *et al* 2002).

- Community-based alternatives sometimes have poorer outcomes than hospital-based care (Roland and Abel 2012). Further, home-based telehealth, as implemented in the Whole System Demonstrator sites, did not improve the quality of life or psychological outcomes for patients with chronic obstructive pulmonary disease (COPD), diabetes or heart failure over a 12-month period (Cartwright *et al* 2013).

Workforce

- In June 2014, there were 5,600 district nurses (Health and Social Care Information Centre 2014b). This is less than 40 per cent of the number of district nurses there were 15 years ago (The Queen's Nursing Institute 2014).
- In 2013, there were around 15,000 full-time equivalent (FTE) primary care practice nurses – an increase of 1.7 per cent since 2012 (Health and Social Care Information Centre 2014a).
- There is a significant potential mismatch between the future demand for nurses and their supply. Forecasts of future supply suggest an overall fall in the number of nurses while demand could grow by up to 23 per cent (Centre for Workforce Intelligence 2013b).
- In 2013, there were 36,294 FTE general practitioners (GPs), an increase of 423 (1.2 per cent) since 2012 and an increase of 6,209 (20.6 per cent) since 2003 (an average annual increase of 1.9 per cent) (Health and Social Care Information Centre 2014a). Further growth in the GP workforce is planned (Health Education England 2013b) but there is debate as to whether this will meet future needs, especially as participation rates are likely to fall.

Finance

- Systematic reviews and national evaluations are generally consistent in their finding that shifting care out of the acute setting and into the community does not lead to significant reductions in health care costs (Edwards 2009).
- Evaluations of integrated care programmes have not demonstrated overall changes to secondary care costs (Bardsley *et al* 2013; RAND Europe and Ernst & Young LLP 2012).

- There is uncertainty about the relative effectiveness of different approaches to integrated care and their impact on costs (Nolte and Pitchforth 2014).
- An economic evaluation in a pragmatic, cluster RCT showed that telehealth interventions were not a cost-effective addition to standard care for people with long-term conditions (Henderson *et al* 2013).

Access

- There is mixed evidence on the capacity of community and primary care-based initiatives to reduce unplanned hospital admissions and help keep people at home (*see* Tables 2 and 3 below).
- A recent literature review from studies across Organisation for Economic Co-operation and Development (OECD) countries found that continuity of care within primary care (being able to see the same professional) reduced unscheduled secondary care (Huntley *et al* 2014).

Technology

- There is conflicting evidence on the impact of telecare and telemedicine. Telemedicine was found to reduce unplanned admissions for heart disease, diabetes, hypertension, and unplanned admissions among older people (Purdy *et al* 2012). Other studies found that telecare did not reduce admissions for people with COPD, diabetes, or heart failure (Bardsley *et al* 2013; Philp *et al* 2013).

Table 2 Summary of evidence on the impact of community-based initiatives on unplanned admissions

Intervention	Impact on unplanned admissions	Disease area/client group	Evidence source
Case management	Reduces	Heart failure and some older frail people	(Purdy *et al* 2012) (Purdy 2010)
Care co-ordination as part of integrated health and social care teams	Reduces	Older frail people	(Philp *et al* 2013)
Specialist clinics	Reduces	Heart failure	(Purdy *et al* 2012)
Education and self-management	Reduces	Adults with asthma and COPD	(Purdy *et al* 2012) (Purdy 2010)
Exercise and rehabilitation	Reduces	COPD and cardiac	(Philp *et al* 2013) (Purdy *et al* 2012)
'Virtual integration'	No significant reduction	Diabetes +/or over 75	(Curry *et al* 2013)
Virtual wards	No impact	High risk	(Bardsley *et al* 2013)
Vaccine programmes	No impact	Asthma, COPD, older people	(Purdy *et al* 2012)
Medication reviews	No impact	Older people, people with heart failure or asthma	(Philp *et al* 2013) (Purdy *et al* 2012)
Falls prevention	No impact	Older frail people	(Philp *et al* 2013)
Integrated care pilots	Increases emergency admissions Decreases elective admissions	Varied	(Roland *et al* 2012)
Hospital at Home	Increases	Older patients with a range of conditions	(Purdy *et al* 2012)

Table 3 Impact of primary care factors on unplanned admissions

The table summarises findings from Purdy (2010) in a review of the evidence on avoiding hospital admissions.

Factor	Impact	Disease area/client group
Small and single-handed practices	Depends on condition – can increase admissions	
Continuity of care	Reduces admissions (but some studies less conclusive)	Ambulatory care sensitive conditions
Out-of-hours care – clinician factors	Wide variation in admission rates between GPs	
Out-of-hours care – change in GP contract	None	
Quality of primary care as measured by the Quality and Outcomes Framework (QOF)	Evidence inconclusive	

Why do community initiatives often fail to have the impact anticipated?

- Poor implementation is a key obstacle to community-based initiatives achieving significant impact on rates of admission (Bardsley *et al* 2013). There are also risks of supply-induced demand (Roland and Abel 2012).
- The key to reducing the use of acute beds lies in changing ways of working across a system, including changes within hospitals, rather than piecemeal initiatives (Edwards 2014; Imison *et al* 2012; Simmonds *et al* 2012).

Relevant college guidance

The Royal College of General Practitioners (RCGP) and the Royal College of Nursing (RCN) are broadly supportive of the principle of delivering more care in community rather than acute settings. The RCGP has argued for improving access and quality through the federation of general practices (**Field *et al* 2008**).

Some years ago, the RCGP and Royal College of Physicians (RCP) issued a joint statement about making the best use of doctors' skills through a balanced partnership between specialists and generalists to better manage long-term conditions and support the 'care closer to home' agenda (**RCGP and RCP 2006**). A policy briefing from the Royal College of Nursing outlined findings from international studies to support shifting services from the acute to the community setting (**Royal College of Nursing 2013b**).

5 Mental health services

What changes were being proposed?

The proposals reviewed by NCAT included:

- closing inpatient wards or beds
- centralising existing services at fewer sites, with more appropriate facilities such as provision of single rooms.

Key drivers

Cost, workforce and implementing national policy were the primary drivers of this type of reconfiguration.

Context and relevant policy

Over the past 30 years, mental health services have moved from a model of institutional care and long-term acute facilities to care delivered by community mental health teams (CMHTs) and a smaller number of inpatient units. In 1999, the Department of Health published the National Service Framework for Mental Health. This set out a programme of mandated change to strengthen and develop community service infrastructure in order to prevent admission to hospital, reduce length of admission and improve patient experience (Mountain *et al* 2009). This included establishing specialist community mental health services: early intervention, assertive outreach, and crisis intervention teams.

More recently, the focus has shifted towards ensuring parity of access to mental and physical health services, first outlined in the public health strategy *Healthy lives, healthy people* (Department of Health 2010) and developed further in the mental health outcomes strategy *No health without mental health* (Department of Health 2011).

Between 2003/4 and 2012/13, demand for specialist mental health services increased by 47 per cent to 1.6 million patients contacts, while the average daily number of available mental health beds fell by 28 per cent between 1998 and 2009/10 (Health and Social Care Information Centre, Community and Mental Health Team 2013). Falling bed availability is mirrored by an overall decline in the percentage of patients with mental health problems receiving inpatient care, from 10.4 per cent in 2003/4 to 6.4 per cent in 2012/13 (NHS Information Centre for Health and Social Care 2013).

What evidence needs to be taken into account when reconfiguring inpatient mental health services?

Summary of evidence

The evidence indicates that substituting inpatient mental health service provision with a community-based service delivers better outcomes for people with moderate mental health needs at comparable cost. Although one-off savings may be generated by rationalising inpatient provision, community services are unlikely to produce ongoing savings and may be more expensive for patients with complex needs. The evidence also suggests that some types of community services are more cost effective than others. There may be arguments for centralisation if this releases capital to invest in improved and safer accommodation. In rural areas, telehealth can facilitate access to specialist advice and support.

Quality

- There is good evidence that community-based models of care improve user satisfaction, engagement with services, medication adherence and clinical outcomes (Knapp *et al* 2011).
- Alternatives to inpatient admissions such as 'crisis houses' or wards using innovative therapeutic models deliver higher levels of user satisfaction, with no difference in short-term clinical outcomes (Slade *et al* 2010).
- RCTs have shown that crisis resolution and home treatment (CRHT) teams improve clinical outcomes and user satisfaction (Carpenter *et al* 2013; Murphy *et al* 2012; National Audit Office 2007; Glover *et al* 2006).

- Access to specialist early intervention services to detect and treat episodes of psychosis has been shown to be more clinically effective than general CMHTs (Knapp *et al* 2014).
- Case studies suggest that CRHTs, working alongside CMHTs, can reduce bed use and improve quality of care (Naylor and Bell 2010; National Audit Office 2007).
- Access to outdoor space, single-sex environments or single rooms can prevent suicide, reduce violence, and aid recovery and discharge (Royal College of Psychiatrists' Research Unit and Healthcare Commission 2005; Marshall *et al* 2004).

Workforce (including links to quality)

- In 2010, there were 2,132 FTE consultants in general (adult) psychiatry in England, and the supply of consultants is expected to increase by 35 per cent to 2,870 FTE consultants over the next 10 years. This growth is needed, but may not be achieved; recruitment into psychiatry training is low, increasing numbers of trainees are moving into the private sector, and mental health staff over 55 years of age are eligible to retire after 20 years' service (Centre for Workforce Intelligence 2011a). There is an uneven geographical distribution of consultants in general psychiatry, with greater numbers in London and the north east (Centre for Workforce Intelligence 2011a).
- In 2010, there were 578 FTE consultants in psychiatry of old age, and the workforce is planned to increase by 77 per cent to 1,022 over the next 10 years (Centre for Workforce Intelligence 2011c).
- In 2012, there were 42,854 FTE qualified mental health nurses. This number increased significantly between 2000 and 2006, and has remained static since then. The 45–54 age group makes up over a third of the workforce, indicating that a large proportion of the workforce are approaching retirement age over the next 10 years (Centre for Workforce Intelligence 2012). Mental health nursing has the highest vacancy rate among the nursing workforce (the three-month vacancy rate in 2010 was 6.3 per cent). This varies across regions, with London exhibiting a vacancy rate of 15.1 per cent in 2011/12 (Centre for Workforce Intelligence 2012).

- The number of commissions for mental health nursing has decreased from just under 4,000 in 2002/3 to 3,096 in 2013/14. Planned commissions for 2014/15 predict a 1.5 per cent increase to 3,143 (Health Education England 2013b; Centre for Workforce Intelligence 2012). Modelling conducted by the Centre for Workforce Intelligence in 2010 indicates that the supply of mental health nurses will increase to 67,920 FTE in 2016 compared to an estimated baseline demand of 69,889 FTE required to deliver the service. Growing demand for mental health services may increase this shortfall (Centre for Workforce Intelligence 2012).

Finance

- Closing inpatient settings can generate one-off savings by generating capital receipts from land sales (Gilburt *et al* 2014).
- Community-based mental health services are equivalent in cost to the inpatient services they replace, particularly for users with moderate mental health needs. Moving services into the community does not generate ongoing cost savings (Thornicroft and Tansella 2004; Knapp *et al* 2011).
- The quality of care provided by CMHTs appears to be closely related to levels of expenditure (Thornicroft and Tansella 2004).
- Service users admitted to residential alternatives to inpatient settings generated significantly lower total costs for mental health services (hospital and community) in the following 12 months than those admitted to standard services (Byford *et al* 2010).
- CRHT teams can reduce hospital admissions and bed use (Carpenter *et al* 2013; Murphy *et al* 2012; Glover *et al* 2006).
- Several studies indicate that specialist early intervention services are less costly than standard care (Knapp *et al* 2014).

Access

- Service user satisfaction is higher in residential alternatives to inpatient care as they provide a safe environment with opportunities for peer support (Gilburt *et al* 2010; Osborn *et al* 2010).

- CRHT teams are effective in supporting users during periods of mental health crisis, facilitating discharge back into the community following inpatient admissions (Carpenter *et al* 2013; Murphy *et al* 2012; National Audit Office 2007; Glover *et al* 2006).

Technology

- In Canada, psychiatrists are conducting remote patient assessments, emergency clinicians are using telehealth to consult crisis workers remotely, and mental health workers are using telehealth to collaborate with other services. In 2010, 54 per cent of mental health consults used telehealth (Praxia Information Intelligence and Gartner Inc. 2011).
- A small number of studies indicate that telehealth systems can be used to help people with mental health illness monitor symptoms and improve self-management (Pratt *et al* 2014; Godleski *et al* 2012).

Relevant college and other guidance

NICE guidance recommends use of assertive outreach or case management for people with severe mental health conditions such as psychosis and schizophrenia, who are likely to disengage from treatment or services (National Institute for Health and Care Excellence 2014b; National Institute for Health and Clinical Excellence 2009a, 2009b, 2006).

The Royal College of Psychiatrists (RCPsych) advises that inpatient rehabilitation services should be provided as part of a wider clinical network, with short-term hospital or community-based rehabilitation units or access to supported accommodation 'available in all but the smallest services' (Wolfson *et al* 2009).

