Variation in healthcare

does it matter and can anything be done?
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Introduction

It is well known that there are enormous variations in many aspects of healthcare and clinical work. There is also a general frustration that good practice is not adopted everywhere. The National Institute for Clinical Excellence (NICE) and the National Service Frameworks (NSFs) have started to address some aspects of variation, but the issue has probably not yet received the attention it deserves.

This perhaps reflects the difficulty of many of the issues, the poverty of some of the data, the sophisticated data analysis required, a lack of knowledge about what variation signifies, a certain amount of resistance to external scrutiny and, above all, the lack of a convincing theory and methodology for large-scale change management, involving professionals.

This report looks at variations in outcomes, access, productivity, performance and patient flow. It explores the extent to which variation indicates an opportunity for improvement, the issues that need to be considered, the main areas that would repay attention, and the implications for policy. The important questions for all types of unwarranted variation are:

- how to identify it?
- how to measure it?
- does it indicate any scope for improvement?
- can anything be done?

There is evidence that organisational and management techniques can be used to address unwarranted variation. It is clear that collaboration between middle managers and clinical teams is pivotal in tackling variations such as productivity and patient flow. Almost all the solutions listed here benefit from strong local management, especially clinical leadership, rather than top-down imposed solutions.

More needs to be done to encourage clinical ownership of Hospital Episode Statistics (HES) and other data in order to show how high-quality data and reduced variation can improve quality, reduce costs and support other NHS policy developments – in areas like payment by results, treatment centres, fee-for-service contracts, GMC revalidation, doctors’ appraisal and the new GMS contract.

Much of the current search for improved efficiency is focused on bureaucracy. The presence of large variations suggests that this scrutiny should not stop at administrative overheads. It should also extend to the area where the vast majority of NHS resources are used: the provision of clinical care. A more sophisticated approach to tackling unwarranted variation represents a far more important potential source of improved efficiency and quality.
Is variation an issue?

Unexplained variation in all aspects of clinical work and healthcare is generally unavoidable because of its complexity and the impossibility of controlling all the variables that may produce it. Some variation may be explained by the characteristics of individual patients or by differences in the capability of clinicians. A significant amount of variation will be legitimate and even desirable: for example, it might be unwise to simply ask slower surgeons to work faster.

The term ‘unwarranted clinical variation’ is useful for describing the issue; John Wennberg, an expert in this area, defines it as ‘care that is not consistent with a patient’s preference or related to [their] underlying illness’.

Beyond variation in the work of clinicians, there is also variability in the way that the system works, which itself produces variations in access, outcomes and other important indicators.

Variations in outcomes and access

Research by Professor Sir Brian Jarman\(^1\)\(^–\)\(^3\) indicates very significant variations in risk-adjusted mortality rates between providers (see Figure 1):

- Crude mortality rates varied from 3.4 per cent to 13.6 per cent.
- Age- and sex-standardised mortality ratios for trusts varied from 53 to 137 (England = 100), representing a 2.6 times variation.
- Standardising for emergency mix and length-of-stay reduced the variation to 67 to 119. Deaths outside hospital or patient characteristics do not explain this 1.8 times variation.

Within individual hospitals, there may also be significant variations in outcomes by day-of-admission (admission at weekends can be more dangerous), time-of-day (night-time operating) or, more anecdotally, time-of-year.

Figure 1. Age- and sex-standardised mortality ratios 1995–2001

Figures based on diagnoses covering 80% of all hospital deaths across a wide range of medical conditions (not surgical procedures). 99% confidence intervals are shown.

Source: Professor Sir Brian Jarman
Risk-adjusted mortality rates for surgery are relatively easy to measure, but identifying variations in other outcomes is more difficult, particularly as the NHS does not assess the condition of patients before admission and there is no universally recognised measure. The problem is even more difficult with emergency admissions or patients with chronic conditions. However, it is likely that the variations in avoidable excess morbidity are at least as great as variations in mortality.

In addition to variations in mortality and morbidity, it is well known that there are unwarranted variations in the utilisation of healthcare and in the thresholds for treatment, by

- area – local clinical preferences, distance and supply being important
- social class – the ‘inverse care law’, that is, the availability of good medical care tends to vary inversely with the need for the population served; this trend is known to operate more completely where medical care is most exposed to market forces, less so where it is reduced
- gender – lower rates of heart surgery in women, for example
- ethnicity – high rates of admission and compulsion in psychiatry
- age – as a result of varying professional views on capacity to benefit.