The RCPsych also advises that 'mental health providers should review the physical environment within which they provide care, and consider whether it is fit for the purpose of providing a therapeutic environment' (Royal College of Psychiatrists 2013, p 54).

The RCPsych Accreditation scheme for Inpatient Mental Health Services (AIMS) sets out standards for inpatient care, including staffing and environment and facilities (Cresswell and Beavon 2010).

6 Accident and emergency (A&E) and urgent care services

What changes were being proposed?

NCAT reviewed three types of proposals:

- downgrading emergency departments to urgent care centres or minor injury units
- developing new urgent care centres or minor injury units
- closing or relocating walk-in centres.

Key drivers

Cost, workforce and safety were the primary drivers of this type of reconfiguration.

Context and relevant policy

Urgent and emergency care services are currently the subject of a review led by Sir Bruce Keogh (NHS England Urgent and Emergency Care Review Team 2014). The review proposes a two-tier approach to emergency departments, divided between 'emergency centres' and 'specialist emergency centres' as well as the development of broader emergency care networks. Other proposals from the review include greater access to information and support for people to self-care; enhanced NHS 111 telephone service; the development of urgent care services outside hospital, including better access to GP, primary and community services; and greater use of health care professionals, including community pharmacists and paramedics.

At this stage, the Keogh proposals do not describe how they expect the emergency centres to be staffed, yet expectations around this will be a significant determinant of the final configuration of services. Phase two of the review is now under way and is seeking to develop a framework for implementation of the proposed changes (NHS Choices 2013).

Recent activity trends

Attendances at type 1 A&E have increased by 6 per cent in the past five years, while attendances at urgent care centres and other community-based alternatives have increased by 23 per cent (NHS England 2014b).

What evidence needs to be taken into account when reconfiguring A&E and urgent care services?

Summary of evidence

There is strong evidence to support a senior doctor presence in A&E seven days a week. Professional guidance suggests consultants should be available at least 16 hours a day. Nurse practitioners are a safe alternative to junior doctors. The evidence also shows that A&E services require:

- 24/7 support from diagnostics, including pathology and radiology
- rapid access to critical care
- rapid access to specialist medical opinion, including geriatricians and paediatricians (on-site) and specialist surgical opinion (senior staff may be remote but part of a network)
- liaison mental health services.

All A&E departments should be part of a formal trauma network. There have been very few studies to assess the impact of centralising A&E services. The limited evidence available suggests that if services are centralised, there are risks to the quality of care where the centralised service does not have the necessary A&E capacity and acute medical support for the additional workload. A proportion of A&E attenders can safely be seen in community settings but there is little evidence that developing these services in addition to A&E will reduce demand.

Changes to A&E services may not result in savings, and significantly increased distances to A&E may increase mortality for the very few patients with the severest illnesses. This needs to be taken into account when assessing the net benefit of any proposal to centralise A&E services. There are opportunities to support local access through networked arrangements and to provide remote support to A&E through telemedicine links to smaller units.

Quality

- One study (Simpson *et al* 2001) found that centralising services from three sites to one improved levels of A&E consultant cover, time to admission, teaching and research at the trust. However, it also resulted in additional workload on acute medicine services; the case-mix of patients became more acute, leading to a longer wait to see a clinician.
- There is evidence that overcrowding in A&E departments leads to poorer outcomes and increases mortality (Sprivulis *et al* 2006). Delays in accessing a bed are also linked to poorer outcomes (Forero *et al* 2011).
- A&E departments should be part of a managed trauma network to ensure that patients with complex trauma receive the necessary specialist care (NHS England Urgent and Emergency Care Review Team 2013). Further evidence on trauma care is provided in the section on trauma.

Workforce (including the impact on quality)

- The presence of senior decision-makers in the A&E department can speed assessment and help avoid admissions (Cooke *et al* 2004; Blunt 2014).
- In 2009, the average number of consultants for each A&E department was just over four (The College of Emergency Medicine 2010).
- Only 30 per cent of hospitals have consultant cover for at least 12 hours a day at weekends (The College of Emergency Medicine 2013).
- Recruitment of doctors to emergency medicine is a challenge. The specialty has high vacancy rates and low fill rates for specialist training. Changing the skill-mix of the emergency medicine workforce through emergency nurse practitioners, physicians and paramedics may be one solution (Health Education England 2013a).
- One study shows how consultants and middle-grade doctors can work in a combined rota to ensure more senior support 24/7 (Sen *et al* 2012).
- Junior doctors are more likely to make diagnostic errors than senior doctors (Guly 2001).
- Nurse practitioners in A&E are a safe alternative to junior doctors (McClellan *et al* 2012; Cooke *et al* 2004).

Finance

- One study (Simpson *et al* 2001) found that centralising A&E services from three sites to one increased the costs of the service.

Access

- Average distance from (next) nearest hospital with A&E:
  - 26.8km (trusts with turnover of less than £200 million)
  - 23km (trusts with turnover of between £200 million and £300 million)
  - 21km (trusts with turnover of more than £300 million)
  - 45 sites are located more than 30km from the next nearest A&E
  - five sites are more than 60km away (**Monitor 2014**).

- A few studies suggest that greater distance to hospital is associated with an increased risk of mortality once illness severity has been taken into account. Nicholl *et al* (2007) found a 1 per cent increase in mortality risk for each 10km increase in distance, an effect that was amplified in people with respiratory distress.

Technology

- Seriously ill or injured children presenting to remote emergency departments with telemedicine links to doctors in specialist paediatric hospitals were less likely to suffer from emergency medication errors (Dharmar *et al* 2013).
- Telemedicine offers a way to provide expert advice remotely to smaller, geographically distant units. There is evidence of its successful use for minor injuries (Darkins *et al* 1996), supporting nurses to deliver care to less seriously ill patients (Brennan *et al* 1998), providing paediatric advice (Dharmar *et al* 2013), and for the initial assessment of trauma patients (Latifi *et al* 2009) and stroke patients (Müller-Barna *et al* 2014).

Key clinical and service interdependencies

Service/support	Rationale	Evidence source
Diagnostic services including pathology, plain radiology and CT scanning **24 hours a day**, with immediate reporting	Enable rapid diagnosis and improve outcomes especially for conditions such as stroke and acute abdomens	(The College of Emergency Medicine *et al* 2014) (Hassan and Walsh 2013) (Forero *et al* 2011) (Martin IC *et al* 2007) (Cooke *et al* 2004)
Critical care services	Capacity to treat the critically ill (1–2% of attendances) and avoid poor outcomes, including death	(The College of Emergency Medicine *et al* 2014) (Hassan and Walsh 2013) (Chalfin *et al* 2007) (Parkhe *et al* 2002)
Acute medicine including geriatricians	Enable rapid diagnosis and treatment to improve outcomes	(The College of Emergency Medicine *et al* 2014) (Hassan and Walsh 2013)
Acute surgery (on-site or as part of network-based support)	Enable rapid diagnosis and treatment to improve outcomes	(The College of Emergency Medicine *et al* 2014)
Acute orthopaedics	Enable rapid diagnosis and treatment to improve outcomes	(Hassan and Walsh 2013)
Paediatric expertise	Significant proportion of A&E attenders are children; failure to spot the severity of a child's illness because of lack of paediatric expertise or training is a key cause of avoidable child death	(Pearson 2008)
Access to inpatient beds	c30% of those attending A&E are likely to require admission to hospital	(NHS England 2014a)
Social workers	The presence of social workers in A&E can be beneficial for patients and staff	(Cooke *et al* 2004)
Liaison mental health services	Help people access mental health services and reduce readmission rates of people with mental health problems	(Callaghan *et al* 2003)

Providing alternatives to A&E, and their impact

There is little evidence (*see* Table 4 below) that providing alternatives to A&E in the community significantly reduces A&E attendances, but improved GP access could be beneficial.

Table 4 Alternatives to A&E, and their impact

Intervention/issue	Impact/issue	Evidence source
Providing additional urgent care facilities outside hospital	10–30% of A&E attenders could be seen in alternative settings	(Mann and Tempest 2014) (Penson *et al* 2012) (Carson *et al* 2011) (Lowy *et al* 1994)
	Parents are poor judges of the severity of their child's illness and so will find it hard to judge whether they should take their child to an A&E or a community-based alternative	(Blacklock *et al* 2011)
	There is little evidence that additional urgent care facilities reduce A&E attendances	(Blunt 2014) (Mason and Snooks 2010) (Cooke *et al* 2004) (Chalder *et al* 2003)
Improving GP access	There is some evidence that lower rates of satisfaction with GP access are linked to higher rates of attendance at A&E	(Blunt 2014)
Enhancing the skills of ambulance staff	There is some evidence that ambulance services have the potential to meet a higher proportion of urgent and emergency care demand and prevent onward transportation to hospital if they had the appropriately trained staff	(Mason *et al* 2007)

Relevant college guidance

The College of Emergency Medicine argues for 'senior decision-makers' at the front door of the hospital. Every emergency department should be staffed by at least 10 working-time equivalent (WTE) consultants to provide a consultant presence 16 hours a day, seven days a week. The College cites the Australian model, where a typical emergency department seeing 60,000–80,000 patients per year would be staffed by 14 consultants (**The College of Emergency Medicine *et al* 2014**).

> *Where an emergency department does not have on-site back-up from particular specialties, there should be robust networks of care and emergency referral pathways.*
> (**The College of Emergency Medicine *et al* 2014**, p 3)

> *There is a balance between centralising or rationalising some services with the consequent risk of patient deterioration en route and the economic cost and reduced expertise of maintaining numerous smaller units. This remains an area of continuing research.*
> (**The College of Emergency Medicine 2013**, p 16)

7 Acute medical services

What changes were being proposed?

NCAT reviewed two types of proposals:

- the concentration of acute medical services onto fewer sites
- maintaining acute medical services while concentrating emergency surgical services.

Key drivers

- Cost, workforce and safety were the primary drivers of this type of reconfiguration.

Context and relevant policy

Two areas of current policy will have an impact on the configuration of acute medical and surgical services. First, as part of the Keogh review (discussed in the previous section), the designation of an A&E department as either an 'emergency centre' or 'specialist emergency centre' will have implications for the supporting acute medical and surgical services. Second, the NHS Services, Seven Days a Week Forum (2013) set up by NHS England has set out a number of clinical standards, recommending that:

- all emergency admissions should be reviewed by a consultant within 14 hours of admission
- hospital inpatients must have access to diagnostic services such as x-ray, ultrasound, CT scanning, magnetic resonance imaging (MRI), echocardiography, endoscopy, bronchoscopy and pathology
- hospital inpatients must have timely 24-hour access, seven days a week, to consultant-directed interventions that meet the relevant specialty guidelines,

either on-site or through formally agreed networked arrangements with clear protocols, such as:

- critical care
- interventional radiology
- interventional endoscopy
- emergency general surgery.

There are 5.3 million emergency admissions each year, most of which are for medical problems. Emergency admissions rose by 20 per cent between 2003/4 and 2012/13 (Health and Social Care Information Centre 2013).

What evidence needs to be taken into account when reconfiguring acute medical services?

Summary of evidence

Consultants should be actively involved in all stages of the care pathway. Acute medical units should have a continuous admitting consultant presence, enabling early consultant review and assessment (within 12 hours). Acute medical services should have rapid access to critical care, a surgical opinion (on-site for unselected emergencies, can be off-site if selected), 24/7 access to diagnostics (including MRI and CT), and seven-day support from therapies and pharmacy as well as liaison psychiatry. There is some evidence that units and/or consultants undertaking higher volumes of care deliver better outcomes, but the link between volume and outcomes is not well understood – and volume may not be the primary driver of improved outcomes.

Quality

- Hospitals with higher numbers of acute medical admissions (40 or more per day) were associated with a reduced adjusted case fatality rate (Bell *et al* 2013).
- There is an association between hospital volume and outcomes for acute myocardial infarction, heart failure, and pneumonia, but these benefits are exhausted at relatively low activity thresholds – 610 patients per year for those with acute myocardial infarction, 500 per year for those with heart failure, and 210 patients per year for those with pneumonia (Ross *et al* 2011).

- The link between volume and outcomes does not necessarily demonstrate a causal relationship (given the variation that exists in outcomes across units, whatever their size) and should not be used in isolation as a justification for centralising care (Harrison 2012).
- A large study of England's 4.3 million emergency admissions in 2005/6 cited by the Keogh review, alongside large US-based and smaller UK-based studies, found that patients' adjusted odds of death for emergency admissions were 10 per cent higher at the weekend, when there is little on-site consultant presence (Aylin *et al* 2010).

Workforce (including the impact on quality)

- The National Confidential Enquiry into Patient Outcome and Death (NCEPOD) (Cooper *et al* 2009; Martin IC *et al* 2007; Cullinane *et al* 2005) consistently identifies lack of consultant input as a contributor to poor-quality care. It recommends active consultant engagement at all stages of the care pathway, stipulating that patients admitted as an emergency should be seen by a consultant within 12 hours (Martin IC *et al* 2007).
- Having a continuous admitting consultant presence on the acute medical unit is associated with reduced adjusted case fatality rates in hospital. This association is most apparent with early death (within 3 days) in hospital (Bell *et al* 2013).
- One study showed that consultants treating higher volumes of medical patients had 25 per cent higher survival rates and lower lengths of stay than 'low volume' consultants (Conway *et al* 2013).
- 24/7 consultant-delivered cardiology service is associated with marked reductions in all-cause mortality following admission with acute coronary syndromes (Ng Kam Chuen *et al* 2012).
- Management by consultant-delivered multidisciplinary teams, including nurses and pharmacists, can reduce length of stay (Fielding *et al* 2013).
- Most consultant physicians spend most of their time in outpatient activity. There is a tension between the demands of the outpatient service and the need for more consultant time in order to deliver seven-day services and support for inpatient care (Royal College of Physicians 2013).
- There is little published data to define a minimum number of physician staff and skill-mix that would assure safety in acute medicine (Sabin *et al* 2014).

Finance

- We could find no evidence about the financial impact of reconfiguring emergency medical services.

Access

NB This is the same evidence as cited for A&E and urgent care, and whole trust reconfiguration.

- Average distance from (next) nearest hospital with A&E:
  - 26.8km (trusts with turnover of less than £200 million)
  - 23km (trusts with turnover of between £200 million and £300 million)
  - 21km (trusts with turnover of more than £300 million)
  - 45 sites are located more than 30km from the next nearest A&E
  - five sites are more than 60km away (Monitor 2014).
- A few studies suggest that greater distance to hospital is associated with an increased risk of mortality once illness severity has been taken into account. Nicholl *et al* (2007) found a 1 per cent increase in mortality risk for each 10km increase in distance, an effect that was amplified in people with respiratory distress.

Technology

- Acute medical services require on-site critical care support. The capacity to deliver the necessary critical care can be a key determinant of whether services can be maintained. A US study of 118,990 patients found that the tele-intensive care units (ICUs) had lower mortality rates and lengths of stay due to case review within an hour of admission by intensivists, as well as shorter response times during crisis (Lilly *et al* 2014). A literature review of 55 studies found that tele-ICUs improved clinical outcomes (Deslich and Coustasse 2014).

Key clinical and service interdependencies

Service/support	Rationale	Evidence source
Diagnostic services including pathology, plain radiology and CT scanning **24 hours a day**, with immediate reporting	Enable rapid diagnosis and improve outcomes, especially for conditions such as stroke and acute abdomens	(Cooper *et al* 2009) (Martin IC *et al* 2007)
Critical care services	To safely manage acutely sick and deteriorating patients	(Cullinane *et al* 2005) (Royal College of Physicians 2002)
Endoscopy	Early endoscopy after acute upper gastrointestinal bleeding reduces re-bleeding and the need for surgery	(Hearnshaw *et al* 2010)
Acute surgery (on-site or as part of network-based support)	Enable rapid diagnosis and treatment to improve outcomes	(Royal College of Surgeons of England 2011)
Geriatric expertise	There is an urgent need to provide adequate specialist geriatric support and assessment to those over 65	(Oliver *et al* 2014)
7-day therapy services	To support active rehabilitation and reduce length of stay	(NHS Services, Seven Days a Week Forum 2013)
7-day pharmacy services	To reduce drug errors	(NHS Services, Seven Days a Week Forum 2013)
Liaison mental health services	Reduces length of stay and improves outcomes	(Royal College of Psychiatrists 2005)

Relevant college guidance

Emergency medicine with clinical decision unit (CDU) facilities or combined medical/surgical assessment units would be able to provide the initial assessment, investigation, triage and management of many patients with abdominal pain. They would need good surgical support with access to CT 24 hours a day. This will allow sustainable out of hours surgical rotas in most hospitals.
(Academy of Medical Royal Colleges 2007, p 19)

10 consultants can deliver early assessment by a consultant 7 days a week.
(Royal College of Physicians 2012a)

We recommend that within regions there must be a wider range and more innovative options for acute medical care, scaled to meet patients' specific needs, fit for purpose and conveniently located... We recommend the development of major acute hospitals serving local regions, providing the most intensive level of emergency and complex acute medical care.
(Royal College of Physicians 2007, p xiii)

8 Acute surgical services

What changes were being proposed?

Most of the proposals reviewed by NCAT focused on the concentration of acute surgical services, often separating acute services from elective care to create 'hot' (emergency) and 'cold' (elective) sites.

Key drivers

Cost, workforce and safety were the primary drivers of this type of reconfiguration.

Context and relevant policy

Two key areas of current policy will have an impact on the configuration of acute medical and surgical services: the Keogh review, and the NHS Services, Seven Days a Week Forum (NHS Services, Seven Days a Week Forum 2013). For further details, *see* the sections on A&E and urgent care, and acute medical services.

There are around 600,000 emergency admissions under the care of general surgeons each year in England. Just over half of them present with abdominal pain (Royal College of Surgeons of England 2014). Emergency anaesthesia and surgery make up an estimated 40–50 per cent of the surgical workload in the UK (Royal College of Anaesthetists 2014).

What evidence needs to be taken into account when reconfiguring acute surgical services?

Summary of evidence

Units providing 24/7 acute (emergency) surgery should ensure early consultant review and assessment (ie, within 12 hours). There should be consultant surgeons and anaesthetists available 24/7 to supervise operations on emergency surgical patients. Acute surgical services should be supported by a dedicated emergency theatre, appropriate critical care services, acute medicine and diagnostic services, including interventional radiology.

Outcomes for emergency surgery vary considerably between units. While centralisation of services may be one way of improving outcomes, the relationship between volume and outcomes is complex. There is also evidence that systematic application of improvement techniques, as well as high-quality peri-operative assessment and post-operative care, are key drivers of improvement.

The emerging field of telemedicine has the potential to improve access to specialist opinion and enhance the treatment of acutely ill patients.

Quality

- Outcomes from emergency surgery vary considerably between hospitals. Overall mortality varies twofold between units for surgical emergencies (Royal College of Surgeons of England 2011). One audit demonstrated a twelvefold variation in outcomes from emergency laparotomy surgery (Saunders *et al* 2012).
- The chance of a patient dying, when admitted as an emergency, is 10 per cent higher if they are admitted at the weekend (Aylin *et al* 2010).
- There is some evidence that hospitals that conduct higher volumes of surgery have better outcomes (Urbach and Baxter 2004). However, the means by which increased institutional volumes affect surgical outcomes are complex and poorly understood (Wei *et al* 2014).
- A large US study suggested that the best way to improve high-risk surgery was through the systematic application of known improvement techniques such as operating room checklists, rather than centralisation in high-volume centres (Finks *et al* 2011).

- A number of studies have shown that a key driver of variation in outcomes for high-risk surgery is the provision of high-quality peri-operative care to pre-empt potential complications, as well as the capacity to manage complications when they do occur (Mullen *et al* 2012, p 201; Ghaferi *et al* 2009, 2011).
- A large US study (Ghaferi *et al* 2009) concluded that there were three key determinants of surgical patient outcomes: the effective management of complications (including rapid transfer to an intensive care unit); access to an interventional cardiologist to manage an acute myocardial infarction; and timely administration of antibiotics to manage sepsis.

Workforce (including links to quality)

- Lack of early consultant involvement and assessment of emergency surgical patients leads to poor outcomes (Wilkinson *et al* 2010; Martin IC *et al* 2007).
- 30 per cent of high-risk surgical cases were suboptimally supervised by consultant surgeons (Royal College of Surgeons of England and Department of Health 2011).
- Emergency surgical operations should be done under consultant surgeon supervision (Campling *et al* 1997).
- In 2011, over 45 per cent of general surgical consultants were working a 1 in 6 on-call rota or a rota of greater intensity (Greatorex and Sarafidou 2011).
- In September 2012, there were 1,990 consultant general surgeons in post. Current forecasts suggest that this number will increase by 31 per cent by 2020 to approximately 2,600 consultants (Health Education England 2013b).
- Lack of senior anaesthetic support has been linked to poor outcomes (Wilkinson *et al* 2010). The anaesthetic service for emergency activity, including surgery, must be provided by a competent anaesthetist who is either a consultant, or a non-consultant with appropriate skills and unimpeded access to a consultant for supervision (Royal College of Anaesthetists 2014).
- A recent survey of UK anaesthetic activity found that a consultant or career grade anaesthetist was present in 87 per cent of general anaesthesia cases and 75 per cent of cases out of hours – significantly higher than other specialties. The low mortality rate of 0.06 per cent supports the safety of consultant-delivered anaesthetic care (Sury *et al* 2014).

Finance

- We could find no evidence on the financial impact of reconfiguring acute surgical services.

Access

NB This is the same evidence as cited for A&E and urgent care, and whole trust reconfiguration.

- Average distance from (next) nearest hospital with A&E:
  - 26.8km (trusts with turnover of less than £200 million)
  - 23km (trusts with turnover of between £200 million and £300 million)
  - 21km (trusts with turnover of more than £300 million)
  - 45 sites are located more than 30km from the next nearest A&E
  - five sites are more than 60km away (Monitor 2014).
- A few studies suggest that greater distance to hospital is associated with an increased risk of mortality once illness severity has been taken into account. Nicholl *et al* (2007) found a 1 per cent increase in mortality risk for each 10km increase in distance, an effect that was amplified in people with respiratory distress.

Technology

- Early evidence from new models of care such as teleconsults, telemonitoring, robotic surgery and telehealth programmes shows that providing access to remote specialist input has the potential to improve clinical outcomes. Examples include telementoring (eg, providing junior surgeons with assistance from a sub-specialist during surgery) (Ereso *et al* 2010); and using telemonitoring to monitor patients in hospital (such as tele-ICUs) – currently used for 11 per cent of critically ill adults in the United States (Lilly *et al* 2014).

Key clinical and service interdependencies

Service/support	Rationale	Evidence source
Anaesthetics delivered by consultant anaesthetists	Key part of the emergency surgical team	(Royal College of Anaesthetists 2014) (Royal College of Surgeons of England 2011)
Critical care services	Lack of access to critical care beds can be a key factor in peri-operative death	(Findlay *et al* 2011)
Dedicated theatre and team	To prevent delays and poor outcomes from emergency surgery	(Campling *et al* 1997)
Interventional and diagnostic radiology	To support accurate diagnosis and treatment planning	(Royal College of Surgeons of England 2011)
Pathology	To support accurate diagnosis and treatment planning	(Royal College of Surgeons of England 2011)
Acute medicine, gastroenterology, cardiology, bronchoscopy	To safely manage acutely ill patients	(Royal College of Surgeons of England 2011)

Relevant college guidance

The 'on-take' consultant, taking lead responsibility for emergency admissions, should be available for telephone advice at all times and on-site within 30 minutes when required. As an absolute minimum, patients not considered high risk are discussed with a consultant within 12 hours of admission (Royal College of Surgeons of England 2011).

The Royal College of Surgeons of England (RCS) supports the World Health Organization (WHO) surgical safety checklist as an 'example of clinical best practice that is endorsed by the College and is currently being implemented throughout the NHS' (Royal College of Surgeons of England 2009a). They also recommend that 'peri-operative objective assessment of risk must become routine. Most importantly, identification of higher risk needs to trigger joint advance planning specific to that case'.

> *Concerns about the delivery and future viability of emergency general surgery are such that the College and the ASGBI believe NHS England should consider establishing a Strategic Clinical Network to oversee the delivery of safe, efficient care and ensure a whole systems approach... Decisions about service change need to be evidence based and aim to improve outcomes for patients. We fully support greater national clinical audit activity and research in order to develop the evidence base for improved patient care.* (Royal College of Surgeons of England and Association of Surgeons of Great Britain and Ireland 2013, p 1)

9 Elective surgical care

What changes were being proposed?

All the reconfigurations of elective surgery reviewed by NCAT involved the separation of emergency surgical care from elective surgery.

Key drivers

Cost and workforce were the primary drivers of this type of reconfiguration.

Context and relevant policy

The NHS Plan in 2000 included the development of a number of diagnostic and treatment centres focused on providing elective surgery and diagnostic procedures (Department of Health 2000). These centres sought to reduce waiting times and increase capacity by separating low-risk planned operations from emergency care. In addition to independent sector treatment centres (ISTCs), the Department of Health launched a strategy in 2002 to increase the proportion of elective procedures conducted as day cases (Department of Health 2002).

Trends in activity

The number of elective day case surgery admissions in England has risen by nearly 80 per cent over a decade, from 3.2 million in 2002/3 to 5.7 million in 2012/13. At the same time, the number of other elective inpatient admissions remained broadly static, at around 1.5 million admissions each year.

What evidence needs to be taken into account when reconfiguring elective surgical services?

Summary of evidence

Professional guidance and the available evidence support the separation of elective from emergency surgery (either geographically or through the provision of dedicated facilities and staff). Patients deemed high risk should only be admitted to a facility with the appropriate critical care and other support. Elective surgical units should be consultant-led. Telemedicine ICUs (or tele-ICUs) where patients are monitored remotely by a critical care team can improve the quality of critical care. Emerging evidence suggests that non-medical staff such as surgical care practitioners can provide safe care for minor surgical procedures.