Certain of these variations are amenable to policy, clinical or managerial interventions. Professor Jarman’s work, contributing to the national allocation formula, demonstrates the huge variation of age/sex-standardised hospital admission and bed usage rates. These can best be explained by an area’s:

- social deprivation – the underprivileged area (UPA) or York deprivation scores
- SMR – standardised mortality ratio
- availability or supply of hospital services.

Variations, as described above, are not unique to the UK. US Medicare per capita spending in 2000 was...

Figure 2. Standardised death rates versus charge per admission

Hospital, age, sex, race, payer, admission source, admission type-standardised death rate versus age/diagnosis-standardised charge per admission. Note: the adjusted death rates have no correlation with age/diagnosis-adjusted costs. In the US, there is a fourfold variation of hospital-standardised mortality rates (HSMRs) and a fivefold variation of adjusted costs, but they are unrelated.

Source: Professor Sir Brian Jarman
US$10,550 per enrollee in Manhattan and US$4,823 in Portland, Oregon. These differences are due to volume effects rather than illness differences, socio-economic status or the price of services.

Unfortunately, this high utilisation was no guarantee of high-quality outcomes. Residents in high-spending regions received 60 per cent more care but did not have lower mortality rates, better functional status or higher satisfaction. This may represent a significant efficiency loss, with potential savings of up to 30 per cent if high spenders reduced expenditure and provided the safe practices of conservative treatment regions. There is also a very significant equity issue, with some areas or groups within the population being seriously undertreated while others, equally worryingly, are overtreated. This lack of relationship between outcomes, measured by death rates and expenditure, is illustrated in Figure 2.

**Variations in productivity and performance**

There are very significant differences in the productivity of individuals, teams and organisations. For example, in:

- A&E – the ratio of nurses per patient varies from less than 1:1,000 to more than 1:2,000, and from 1:2,500 to 1:6,000 for medical staff
- outpatients – doctors’ workloads vary fivefold
- outpatient cancellation rates – differences are more than twofold
- outpatient new to follow-up ratios – large variations
- equipment use – differences almost twofold (see Figure 3).

In December 2002, the Department of Health (DoH) distributed details of local practitioners’ activity rates in five surgical specialities (ENT, ophthalmology, trauma and orthopaedics, general surgery, and urology) compared to the national distribution of activity in these specialisms. This work by Dr Karen Bloor and Professor Alan Maynard is written up in more detail in the Health Service Journal. Figures 4 and 5 show large variations in the levels of activity between surgeons, as measured by finished consultant episodes (FCEs).

This is clearly an important subject for further research into the causes of variation and potential routes to improvement, as it seems likely that there is considerable unused capacity tied up in these variations.

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**Figure 3. Imaging equipment utilisation**

| Source | Audit Commission Acute Hospital Portfolio, 2001 | 05 |
Variations in flow

One of the most interesting findings of the NHS Modernisation Agency’s work has been in the solution to waiting problems: improving the flow of patients through the system rather than simply adding capacity. Obstacles to improving flow include large variations in:

- the time of presentation in A&E – clustering due to the timing of GP visits and surgery hours
- lengths of stay for similar conditions
- opening and operating hours for diagnostic equipment
- the day of admission.

Reducing this sort of variation and matching capacity with demand has huge potential for increasing the productivity of the system, and improving the experience of patients and staff, owing to the environment being less stressful and more controlled. A forthcoming joint NHS Confederation and NHS Modernisation Agency paper on demand-and-capacity planning will explore this in more detail.7

Figure 4. The level of activity of general surgeons in an anonymous NHS trust in relation to the national distribution of clinical activity in that area, by FCE

Figure 5. The level of activity of general surgeons in an anonymous NHS trust in relation to the national distribution of weighted productivity, using relative reference costs as a proxy

*FCEs × national average reference cost based on HRGs
The causes of variation

There are a number of causes of unwarranted variation.\(^8\)

Variations in utilisation of services

These include differences in approach to preference-sensitive care – conditions where more than one treatment option exists and where clinician or patient preference may determine which is selected.

They also include variations in supply-sensitive care. Many clinical decisions seem to be subtly influenced by the availability of particular services:

- Increasing bed availability is known to lead to an increase in admissions while, in one study, doubling the number of cardiologists has been associated with a halving in the interval between appointments.\(^8\)

Work by the King’s Fund (see Figure 6) shows ambulatory care-sensitive conditions – where there is agreement that the risk of hospitalisation can be reduced by timely and effective ambulatory care, for example, heart failure, diabetes and asthma. These variations in admission rates are only partly explained by deprivation. Other factors such as professional preferences may also be a cause.