Quality

- Separating the elective surgical workload can improve efficiency and avoid cancellations (Mayer *et al* 2008). However, the efficiency gains can be affected by patient case-mix and demand (Kjekshus and Hagen 2005).
- ISTCs may improve the quality of care due to the more predictable work flow and increased senior supervision of complex cases (Chard *et al* 2011).

Workforce

- A four-year prospective audit of surgical care practitioners (nurses or allied health professionals trained to provide minor surgical procedures) found that their care was safe, acceptable to patients, and reduced waiting times (**Martin S *et al* 2007**).
- A recent systematic review of GPs with a special interest in surgical procedures found that while they may provide an alternative workforce and improved access to care, further evidence was needed on their efficacy and cost-effectiveness (**Taneja *et al* 2014**).

Finance

- We could find no evidence on the financial impact of reconfiguring elective surgical services.

Access

- Patients are willing to choose a more distant provider to receive higher-quality care or faster care (Dixon *et al* 2010; Chang *et al* 2004; Ryan *et al* 2000).

Technology

- As described in acute surgery, there is early evidence from new models of care such as teleconsults, telemonitoring, robotic surgery and telehealth programmes that shows that providing access to remote specialist input has the potential to improve clinical outcomes. Examples include telementoring (eg, providing junior surgeons with assistance from a sub-specialist during surgery) (Ereso *et al* 2010); and using telemonitoring to monitor patients in hospital (such as tele-ICUs) – currently used for 11 per cent of critically ill adults in the United States (Lilly *et al* 2014).

Key clinical and service interdependencies

Service/support	Rationale	Evidence source
Anaesthetics – delivered by consultant anaesthetists	'Anaesthesia for day surgery should be consultant led. All anaesthetists delivering day surgical care must be trained, experienced and skilled in day surgery practice because high-quality anaesthesia is pivotal to a successful outcome.' p 50	(Royal College of Anaesthetists 2014)
Critical care services	Access to appropriate recovery and critical care support is needed in elective surgical units to manage acutely sick patients and avoid peri-operative death. Units without comprehensive critical care facilities and consultant support should not be undertaking complex surgery or accepting 'high-risk' patients	(Findlay *et al* 2011) (Royal College of Surgeons of England and Department of Health 2011) (Wilkinson *et al* 2010) (Callum *et al* 2000)
Interventional and diagnostic radiology	To support accurate diagnosis and treatment planning, including anaesthesia	(Royal College of Anaesthetists 2014)
Pathology	To support accurate diagnosis and treatment planning, including anaesthesia	(Royal College of Anaesthetists 2014)

Relevant college guidance

The RCS recommends separating elective surgical admissions from emergency admissions, suggesting that this can result in earlier investigation, definitive treatment and better continuity of care, as well as reducing hospital-acquired infections and length of stay (particularly medical emergencies) wherever possible (Royal College of Surgeons of England 2007b). It also advises streaming elective care into minor, intermediate and complex cases. Hospitals providing complex elective surgery or minor/intermediate surgery for higher-risk patients with co-morbidities should provide 'sufficient critical care support appropriate to patient need' (Royal College of Surgeons of England and Department of Health 2011; Royal College of Surgeons of England 2007b, p 3).

Work conducted by the RCS of England and Department of Health (2011) on high-risk surgical patients showed that mortality rates for this group – which includes most major gastrointestinal and vascular procedures – exceed the rate for cardiac surgery by between two and three times, with complication rates of 50 per cent not uncommon. Their report recommends that patients with a predicted hospital mortality of 5 per cent or above should have active consultant input in the diagnostic, surgical, anaesthetic and critical care elements of their pathway. Further, surgical procedures with a predicted mortality of 10 per cent or above should be conducted under the direct supervision of a consultant surgeon and consultant anaesthetist unless the responsible consultants have satisfied themselves that their delegated staff have adequate competency, experience, and human resources, and are adequately free of competing responsibilities.

10 Trauma

What changes were being proposed?

The proposals reviewed by NCAT included:

- region-wide initiatives, centralising trauma services into designated major trauma centres and the creation of trauma networks linking local hospitals to the centre
- centralising trauma onto one site within multi-site trusts. In one case, this involved the separation of trauma from elective orthopaedic services.

Key drivers

National policy and safety were the primary drivers of this type of reconfiguration.

Context and relevant policy

In 2010, the NHS Clinical Advisory Group on trauma published evidence-based advice (NHS Clinical Advisory Groups 2010) for strategic health authorities to help them design and implement trauma networks across England. A summary of their key recommendations is provided in the box on page 63. While the guidance references the RCS recommendation that trauma centres should see a minimum of 250 critically ill people each year, it is not a formal recommendation of the report.

Regional trauma networks went live across England in April 2012. From April 2013, major trauma services have been commissioned by NHS England. The service specification set out in the standard contract (NHS England 2013c) draws heavily on the Clinical Advisory Group's work.

Major trauma is defined as serious, possibly multiple injuries that are scored at 15 or above on the injury severity score (ISS) scale. The National Audit Office (NAO) estimates that this type of trauma occurs 20,000 times in England each year (National Audit Office 2010a).

What evidence needs to be taken into account when reconfiguring trauma services?

Summary of evidence

Formalised systems of trauma care, in which care for the most complex patients is centralised into a small number of trauma centres, improves patient outcomes. Trauma centres need 24/7 access to fully staffed theatres and diagnostics, including CT, MRI and pathology. They also need comprehensive critical care and neurosurgical support.

Quality

- Providing care for patients in trauma centres that are part of a formalised system of trauma care can result in a significant decrease in mortality (Cameron *et al* 2008; MacKenzie *et al* 2006).
- There is some debate about the contribution that higher volumes of cases make to improved outcomes. Some studies have shown clear linkages between trauma centre volumes and outcomes (Nathens *et al* 2001) while others (Demetriades *et al* 2005) maintain that the way in which care is organised and delivered is more important.
- The United Kingdom has been slow to adopt these formalised systems of trauma care, and in 2007, NCEPOD, in its report, *Trauma: who cares?* found suboptimal care in 60 per cent of the major trauma patients covered by its review (**Findlay *et al* 2007**).

Workforce

- A recent review of the workforce needed to support trauma networks identified significant risks around the following staff groups:
  - interventional radiologists and nurses
  - emergency physicians
  - rehabilitation medicine (**Centre for Workforce Intelligence Regional Trauma Network Team 2011**).

- The trauma and orthopaedic consultant workforce has grown by 59 per cent from 1,265 FTE staff in 2002 to 2,015 in 2012. Consultant numbers are expected to grow by a further 36–55 per cent by 2028, up to just over 3,000. There is a significant risk that the supply of trauma and orthopaedic surgeons over the projection period will exceed the levels of service that the NHS can afford to commission (Centre for Workforce Intelligence 2014).

Finance

- We could find no evidence on the financial impact of reconfiguring trauma services.

Access

- There is mixed evidence about the impact of travel times on trauma outcomes. One study of major trauma in Scotland (McGuffie *et al* 2005) suggested that longer travel times did not worsen outcomes, whereas other studies (Hsia *et al* 2014; Nicholl *et al* 2007) have suggested that increased travel times do have an adverse impact on outcomes.

Technology

- Early evidence from new models of care such as teleconsults, telemonitoring, robotic surgery and telehealth programmes shows that providing access to remote specialist input has the potential to improve clinical outcomes. Examples include managing trauma patients in a rural setting with remote support from a specialist trauma centre (Latifi *et al* 2009).

Key clinical and service interdependencies

Service/support	Rationale	Evidence source
24/7 access to fully staffed and equipped emergency theatre	To prevent delays and poor outcomes from emergency trauma surgery	(NHS Clinical Advisory Groups 2010)
CT co-located in the emergency department	To support accurate diagnosis and treatment planning	(NHS Clinical Advisory Groups 2010)
MRI scanning available 24/7	To support accurate diagnosis and treatment planning	(NHS Clinical Advisory Groups 2010)
Neurosciences	To safely manage patients with severe head or spinal cord injury – access needed to neurosurgery consultants 24/7	(NHS Clinical Advisory Groups 2010)
Critical care services	Access to appropriate recovery and critical care support is needed to manage acutely sick patients and avoid peri-operative death	(Findlay *et al* 2011) (Royal College of Surgeons of England and Department of Health 2011) (Wilkinson *et al* 2010) (Callum *et al* 2000)
Pathology	To support accurate diagnosis and treatment planning, including anaesthesia	(Royal College of Anaesthetists 2014)

Relevant college guidance

The RCS (Royal College of Surgeons of England 2007a), citing Nathens *et al* (2001), recommends that, as a minimum, major trauma centres should admit more than 250 critically injured patients a year. But in subsequent guidance, it suggested a minimum of between 400 and 600 cases and serving a population of 2–3 million (Royal College of Surgeons of England 2009b). In the United States, the American College of Surgeons (2012) requires hospitals seeking accreditation as a major trauma centre to admit more than 240 cases a year.

continued on next page

Summary of key recommendations from *Regional networks for major trauma: NHS Clinical Advisory Groups report* (2010)

- Each region needs to identify and designate at least one hospital to act as a major trauma centre, supported and linked via a trauma network to local trauma units.
- All patients identified as major trauma (using a trauma triage tool) should be taken to a major trauma centre.
- Those who are within 45 minutes' travel time from the centre should be taken there directly, bypassing other units. Patients further than 45 minutes' travel time from the centre should be stabilised first in their local trauma unit.
- A trained trauma team should be present 24 hours a day for the immediate reception of the patient. The trauma team leader should be a consultant in the major trauma centre and, in the trauma unit, there should be at least ST4 or equivalent competency who will attend within 30 minutes by a consultant.

For emergency trauma surgery:

- this should be performed by a consultant surgeon with appropriate skills and experience
- all patients requiring acute intervention for haemorrhage control must be in a definitive management area (operating room or intervention suite) within 60 minutes.

11 Stroke care

What changes were being proposed?

Most of the proposals reviewed by NCAT involved the concentration of acute stroke services and the designation of hospitals either as hyper-acute stroke units, able to offer CT scanning and thrombolysis 24/7, or as local stroke units. They included two region-wide reconfigurations of stroke services. There was one proposal to create a stroke centre in an elective hospital (chosen to maximise local access).

Key drivers

Quality was the primary driver of this type of reconfiguration.

Context and relevant policy

In 2007, the Department of Health set out a national strategy for stroke (Department of Health 2007) drawing on the available evidence. The strategy set out the expected standards of care (*see* box under 'Relevant college guidance' on pages 67–68).

The Department's strategy acknowledged that the existing pattern of services with limited numbers of specialist staff would make it difficult to implement the model proposed for rapid thrombolysis treatment in all hospitals. It proposed the development of hyper-acute centres in a 'hub and spoke model' supported by an increase in the range of clinicians available to provide specialist acute input (for example, acute physicians and specialist nurses). The policy is supported by aligned guidance from NICE and the Royal College of Physicians (National Institute for Health and Clinical Excellence 2008; Royal College of Physicians 2012b).

There are approximately 152,000 strokes in the United Kingdom every year and one in five strokes are fatal (Stroke Association 2013). The mortality rate has halved since 1993 (British Heart Foundation 2011), partly due to better control of risk factors and partly due to better understanding and delivery of best practice in acute care (National Audit Office 2010b). The prevalence of stroke is expected to rise as a result of underlying risk factors in the population (Cardio & Vascular Coalition 2009).

What evidence needs to be taken into account when reconfiguring stroke services?

Summary of evidence

Stroke patients require specialist multidisciplinary care and rehabilitation. A centralised model of acute stroke care, in which hyper-acute care is provided to all patients with stroke across an entire metropolitan area, can reduce mortality and length of stay. There is also growing evidence on the use of telemedicine to support the rapid assessment and treatment of stroke in areas without easy access to a hyper-acute stroke unit.

Quality

- Two systematic reviews have demonstrated better outcomes for patients with stroke if treated by multidisciplinary teams that exclusively manage stroke patients in a dedicated ward (stroke, acute, rehabilitation, comprehensive), with a mobile stroke team or within a generic disability service (mixed rehabilitation ward) (Stroke Unit Trialists' Collaboration 1997, 2013).
- London's centralised hub and spoke model for all those developing symptoms of stroke was effective in reducing mortality and hospital length of stay, while Manchester's centralised hub and spoke model for all those presenting within four hours of developing symptoms of stroke was only effective in reducing hospital length of stay but did not significantly reduce mortality (relative to national trends) (Morris *et al* 2014).
- Early supported discharge (ESD) that provides people with rehabilitation in their own homes can reduce long-term dependency and reduce length of hospital stay (Fearon *et al* 2012).

Workforce

- There are national shortages of stroke physicians (Centre for Workforce Intelligence 2011b).
- One large-scale study of stroke patients in England found that post-stroke mortality outcomes were not affected by seven-day as opposed to five-day ward rounds by stroke specialists, but were improved by higher nurse:bed ratios (Bray *et al* 2014).

Finance

- London's centralised hub and spoke model for all people presenting with stroke has reduced mortality for a reduced cost per patient, predominantly as a result of reduced length of hospital stay (Morris *et al* 2014; Hunter *et al* 2013).

Access

- A key issue in stroke care is the time to treatment. One study has estimated that 1.9 million neurons are lost for each minute that a stroke is untreated (Saver 2006). The current evidence points to benefits for patients being treated with thrombolysis within a three-hour window, but that a more favourable outcome may be achieved if delivered within 90 minutes of stroke onset (Adams *et al* 2007).

Technology

- For areas without easy access to a hyper-acute stroke unit, telemedicine or 'telestroke' services can reduce the time to assessment and treatment, and improve outcomes (Müller-Barna *et al* 2014; Rubin and Demaerschalk 2014; Morales-Vidal and Ruland 2013).

Key clinical and service interdependencies

Service/support	Rationale	Evidence source
CT and MRI available 24/7	To support accurate diagnosis and treatment planning	(Royal College of Physicians 2012b)
Capacity to deliver thrombolysis	To improve outcomes	
Acute vascular surgical service (hyper-acute)	To provide specialist treatment for stroke patients with neurovascular episodes to improve outcomes	
Neuroscience service, including neuroradiology (hyper-acute)	To provide specialist treatment for stroke patients requiring neurosurgical intervention, including those with subarachnoid haemorrhage or intracerebral haemorrhage, to improve outcomes	
Critical care services	Access to critical care support is needed to manage acutely sick stroke patients	
Specialist stroke rehabilitation services	To enhance recovery and improve outcomes	

Relevant college guidance

Extract from *National clinical guideline for stroke* (Royal College of Physicians 2012b, p 19)

- All community medical services and ambulance services (including call handlers) should be trained to treat patients with symptoms suggestive of an acute stroke as an emergency requiring urgent transfer to a centre with specialised hyperacute stroke services.
- All patients seen with an acute neurological syndrome suspected to be a stroke should be transferred directly to a specialised hyper-acute stroke unit that will assess for thrombolysis and other urgent interventions and deliver them if clinically indicated.
- All hospitals receiving acute medical admissions that include patients with potential stroke should have arrangements to admit them directly to a specialist acute stroke unit (onsite or at a neighbouring hospital) to monitor and regulate basic physiological functions such as blood glucose, oxygenation, and blood pressure.
- All hospitals admitting stroke patients should have a specialist stroke rehabilitation ward, or should have immediate access to one.
- All 'health economies' (geographic areas or populations covered by an integrated group of health commissioners and providers) should have a specialist neurovascular (TIA) service able to assess and initiate management of patients within 24 hours of transient cerebrovascular symptoms.

continued on next page

Extract from *National clinical guideline for stroke* (continued)

The guideline (p 22) provides an example of staffing levels agreed for the London stroke reorganisation, noting that they assume normal working hours.

Example of recommended staffing levels

	Professional cover				
	Physiotherapist (WTE per 5 beds)	Occupational therapist (WTE per 5 beds)	Speech and language therapist (WTE per 10 beds)	Nurses (WTE per bed)	Consultant cover
Hyperacute stroke unit	0.73	0.68	0.68	2.9 (80:20 trained:untrained skillmix)	24/7, 6 BASP thrombolysis trained physicians on a rota
Stroke unit	0.84	0.81	0.81	1.35 (65:35 trained:untrained skillmix)	Patients should be seen on a daily ward round 5 days a week

WTE = whole-time equivalent; BASP = British Association of Stroke Physicians

12 Specialist vascular surgery

What changes were being proposed?

The proposals reviewed by NCAT involved the centralisation of specialist vascular surgical services alongside the creation of vascular clinical networks and the designation of vascular surgery and screening centres.

Key drivers

National policy and quality were the primary drivers of this type of reconfiguration.

Context and relevant policy

As a specialist service, since April 2013, vascular services have been commissioned by NHS England. The NHS England (2013b) standard contract for specialised services draws heavily on guidance from the Vascular Society for Great Britain and Ireland and NCEPOD, as well as available evidence, and includes the recommendations set out in the box on page 73. The contract also stipulates target outcomes, access times and minimum volumes for vascular surgery centres.

In 2013, around 21,000 patients had an elective repair of an abdominal aortic aneurysm (AAA) and 16,000 patients had carotid endarterectomy (CEA) (Clinical Effectiveness Unit, Royal College of Surgeons of England 2013).

What evidence needs to be taken into account when reconfiguring vascular surgery services?

Summary of evidence

There is good evidence to support the concentration of specialist vascular services in centres serving larger populations (NHS England contract suggests 800,000) with surgeons doing minimum volumes of activity and the centres having the necessary critical care, radiological and surgical support services. Telemedicine can be used to safely assess patients with vascular problems in more remote locations, avoiding lengthy travel to outpatient consultations.

Quality

- A UK study of the outcomes from elective aneurysm repair between 2001 and 2005 showed that the mortality rate in the units with the lowest caseload was 8.5 per cent compared to 5.8 per cent in units with a higher caseload. Many small-volume centres had mortality rates of 20 per cent or above (Thompson *et al* 2011).
- A systematic review of studies looking at the relationship between volume and outcomes for CEA (a procedure requiring vascular surgery) showed that the risk from surgery decreased as the annual hospital volume increased (Holt *et al* 2007a).
- A large national study in the United States showed that low-volume hospitals are associated with a 56 per cent greater risk of in-hospital death after surgery for AAA than high-volume hospitals (Dimick *et al* 2002). However, some argue that it is surgeon volume rather than institution volume that drives the improved outcomes seen in high-volume institutions (McPhee *et al* 2011).
- There is evidence that the centralisation of vascular services in the United Kingdom is resulting in better outcomes (Earnshaw *et al* 2012). UK-wide mortality rates following AAA procedures fell from 7 per cent in 2008 to 2.4 per cent in 2012/13 (**Clinical Effectiveness Unit, Royal College of Surgeons of England 2013**).

Workforce (including impact on quality)

- There is evidence to support the link between hospital and surgeon volumes and outcomes for vascular surgery (AbuRahma *et al* 2013; Chikwe *et al* 2013; Karthikesalingam *et al* 2010; Holt *et al* 2007b).
- Only surgeons with vascular expertise should operate on emergency aortic aneurysm patients (**Gray *et al* 2005**).
- There are currently 458 surgeons undertaking vascular surgery. The Vascular Society is arguing for a doubling in training numbers to meet future service and population needs and compensate for the anticipated number of retirements. This would increase the vascular surgical workforce by around 50 per cent and provide for one surgeon per 100,000 population (**Harkin *et al* 2014**).

Finance

- We could find no evidence on the financial impact of reconfiguring vascular surgery services.

Access

- Elective open aortic aneurysm surgery should be concentrated into fewer hospitals. Patients with ruptured aortic aneurysm can be transferred safely for journeys of more than an hour by road or over 25 miles (**Gray *et al* 2005**).
- There is mixed evidence about the impact of travel time and outcomes for the treatment of ruptured abdominal aortic aneurysms (Souza and Strachan 2005; Adam *et al* 1999).
- A 2008 analysis showed that in the United Kingdom, if aneurysm surgery was performed in centres with a record of demonstrable safety and a threshold of 33 procedures per year, the number of hospitals performing aneurysm repairs would drop from 242 to 48 and travel times would increase by 28 minutes relative to the nearest hospital (Holt *et al* 2008).
- In a study of 262 individuals, 92 per cent were willing to travel for at least an hour beyond their nearest hospital to access a service with a lower peri-operative mortality rate (Thompson *et al* 2011).

Technology

- Common vascular-type symptoms can safely be assessed across a telelink, in many cases avoiding the need for an outpatient consultation for patients in remote sites (Hands *et al* 2006; Endean *et al* 2001).

Key clinical and service interdependencies

Service/support	Rationale	Evidence source
Intensive care (co-located)	To safely manage acutely sick patients	(NHS England 2013b)
Interventional vascular radiology 24/7 (co-located but can be provided through network arrangements)	Access needed within 1 hour to improve outcomes	
Interdependent services • Stroke surgery and vascular opinion on stroke management • Limb-salvage surgery • Diabetes specialist hospital services and diabetic community services • Renal inpatient units • Interventional cardiology • Cardiac surgery • Thoracic surgery • Major trauma centres and trauma units	Overlap of patients and/or staff expertise needed	
Related services • Rehabilitation services • Limb-fitting service	Needed by some vascular surgery patients	

Relevant guidance

The Vascular Society for Great Britain and Ireland has used the available evidence to underpin its professional guidance (reflected in the NHS England contract – excerpts below). The guidance includes a benchmark maximum mortality rate for the treatment of AAA (**Wyatt *et al* 2012**).

Extracts from NHS England's standard contract for specialised vascular services

> *A minimum population of 800,000 is considered necessary for an AAA screening programme and is often considered the minimum population required for a centralised vascular service. This is based on the number of patients needed to provide a comprehensive emergency service, maintain competence among vascular specialists and nursing staff; the most efficient use of specialist equipment, staff and facilities, and the improvement in patient outcome that is associated with increasing caseload.*
> (**NHS England 2013b**, p 2)

> *Each surgeon will need to have an appropriate arterial workload (e.g. in the region of 10 AAA emergency and elective procedures per surgeon per year and commensurate numbers of lower limb and carotid procedures), which will necessitate an appropriate catchment area to generate sufficient case volume.*
> (**NHS England 2013b**, p 8)

13 Maternity services

What changes were being proposed?

NCAT reviewed proposals to:

- concentrate consultant-led obstetrics services onto fewer hospital sites
- create, maintain or close stand-alone midwife-led birthing units.

Key drivers

Workforce, dependency on paediatrics, cost and safety were the primary drivers of this type of reconfiguration.

Context and relevant policy

NHS England commissioning guidance (NHS Commissioning Board 2012) encourages the following:

- compliance with NICE guidance (*see* below)
- adequate staffing and a skill-mix and deployment which ensures that midwives are able to deliver continuity of antenatal and postnatal care
- achievement of 1:1 care in labour measured either through patient reported outcome measures (PROMS) or using agreed tools such as the National Patient Safety Agency (NPSA) scorecard
- evidence of access to all types of intrapartum care: home birth, midwife-led environments (freestanding or alongside units), and obstetric-led environments.

Most births (87 per cent in 2012) take place in obstetric units, with 11 per cent in midwife-led units and 2.4 per cent at home (National Audit Office 2013). The number of obstetric units in England has fallen slightly from 180 in 2007 to 177 in 2010. In 2010, all acute trusts had a maternity service, 97 per cent had an obstetric unit, 35 per cent had an alongside midwife-led unit and 24 per cent had a midwife-led birthing unit. In

2007, the annual number of deliveries in a midwife-led birthing unit ranged from 8 to 548; for an alongside midwifery-led unit, it ranged from 93 to 2,860; and for deliveries in obstetric units, it ranged from 914 to 6,781 (Redshaw *et al* 2011).

Birth rates fluctuate. After a period of decline, they rose for most of the past decade, but fell by 0.6 percentage points in 2013 (Office for National Statistics 2014). The mean age of mothers at childbirth is rising, with the numbers of women giving birth over the age of 35 rising steeply. The mean age of giving birth was 30 in 2013 (Office for National Statistics 2014). Adverse pregnancy outcomes rise with age and women over 40 have a higher risk of complications (Royal College of Obstetricians and Gynaecologists (RCOG) 2009), so the complexity of births that obstetric services must manage has been increasing.

What evidence needs to be taken into account when reconfiguring obstetric services?

Summary of evidence

To minimise the risk of complications and poor outcomes for high-risk women, senior obstetricians should ideally be present on the labour wards 24/7. But there is no evidence on the minimum number of doctors required to achieve this. Current RCOG job planning guidance limits obstetric ward-based commitments, magnifying the number of doctors needed to deliver 24/7 cover. Obstetric units need dedicated anaesthetic support, with the capacity to transfer women to critical care if necessary. Specialist mental health services should be available.

There is no clear relationship between outcomes and the size of obstetric units. There is a need to balance the benefits of centralisation with the risks from the loss of local access. Stand-alone midwife-led birthing units are a safe option for low-risk mothers, and home birth is a safe option for low-risk mothers who have already had children. There are questions about the financial sustainability and the capacity to staff stand-alone midwife-led birthing units. It may be possible to sustain obstetric units with lower levels of consultant cover if they focus on low-risk births and have robust transfer arrangements. Midwifery staffing levels need to support 1:1 care during labour irrespective of the setting.

Quality

- An analysis of data for low-risk births tentatively found that there was no clear relationship between size of obstetric unit and rate of intervention (Rowe *et al* 2014).
- A study in Finland found that outcomes for women delivering in lower-level hospitals were no worse than those delivering in higher-level hospitals. It concluded that health and service data do not support the need to close down small hospitals in a regionalised system where there is a well-functioning referral system (Hemminki *et al* 2011).
- A large Australian study found that lower hospital volume is not associated with adverse outcomes for low-risk women (Tracy *et al* 2006).
- There is evidence demonstrating poorer outcomes for mother and child out of hours (when consultants have traditionally not been on-site) (Pasupathy *et al* 2010; O'Donoghue *et al* 2008; The King's Fund 2008).
- Between 2000 and 2010, around 1 in 1,000 births resulted in a clinical negligence compensation claim averaging £610,000, but 40 per cent of such claims are resolved without payment (NHS Litigation Authority 2012). Most of the clinical negligence compensation claims were based on mistakes in the management of labour, mistakes relating to caesarean sections and errors resulting in cerebral palsy (NHS Litigation Authority 2012).

Workforce (including impact on quality)

- Greater levels of consultant staffing are associated with improved outcomes, including fewer stillbirths and fewer readmissions (Gerova *et al* 2010; Joyce *et al* 2004).
- Less-experienced operators have been associated with adverse outcomes for instrumental births (Murphy *et al* 2003) and failure to recognise the severity of a woman's condition (Lewis 2011).
- One-to-one midwife care for women during childbirth reduces the chance of intervention without compromising outcomes, and improves women's reported birth experience (Hodnett *et al* 2013).

- Obstetric unit staffing levels routinely fall short of professional guidance (National Audit Office 2013).
- In 2007, the average number of consultant obstetricians in obstetric units per 1,000 women varied between 2.4 and 14.8, with a median of 6.8. Only 8 per cent of obstetric units had more than 60 hours of consultant presence. However, in 2010, 80 per cent of trusts said they had improved consultant staffing in the past three years and a further 58 per cent were planning to continue this expansion (Redshaw *et al* 2011).
- In September 2012, there were 1,913 consultant obstetricians and gynaecologists in post. Current forecasts suggest that this number will increase by 62 per cent by 2020 to approximately 3,100 consultants (Health Education England 2013b).
- In 2011, there were 25,216 midwives in the NHS. This number is expected to increase by between 1 per cent and 14 per cent by 2016. Future demand for midwives is uncertain. Current projections vary between –16 per cent and +6 per cent – depending on assumptions about skill-mix and productivity (Centre for Workforce Intelligence 2013a).
- There are opportunities to assist care during delivery with midwifery support workers but the degree to which they are used varies considerably (Redshaw *et al* 2011).

Finance

- A 2012 study of the cost-effectiveness of different birth settings (based on 2009/10 prices) calculated the mean costs as:
  - £1,066 (home birth)
  - £1,435 (freestanding midwifery unit)
  - £1,461 (alongside midwifery unit)
  - £1,631 (obstetric unit).

  It concluded that for multiparous low-risk women, home was the most cost-effective option. For nulliparous low-risk women, planned birth at home is also the most cost-effective option but is associated with an increase in adverse perinatal outcomes (Schroeder *et al* 2012).

Access

- A study of French births found that distance to an obstetric unit did not increase neonatal mortality risk except for distances greater than 45km (Pilkington *et al* 2014).
- One Dutch study found that women who changed risk status from 'low' to 'high' during labour had worse outcomes; it also found that a transfer time from home to hospital of more than 20 minutes by car was associated with increased risk of mortality and adverse outcomes (Ravelli *et al* 2011).

Technology

- A review of the literature on telemedicine in obstetrics showed that it has been used in a wide variety of ways, including reading ultrasounds, monitoring pregnant women with diabetes, counselling patients, and supporting parents and children postpartum from remote sites. The review concluded that more evidence was needed on the net economic and other benefits in this area (Magann *et al* 2011).

Key clinical and service interdependencies

Service/support	Rationale	Evidence source
Critical care services including cardiovascular blood monitoring, pulse oximetry and rapid transfusions	Management of women with severe morbidities	(Wanderer *et al* 2013) (Royal College of Obstetricians and Gynaecologists *et al* 2007)
Dedicated anaesthesia services	Provide pain relief during childbirth and support theatres for women requiring caesarean sections	(Royal College of Obstetricians and Gynaecologists *et al* 2007)
Neonatal services	To safely manage babies with critical care needs	(Royal College of Obstetricians and Gynaecologists *et al* 2007)
Mental health services	To support women with postpartum mental illness	(Lewis 2004)

Evidence on midwife-led birthing units and home births

- The Birthplace study (Birthplace in England Collaborative Group 2011) found that for low-risk women who have given birth before, the outcome of giving birth is no worse at home or in a midwife-led unit (alongside or stand-alone) and the rates of intervention were lower.
- The same study found that for low-risk women who have not given birth before, the outcome of giving birth is no worse in a midwife-led unit (alongside or stand-alone) but is slightly worse for home births.
- From 2001 to 2013, 30 new midwife-led birthing units were opened, while 24 were closed, leaving a total of 59 in 2013 (Dodwell 2013).
- Concern over the long-term sustainability of midwife-led birthing units has been raised by NCAT (a clinical assurance body) when trusts were planning stand-alone units as part of reconfigurations (Imison *et al* forthcoming).

Relevant college and other guidance

Consultant staffing

The *Safer childbirth* guidelines recommend 60-hour consultant presence for units of 2,500–4,000 births per year, 98 hours for 4,000–5,000 births per year, and 168 hours for more than 5,000 births per year (Royal College of Obstetricians and Gynaecologists *et al* 2007). The capacity to meet Royal College guidance targets is partly dependent on current job planning practices. An example job plan attached to Safer childbirth suggests that a consultant obstetrician would expect to be present on the labour ward for only two half-day sessions (Royal College of Obstetricians and Gynaecologists *et al* 2007). The RCOG has argued that centralising obstetric services so that units have at least 6,000 births per year would enable the current workforce to support 24/7 consultant presence in all units (Royal College of Obstetricians and Gynaecologists 2013). But it does not recommend centralisation in all cases.

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Midwifery staffing

The Royal College of Midwives (RCM) and other Royal Colleges involved in maternity care recommend that trusts use the Birthrate Plus® (BR+) workforce planning tool to plan staffing levels that take account of differing local needs, case-mix and midwifery skill-mix in order to meet the requirement for one-to-one care. The guidance states that: 'The minimum midwife-to-woman ratio is 1:28 for safe level of service to ensure the capacity to achieve one-to-one care in labour', but this may reduce if caseload at the unit is more complex (Royal College of Obstetricians and Gynaecologists *et al* 2007, p 30).

Neonatal support

24-hour availability (within 30 minutes) of consultants and 24-hour resident cover by a ST1/2 or an advanced neonatal nurse practitioner (ANNP), who is trained and assessed as competent in neonatal life support and whose only responsibility is to the neonatal and maternity services (Royal College of Obstetricians and Gynaecologists *et al* 2007).

Stand-alone midwife-led birthing units

The RCOG and RCM have supported the provision of intrapartum care in stand-alone midwife-led birthing units, but the RCOG suggests that this only applies for multiparous, low-risk women (Royal College of Obstetricians and Gynaecologists 2013). The RCM emphasises the reduced interventions and other benefits of stand-alone units and regards them as valuable choices available to women in a maternity service portfolio (Coxon 2013).

NICE Guidance

Draft NICE guidance (National Institute for Health and Care Excellence 2014a) recommends that commissioners and providers should ensure that all women have the choice of four different birth settings in their local area or a neighbouring area:

- obstetric unit
- stand-alone midwife-led birthing unit
- alongside midwife-led birthing unit
- home birth.

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NICE further recommends that 'low-risk' (*see* definition below) multiparous women should be advised to give birth in a midwife-led unit (stand-alone or alongside) or at home because the rate of intervention is lower and the outcome for the baby is no different compared with an obstetric unit (Birthplace in England Collaborative Group 2011). NICE also recommends that 'low-risk' nulliparous women should be advised to give birth in a midwife-led unit. However, as there is an increased risk for first-time births planned at home, they recommend that first-time mothers are advised of this risk (Birthplace in England Collaborative Group 2011). (*See* detail below.)

Risk assessment of pregnancy

NICE guidelines specify a set of pre-existing medical conditions and previous pregnancy complications that indicate an increased risk of complications during labour. They suggest advising women with these indications to give birth in an obstetric unit. It is estimated that:

- one in three women can be assessed as at low risk
- one in six women can be assessed as at high risk
- one in two women cannot be assessed for risk level – largely first-timers and multiparous women with first-pregnancy complications. A substantial proportion (25 per cent) of this group will require specialist care prior to labour – eg, because of fetal growth restriction or maternal hypertension.

(Royal College of Obstetricians and Gynaecologists 2013)

14 Neonatal services

What changes were being proposed?

NCAT reviewed one proposal to:

- reconfigure a neonatal network, downgrading local neonatal units.

Key drivers

National policy and quality were the primary drivers of this type of reconfiguration.

Context and relevant policy

Neonatal services provide care for all babies less than 44 weeks post menstrual age that require ongoing medical care. In 2003, neonatal services were organised into managed clinical networks of three tiers. The most severely ill babies requiring long-term intensive care are transferred to and cared for at a specialist neonatal intensive care unit (NICU). Second-tier neonatal units are designated local neonatal units (LNUs), with the bottom tier known as special care units (SCUs) (British Association of Perinatal Medicine 2010). The current NHS England commissioning contract (NHS England 2013a) sets out a service specification for these services (*see* box on pages 86–87).

In total, around 60,000–70,000 babies (approximately 10 per cent of all births) per year will receive some type of neonatal care (ie, special care, high dependency care or intensive care services) (NHS England 2013a). More babies need neonatal care because of:

- increases in fertility rates for all age groups, but particularly for women aged over 40 and under 20
- the availability of assisted conception
- a 30 per cent increase in women admitted at 25 weeks of gestation or less whose babies need specialist care (Department of Health 2009).

What evidence needs to be taken into account when reconfiguring neonatal services?

Summary of evidence

Women likely to give birth to very preterm babies should be encouraged to give birth at a specialist hospital with the highest levels of neonatal care. There is strong evidence that neonatal support can be safely provided by non-medical paediatric staff. However, the use of alternative models – where advanced neonatal nurse practitioners (ANNPs) provide this support to obstetric units instead of paediatricians – remains limited to a very small number of hospitals in England due to a lack of systematic workforce development. This model has enabled obstetric units to continue on sites where paediatric inpatient services have been closed.

Quality

- Extremely preterm and very low-weight babies do better in specialist hospitals providing neonatal intensive care and survival is further improved in units with higher volumes of activity (Marlow *et al* 2014; Watson *et al* 2014; Lasswell *et al* 2010).
- Women with preterm babies who book for their care at specialist hospitals have lower mortality compared with those booking at local (non-specialist) hospitals, although antenatal transfer does result in a group of babies with improved survival chances (Marlow *et al* 2014).

Workforce

- ANNPs can safely substitute for junior and middle-grade doctors to provide resuscitation and stabilisation (Smith and Hall 2011).
- There are difficulties in recruitment and retention of ANNPs, which could be overcome by a more structured approach to the career trajectory (Smith and Hall 2011).
- A US study found that neonatal nurse practitioners and physician assistants were effective alternatives to residents for neonatal intensive care units (Carzoli *et al* 1994).

- In September 2012, there were 2,638 consultant paediatricians in post. Current forecasts suggest that this number will increase by 70 per cent by 2020 to approximately 4,500 consultants (Health Education England 2013b). NB: Consultant paediatricians provide medical support to both neonatology and paediatric services.

Finance

- A study modelling the impact of introducing clinical networks for neonatal intensive care in Trent found that networks would cost an average of £0.75 million more per year (Draper *et al* 2004).

Access

- Emergency transfer of a preterm baby within the first 24 hours after birth (acute transfer) is associated with increased mortality and morbidity (Mohamed and Aly 2010; Towers *et al* 2000; Shlossman *et al* 1997).
- Reorganisation of neonatal services into managed clinical networks increased the proportion of preterm babies (27–28 weeks) born in hospitals with specialist neonatal centres from 18 per cent to 49 per cent. The percentage of babies transferred to a local neonatal unit between 1 and 28 days after delivery increased from 18 per cent to 22 per cent; however, there was a 5 per cent increase in acute transfers, to 12 per cent (Gale *et al* 2012).
- More than half of all preterm babies in England are not delivered at centres with the highest volume of neonatal intensive activity, and almost a third of acute transfers were to a centre with equivalent or lower specialist facilities. This suggests that centres are experiencing difficulties in managing intensive care capacity (Gale *et al* 2012).
- Regional centralisation of neonatal services in Australia, France and the United States resulted in over 80 per cent of very low-weight babies being delivered in specialist neonatal intensive care centres (Gale *et al* 2012; Binder *et al* 2011; Zeitlin *et al* 2010; Lui *et al* 2006).

Technology

- A study of telemedicine found that access to telemedicine consultations and education from neonatal specialists reduced infant mortality in hospitals without a NICU and reduced the number of very low-birthweight babies delivered in non-NICU hospitals (Kim *et al* 2013).
- Telemedicine can be used to accurately conduct neurological examinations in neonatal intensive care units (Wenger *et al* 2014).
- Substituting telemedicine for acute neonatal consultations in regional hospitals in Queensland reduced unnecessary patient transport and generated cost savings (Armfield *et al* 2012).

Key clinical and service interdependencies

Service/support	Rationale	Evidence source
Obstetric services	Provide immediate care for sick newborn and preterm babies	(NHS England 2013a)
Paediatric services	For the ongoing care of neonates and the medical cross-cover in some hospitals between paediatrics and neonates	
Related services: • community paediatric services • primary care and social care • hospice care • children's centres • ambulance services • psychiatric services • national screening and laboratory services • neonatal surgical services • neonatal supra specialist services	Some babies require care which is ongoing and beyond the scope of neonatal services	

Relevant guidance

Extracts from NHS England Standard Contract for Neonatal Care

'Services caring for babies born before 27 weeks and those in other higher risk category groups (e.g. sick, more mature babies requiring prolonged intensive care) should be concentrated in relatively few centres in order to:

- Ensure that expert and experienced staff treat sufficient numbers of cases to maintain a safe high quality service and move towards the national standards;
- Maximise the use of scarce, expensive resources (staff, facilities and equipment).
- Organise retrieval services across large enough areas to be effective and economic.
- Services and support must be in place for families whose babies are cared for long distances from home.'

(NHS England 2013a, p 2)

'Each unit must work towards an agreed plan with commissioners to have nurse staffing levels based on the following nurse to baby ratios:

- 1:1 Intensive Care
- 1:2 High Dependency
- 1:4 Special Care.'

(NHS England 2013a, p 8)

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Extracts from NHS England Standard Contract for Neonatal Care (continued)

'Intensive Care

Intensive Care is care provided for babies who are the most unwell or unstable and have the greatest needs in relation to staff skills and staff to patient ratios. This includes any day where a baby receives any form of mechanical respiratory support via a tracheal tube...

High Dependency Care

High Dependency Care is provided for babies who require skilled staff but where the ratio of nurse to patient is less than intensive care. This care takes place in a neonatal unit where a baby does not fulfil the criteria for intensive care but receives any form of non-invasive respiratory support...

Special Care

Special Care is provided for babies who require additional care delivered by the neonatal service but do not require either intensive or high dependency care.'

(NHS England 2013a, p 4)

Extract from Department of Health (2009) *Toolkit for high-quality neonatal services*

'Three tiers of staff will be available to provide medical care:

- tier 1 – direct care (specialist trainee (ST)1–3/advanced neonatal nurse practitioner (ANNP));
- tier 2 – resident experienced support (ST4 and above; ANNP);
- tier 3 – consultant.

The availability and experience of tier 2 and tier 3 staff are different between the three categories of neonatal services.

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Extract from Department of Health (2009) *Toolkit for high-quality neonatal services* (continued)

Special care units have:

- 24-hour availability from a consultant paediatrician (or equivalent non-consultant career grade doctor); out-of-hours cover is provided as part of a general paediatric service;
- 24-hour cover of resident experienced support (ST4 and above or ANNP); out-of-hours cover is usually as part of a general paediatric service; and
- 24-hour cover for provision of direct care (ST1–3 or ANNP); out-of-hours cover is usually provided as part of a general paediatric service.

Units providing short-term intensive care have:

- 24-hour availability of consultant paediatrician (or equivalent non-consultant career grade doctor) with experience and training in neonatal care; out-of-hours cover is usually provided as part of a general paediatric service;
- 24-hour cover of resident experienced support with ability to respond immediately to neonatal emergencies (ST4 and above or ANNP); although out-of-hours cover is usually provided as part of a general paediatric service, where a busy general service co-exists a separate rota is provided for the neonatal service; and
- 24-hour cover for provision of direct care with sole responsibility for the neonatal service (ST1–3 or ANNP).

Intensive care units have:

- 24-hour availability of a consultant neonatologist whose principal duties, including out-of-hours cover, are to the neonatal unit;
- 24-hour cover of resident experienced support for sole cover of the neonatal service and associated emergencies (ST4 and above or ANNP); and
- 24-hour cover for provision of direct care with sole responsibility to the neonatal service (ST1–3 or ANNP).'

(Department of Health 2009, p 42)

15 Paediatric services

What changes were being proposed?

NCAT reviewed proposals to:

- centralise paediatric inpatient units
- retain, create or close stand-alone paediatric assessment units (PAUs). PAUs are designed to offer observation, treatment and discharge of children without admitting them as an inpatient.

Key drivers

Workforce, cost and safety were the primary drivers of this type of reconfiguration.

Context and relevant policy

Getting the right start: National Service Framework for children – standard for hospital services (Department of Health 2003a) was the most recent national policy statement on children's hospital services. Specialist paediatric services, including paediatric intensive care, are now commissioned by NHS England, which has developed a range of service specifications for different sub-specialist areas.

Centralisation of paediatric services has been on the agenda for almost 20 years, driven by trends in paediatric activity and a desire to maintain trainees' exposure to less common childhood diseases (British Paediatric Association 1997; MacFaul *et al* 2000). The rate of admission for children under 15 grew by over 25 per cent between 1999 and 2010 (from 63 per 1,000 to 81 per 1,000) (Gill *et al* 2013) and the average length of stay has fallen from 3.8 days in 1996/7 to 1.9 days in 2006/7, with nearly three-quarters (71 per cent) of admissions lasting less than a day (Department of Health 2008). The consequence has been a significant reduction in the number of paediatric beds.

What evidence needs to be taken into account when reconfiguring paediatric services?

Summary of evidence

Paediatric inpatient units need to be staffed by paediatric consultants and the appropriate level of specialist paediatric nursing. There is little evidence, outside of professional consensus, to guide the appropriate level of medical staffing – in particular the balance between senior and junior doctors, and medical versus specialist nursing staff.

There is little research to guide an optimal configuration of paediatric services. Constraints on the paediatric workforce are key drivers of future configuration, with more evidence needed about safe staffing models for ambulatory services. The limited evidence available suggests there is scope for paediatric services to shift further towards a primary/community care-based model.

Quality

- Failure to spot the severity of a child's illness because of lack of paediatric expertise and training is a key cause of avoidable child death (Pearson 2008).
- Three coroner reports in early 2014 expressed concerns about the lack of consultant supervision of paediatric trainees and the lack of consultant assessment for paediatric admissions (Royal College of Paediatrics and Child Health 2014).

Workforce

- In 2007, the Royal College of Paediatrics and Child Health (RCPCH) reported an average shortfall of five consultants per hospital (Academy of Medical Royal Colleges 2007).
- In September 2012, there were 2,638 consultant paediatricians in post. Current forecasts suggest that this number will increase by 70 per cent by 2020 to approximately 4,500 consultants (Health Education England 2013b). NB: Consultant paediatricians provide medical support to both neonatology and paediatric services.

- In 2012, only 28 per cent of paediatric junior doctor rotas were staffed by 10 or more doctors – the number recommended for training and compliance with the European Working Time Directive (Royal College of Paediatrics and Child Health 2013b).
- Higher nurse-to-patient paediatric staffing ratios make readmission less likely in the 15–30 days after discharge in medicine and surgery, with a significant improvement above 1:4 (Tubbs-Cooley *et al* 2013).
- One study of two small community hospitals in the United States found that having paediatricians work in both the inpatient unit and the emergency department saved money and could be an effective strategy to sustain 24-hour staffing for small inpatient units (Dudas *et al* 2011).
- A small prospective study compared outcomes for patients seen by paediatric nurse practitioners (PNPs) compared to those seen by doctors and found there were no statistically significant differences in discharge or re-attendance rates (Basu and Garside 2012).

Finance

There is little evidence on finance.

- One study of a paediatric inpatient centralisation and opening of a paediatric assessment unit supported by a community children's nursing team found that the reconfiguration resulted in lower health care use and lower costs (Callery *et al* 2014).

Access

There is little and conflicting evidence on access.

- One study undertaken in 1999 of children in East Anglia found that asthma mortality increased with travel time to hospital, with a relative risk of 1.07 for each 10-minute increase in journey time. The authors found no consistent trend for mortality to increase with travel time to general practitioner surgeries (Jones *et al* 1999).

- One study of infant deaths in Cumbria (1950–93) found no evidence to suggest that living further from hospitals, in terms of road travel time, increased the risk of infant death or stillbirth (Dummer and Parker 2004).

Technology

- A small review of the literature about telemedicine and unscheduled paediatric care found studies reporting improvements in care quality indicators, better staff-reported measures of quality and reduced transfer rates (Roberts *et al* 2012).

Key clinical and service interdependencies

Service/support	Rationale	Evidence source
Diagnostic services including radiology and pathology	Ruling out serious infections in children requires a combination of clinical features, laboratory tests and observation	(Bruel and Thompson 2014)
Paediatric intensive care units (PICUs) must be accessible as part of a network	To safely manage acutely sick and deteriorating children	(Royal College of Paediatrics and Child Health 2008)
Child and Adolescent Mental Health Services (CAMHS) and child protection services	Must be accessible via on-call or network arrangements to support children at risk and/or with mental health needs	(Royal College of Paediatrics and Child Health 2008)

Evidence on paediatric assessment units

An RCPCH survey from 2013 showed that 46 PAUs rely on remote access to consultant opinion by telephone, and 33 have access to consultants in person (Clark and Winch 2013).

- A systematic review of 25 studies of PAUs (not stand-alone) found that they are a safe alternative to emergency admission. Between 40 per cent and 60 per cent of children attending did not require admission (Ogilvie 2005).
- One study found that paediatric inpatient admissions reduced by 47 per cent after a PAU was introduced (Macleod *et al* 2002).
- Key vital signs are a good differentiator of the acutely sick child (Thompson *et al* 2009) and safety in a stand-alone PAU would be enhanced with clear protocols for transfer.

- Stand-alone PAUs should not treat babies less than one month old and children older than 12 with abdominal pain as they have very high admission rates (Zebrack *et al* 2005).
- A small-scale prospective study of the differences between trainees' (middle grade) and consultants' clinical decision-making in a PAU found that consultants were quicker and discharged more patients home without readmission or clinical incident (Puttha *et al* 2013).

Relevant college guidance

Paediatric inpatient unit medical staffing

- Every child or young person who is admitted to a paediatric department with an acute medical problem is seen by a paediatrician on the middle grade or consultant rota within four hours of admission.
- Every child or young person who is admitted to a paediatric department with an acute medical problem is seen by a consultant paediatrician (or equivalent staff, speciality and associate specialist grade doctor who is trained and assessed as competent in acute paediatric care) within the first 24 hours.
- At least one medical handover in every 24 hours is led by a paediatric consultant (or equivalent).
- A paediatric consultant (or equivalent) is present in the hospital during times of peak activity.
- All general acute paediatric rotas are made up of at least ten WTEs, all of whom are EWTD compliant.

(Royal College of Paediatrics and Child Health 2011)

Paediatric inpatient unit nurse staffing

- A minimum of two registered children's nurses must be in the inpatient unit at all times.

(Royal College of Paediatrics and Child Health 2008)

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Paediatric assessment units

Consultants, *or someone assessed as competent to work on the paediatric consultant rota*, should be 'available' to a stand-alone paediatric assessment unit but this may not involve consultants being present; their opinion can be reached via phone (Royal College of Paediatrics and Child Health 2014). Wherever the consultants are based, children staying for more than eight hours at a PAU should receive a consultant review of their case before further treatment decisions are made (Royal College of Paediatrics and Child Health 2011).

ANPs can lead care for children in stand-alone PAUs, with remote consultant support using co-located A&E middle-grade doctors to provide emergency medical assistance when required (Royal College of Paediatrics and Child Health 2009). PAUs should be staffed by at least two children's nurses at all times (Royal College of Nursing 2013a).

The RCPCH has recommended the closure of smaller paediatric inpatient units, to be replaced by PAUs, in order to resolve workforce pressures (Royal College of Paediatrics and Child Health 2013a). Models of acute paediatric units and the sets of services they feature are outlined by the RCPCH and summarised in the next box.

Models of delivering acute paediatric services

Source: Goudie and Goddard 2011

Model	Services
Small units, proximal to larger units	Emergency department (ED); short-stay paediatric assessment unit (SSPAU)
Small units, remote from larger units, level 1 special care baby unit (SCBU)	ED; SSPAU; 24/7 paediatric inpatient unit; consultant non-resident overnight; consultant presence 12–16/24; trainees resident 24/7
Medium-sized units, level 2 neonatal intensive care unit (NICU)	ED; SSPAU; 24/7 paediatric inpatient unit; consultant non-resident overnight; consultant presence 12–16/24; trainees resident 24/7
Medium-sized units, level 3 NICU	ED; SSPAU; overnight admission unit; level 3 NICU; 2 x consultant resident 24/7; trainees resident 24/7
Larger units, level 3 NICU, some specialist services	ED; SSPAU; overnight admission unit; level 3 NICU; PICU; specialist services minority requiring 24/7 hands-on care; 3 x consultant resident 24/7; consultant may be non-resident if appropriate resident competencies are available
Comprehensive larger units, level 3 NICU, surgical specialties, specialist services (6–8 for UK)	ED; SSPAU; overnight admission unit; level 3 NICU; PICU; specialist services minority requiring 24/7 hands-on care; 3 x consultant resident 24/7; consultant may be non-resident if appropriate resident competencies are available

Appendix A: Summary of evidence

Table A1 Summary of evidence to support clinical service reconfiguration

Specialty	Summary of evidence
Whole trust reconfiguration	There is little evidence to guide whole hospital reconfiguration and much of the evidence that does exist is somewhat out of date. The available evidence suggests that smaller hospitals in England are not inherently less safe or less efficient. However, there may be good arguments, on quality grounds, for centralising some local hospital services or providing them on a more networked basis (*see* later sections). Active participation in clinical networks can help ensure that patients receive the best quality of care as close to where they live as possible as well as managing workforce pressures. A major challenge for small hospitals is to move from a consultant-led to a consultant-delivered model of care. The use of a national tariff disadvantages smaller providers. The current pressures to expand the number of consultant staff to provide higher-quality consultant-delivered care will increase their fixed cost base and magnify this problem.
Community-based services	A significant proportion of hospital beds are occupied by frail older people and people with long-term conditions who would be more appropriately cared for in the community. For some conditions, admissions could be avoided with more proactive care and, in many cases, length of stay could be reduced if there were more services to support rehabilitation and discharge. This would deliver a much better patient experience. However, there is a lot of evidence to suggest that it can be hard for community-based initiatives, including changes to primary care, to significantly reduce hospital admissions. The key to improvement lies in changing ways of working across a system (including within hospitals), supported by good continuity of primary care. Even with successful implementation, there is little evidence to suggest that more community-based models of care will generate significant savings.
Mental health services	The evidence indicates that substituting inpatient mental health service provision with a community-based service delivers better outcomes for people with moderate mental health needs at comparable cost. Although one-off savings may be generated by rationalising inpatient provision, community services are unlikely to produce ongoing savings and may be more expensive for patients with complex needs. The evidence also suggests that some types of community services are more cost effective than others. There may be arguments for centralisation if this releases capital to invest in improved and safer accommodation. In rural areas, telehealth can facilitate access to specialist advice and support.

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Table A1 (continued)

Specialty	Summary of evidence
Accident and emergency (A&E) and urgent care services	There is strong evidence to support the need for senior doctor presence in A&E 7 days a week. Professional guidance suggests consultants should be available at least 16 hours a day. Nurse practitioners are a safe alternative to junior doctors. The evidence also shows that A&E services require: • 24/7 support from diagnostics, including pathology and radiology • rapid access to critical care • rapid access to specialist medical opinion, including geriatricians and paediatricians (on-site) and specialist surgical opinion (senior staff may be remote but part of a network) • liaison mental health services. All A&E departments should be part of a formal trauma network. There have been very few studies to assess the impact of centralising A&E services. The limited evidence available suggests that where services are centralised, there are risks to the quality of care if the centralised service does not have the necessary A&E capacity and/or acute medical support for the additional workload. A proportion of A&E attenders can safely be seen in community settings but there is little evidence that developing these services in addition to A&E will reduce demand. Changes to A&E services may not result in savings, while increased distances to A&E may increase mortality for the very few patients with the severest illnesses. This needs to be taken into account when assessing the net benefit of any proposal to centralise A&E services. There are opportunities to support local access through networked arrangements and to provide remote support to A&E through telemedicine links to smaller units.
Acute medical services	Consultants should be actively involved in all stages of the care pathway. Acute medical units should have a continuous admitting consultant presence, enabling early consultant review and assessment (within 12 hours). Acute medical services should have rapid access to critical care, a surgical opinion (on-site for unselected emergencies, can be off-site if selected), 24/7 access to diagnostics including MRI and CT, and 7-day support from therapies and pharmacy as well as liaison psychiatry. There is some evidence that units and/or consultants undertaking higher volumes of care deliver better outcomes, but the link between volume and outcomes is not well understood; volume may not be the primary driver of improved outcomes.
Acute surgical services	Units providing 24/7 emergency surgery should ensure early consultant review and assessment (within 12 hours). There should be consultant surgeons and anaesthetists available 24/7 to supervise operations on emergency surgical patients. Acute surgical services should be supported by a dedicated emergency theatre, appropriate critical care services, acute medicine and diagnostic services, including interventional radiology. Outcomes for emergency surgery vary considerably between different units. While centralisation of services may be one means of improving outcomes, as already noted the relationship between volume and outcomes is complex. There is also evidence that systematic application of improvement techniques and high-quality peri-operative assessment and post-operative care are key to driving improvement. The emerging field of telemedicine has the potential to improve access to specialist opinion and enhance the treatment of acutely ill patients.

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Table A1 (continued)

Specialty	Summary of evidence
Elective surgical care	Professional guidance and the available evidence support the separation of elective from emergency surgery (either geographically or through the provision of dedicated facilities and staff). Patients deemed high risk should only be admitted to a facility with the appropriate critical care and other support. Elective surgical units should be consultant-led. Telemedicine ICUs (or tele-ICUs), where patients are monitored remotely by a critical care team, can improve the quality of critical care. Emerging evidence suggests that non-medical staff such as surgical care practitioners can provide safe care for minor surgical procedures.
Trauma	Formalised systems of trauma care – in which care for the most complex patients is centralised into a small number of trauma centres – improves patient outcomes. Trauma centres need 24/7 access to fully staffed theatres and diagnostics, including CT, MRI and pathology. They also need comprehensive critical care and neurosurgical support.
Stroke care	Stroke patients require specialist multidisciplinary care and rehabilitation. A centralised model of acute stroke care, in which hyper-acute care is provided to all patients with stroke across an entire metropolitan area, can reduce mortality and length of stay. There is also growing evidence on the use of telemedicine to support rapid assessment and treatment of stroke in areas without easy access to a hyper-acute stroke unit.
Specialist vascular surgery	There is strong evidence to support the concentration of specialist vascular services in centres serving larger populations (NHS England contract suggests 800,000) with surgeons doing minimum volumes of activity and the centres having the necessary critical care, radiological and surgical support services. Telemedicine can be used to safely assess patients with vascular problems in more remote locations and avoid lengthy travel to outpatient consultations.
Maternity services	To minimise the risk of complications and poor outcomes for high-risk women, senior obstetricians should ideally be present on the labour wards 24/7. But there is no evidence on the minimum number of doctors required to achieve this. Current RCOG job planning guidance limits obstetric ward-based commitments, magnifying the number of doctors needed to deliver 24/7 cover. Obstetric units need dedicated anaesthetic support, with the capacity to transfer women to critical care if necessary. Specialist mental health services should be available. There is no clear relationship between outcomes and the size of obstetric units. There is a need to balance the benefits of centralisation with the risks from the loss of local access. Stand-alone midwife-led birthing units are a safe option for low-risk mothers, and home birth is a safe option for low-risk mothers who have already had children. There are questions about the financial sustainability and the capacity to staff stand-alone midwife-led birthing units. It may be possible to sustain obstetric units with lower levels of consultant cover if they focus on low-risk births and have robust transfer arrangements. Midwifery staffing levels need to support 1:1 care during labour irrespective of the setting.

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Table A1 (continued)

Specialty	Summary of evidence
Neonatal services	Women likely to give birth to very preterm babies should be encouraged to give birth at a specialist hospital with the highest levels of neonatal care. There is strong evidence that neonatal support can be safely provided by non-medical paediatric staff. However, the use of alternative models – where advanced neonatal nurse practitioners (ANNPs) provide this support to obstetric units instead of paediatricians – remains limited to a very small number of hospitals in England due to a lack of systematic workforce development. This model has enabled obstetric units to continue on sites where paediatric inpatient services have been closed.
Paediatric services	Paediatric inpatient units need to be staffed by paediatric consultants and the appropriate level of specialist paediatric nursing. There is little evidence, outside of professional consensus, to guide the appropriate level of medical staffing – in particular the balance between senior and junior doctors, and medical versus specialist nursing staff. There is little research to guide an optimal configuration of paediatric services. Constraints on the paediatric workforce will be key drivers of future configuration, with more evidence needed about safe staffing models for ambulatory services. The limited evidence available suggests there is scope for paediatric services to shift further towards a primary/ community care-based model.

Appendix B: Methodology

The NIHR research on which this paper is based employed a multi-level qualitative approach that involved:

- in-depth content analysis of NCAT reviews and associated guidance produced by NCAT
- interviews with a small sample of NCAT reviewers
- a focused review of documentation submitted to NCAT in advance of a visit
- a targeted literature search of academic journals, grey literature, national policies, guidelines and clinical standards within health care literature in the service areas covered by the NCAT reviews (conducted between June and October 2013).

Initial literature search (2013)

The initial literature search sought to identify evidence to supplement the themes emerging from the qualitative content analysis of the NCAT reviews. An initial search of the literature on reconfiguration from 1983–2013 was conducted using free text searching within The King's Fund Information & Knowledge Service database, DH Data and PubMed. This did not identify literature which could be used to support or reject the positions outlined by NCAT in its reviews.

A refined search strategy was used to conduct keyword searches within PubMed and Google Scholar. In addition, a large proportion of articles were identified through hand-searching and snowballing to identify relevant articles and grey literature. We also sought advice on relevant sources from clinical and academic experts. In total, 504 references were identified pertaining to the configuration of the following service areas:

- A&E, urgent and emergency care, emergency surgery, acute medicine
- paediatric and neonatal care

- specialist services (including vascular surgery, trauma, stroke, oncology, specialist orthopaedic services)
- elective surgery (including orthopaedics)
- maternity
- primary and out-of-hospital care (including intermediate care and geriatric services)
- mental health
- whole trust or health system.

A detailed description of the search strategy and search strings will be available in a forthcoming research report, *Insights from the clinical assurance of service reconfiguration in the NHS: the drivers of reconfiguration and the evidence that underpins it*, in Health Services and Delivery Research (HS&DR) journal.

Updated literature search (2014)

An additional review of the literature was conducted between July and September 2014 for this publication to supplement the evidence gathered in the initial search. The five drivers of clinical service reconfiguration were used as a framework to conduct additional online keyword searching, snowball sampling and hand-searching of journal articles, guidelines and grey literature. A further 634 references were identified and reviewed.

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Candace holds a Masters degree in health economics and health policy from Birmingham University. Her first degree was from Cambridge University, where she read natural sciences.

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Before joining the Fund, Matthew worked at the Innovation Unit, a social enterprise that works with public services to reshape the services they deliver. He was involved in researching and co-ordinating projects across health, education and local government.

Matthew has also worked as an intern at University College London's Constitution Unit, where he was part of a team researching the role of special advisers in the UK's political system and wrote a research note on special advisers in Cabinet. He holds a Philosophy, Politics and Economics degree from Oxford University.

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Acknowledgements

We would like to thank the following people for their helpful feedback and support, both in our original research and in the writing of this report: Dr Chris Clough and Judy Grimshaw from the National Clinical Advisory Team (NCAT), Nigel Edwards and Dr Timothy Evans. Dr Vaughan Lewis and Dr Lawrence Goldberg provided helpful comments on this report. We would also like to thank colleagues from within The King's Fund, Helen Gilburt, Professor Chris Ham, Rebecca Gray, Chris Naylor, David Buck, Richard Humphries and James Thompson. Any errors or omissions are entirely our responsibility.

Funding acknowledgement

This publication draws on research funded by the National Institute for Health Research (NIHR) Health Services and Delivery Research Programme (project number 12/5001/59) (*see* www.nets.nihr.ac.uk/programmes/hsdr).

Department of Health Disclaimer

The views and opinions expressed herein are those of the authors and do not necessarily reflect those of the Health Services and Delivery Research Programme, NIHR, NHS or the Department of Health.

Published by
The King's Fund
11–13 Cavendish Square
London W1G 0AN
Tel: 020 7307 2568
Fax: 020 7307 2801

Email:
publications@kingsfund.org.uk

www.kingsfund.org.uk

First published 2014 by
The King's Fund

Charity registration number:
1126980

ISBN: 978 1 909029 43 9

A catalogue record for this publication is available from the British Library

Edited by Kathryn O'Neill

Typeset by
Grasshopper Design Company

Printed in the UK by
The King's Fund

The King's Fund

Ideas that change health care

The reconfiguration of clinical services is often presented as a necessary step to quality improvement and financial sustainability. Yet reconfiguration frequently faces public and political opposition and does not deliver the benefits anticipated. But what are the key drivers of reconfiguration and what is the evidence to underpin it?

The reconfiguration of clinical services: what is the evidence? aims to help those planning and implementing major clinical service reconfigurations to ensure that change is as evidence-based as possible. Covering 13 clinical service areas, it explores the five key drivers of reconfiguration: quality, workforce, cost, access, and technology. It builds on a major forthcoming analysis of service reconfiguration reviews conducted by the National Clinical Advisory Team (NCAT) and commissioned by the National Institute of Health Research.

The report argues that there is no 'optimal design' for local services; getting the right balance between access, workforce, quality, finance and technology will play out differently for patients with different levels of clinical risk and complexity. However, the available evidence

- questions presumptions that reconfiguration will deliver significant savings
- shows that more significant gains in quality may be achieved through service improvement strategies than reconfiguration.
- suggests that workforce and service planning needs to be done together to support the development of staffing for new models of care
- demonstrates the opportunities that technology provides to sustain local services.

Hospitals are part of a wider spectrum of care. Those planning services need to look across that spectrum to ensure the most efficient distribution of services, to remove duplication, and to ensure patients receive the right care, in the right location at the right time.

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Charity registration number: 1126980

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ISBN 978-1-909029-43-9