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Figure 6. Ambulatory care-sensitive (ACS) admission rates by London ward and deprivation index 2001–03, age 15–64

The graph shows that admission rates are higher in more deprived areas: there is a twofold difference between the least and most deprived wards. The correlation of 0.387 suggests that almost 40 per cent of the variation between wards can be ‘explained’ by socioeconomic deprivation.

Some of the differences between areas are likely to be due to differences in illness levels of the population (‘need’) but also differences in access to good quality primary care and the supply of hospital care.

Variations in outcomes

Variations in the use of effective care can be due to differences in clinical knowledge, differential rates of diffusion and adoption of innovation.

Internal systems, in particular, an absence of well-designed systems, are important. Evidence from Professor Jarman’s research and the Healthcare Commission’s clinical governance scores seems to suggest that high-quality audit*, effective research*, the use of information and education** and training** scores may be associated with lower mortality (*p<0.05; **p<0.1).

Variations in productivity and flow

Reflecting on the information in Figures 4 and 5, it is not clear how far differences in productivity are caused by external factors such as bottlenecks, theatre time, bed availability and individual clinicians’ characteristics – capacity, age, areas of interest, private sector work and poor use of time – or are the result of a natural spread in the population.

There are important differences resulting from managerial and policy decisions, such as those relating to the allocation of resources. These include scheduling to improve access to beds, theatres and other support services for surgeons; medical and nurse staffing levels; incentives for improvement; and the availability of specific technologies and treatments.

Organisational culture, team-working, internal communication, attitudes to learning – whether by error or otherwise – and other related factors may also be important. For example, Professor Jarman’s work indicates that hospitals with high levels of adverse events appear to have lower death rates.9

We are encouraging the DoH to fund further work on the impact of both managerial and policy decisions and organisational culture.

Timing issues such as days of the week, weekends, opening hours, GP visit timing, holidays, medical staff rotation changes, and so on, also seem to cause variation.
What is to be done?

There is little doubt that unexplained variation in a number of important clinical areas is a very significant issue and will repay management and clinical attention. There is evidence that this is already happening. Professor Jarman reports, for paediatric cardiac surgery, that there is a reduction in the level of variation in standardised mortality rates over time. In other areas the story is less encouraging.

Many interventions in this area have been ineffective. The first Health Service Indicators (HSIs) were published in the early 1980s and the Audit Commission has been publishing reports ever since – with almost identically-shaped graphs showing the highest and lowest performers – and arguing that there would be huge improvement if the poorest performers could match the highest.

Making a real difference requires high-quality leadership, especially by clinicians, and improved commissioning. This needs to be supported by richer measurement, measuring success, support for those using the data and public disclosure.

Richer measurement

Florence Nightingale argued that hospitals should collect information on whether their patients were dead, relieved or unrelieved. One hundred and fifty years later, Kind and Williams, in the paper published as a companion to this report, point out the importance of monitoring outcomes beyond crude mortality rates, which are about three per cent for hospital inpatients. But, for the great majority of patients, we know nothing about their change of health status following treatment. As we move more towards a payment by results, and even a fee-for-service basis, it will become increasingly important that this status is understood so that commissioners can manage utilisation levels and match commissioning to need.

Kind and Williams argue that mortality rates are important but miss the main objective of measurement in estimating the impact of healthcare on people’s quality of life. Measuring successes, by contrast, makes possible a more appreciative approach that may make it easier to use the data by way of opening discussions on how to generate improvement. This is reinforced by Vallance-Owen’s work for BUPA, which since 1998 has used a version of the SF-36 questionnaire within its hospitals to measure outcomes of surgery. This is about learning from good practice, not just the identification of potentially poor performance.

Consideration should be given to adopting some form of better measurement of health outcomes in the NHS that includes self-reported health status. This could take the form of:

- SF-36 (see www.sf-36.org)
- the Picker Institute approach – measuring patients’ experience of care (see www.pickereurope.org)
- EQ-5D – proposed in the Kind and Williams paper, a generic measure more simple than SF-36 (see Figure 8).

Better data

While the data has improved, there is more to do:

- HES should be more widely available to researchers and users in the NHS.
- Independent-sector hospital data should be included in HES, and include NHS consultant identifiers.
- Office for National Statistics (ONS) deaths data and HES need to be better linked to allow for more sophisticated measures of mortality, and made more generally available for analysis. This would prevent hospitals in areas with few services to support patients to die at home from appearing to have poor mortality rates, and allow a much better measurement of outcome.
• The use of a single identifier for patients would allow record linkage, similar to that used in Scotland. Our current inability to easily link episodes in secondary care, or secondary care and primary care patient data, is a major obstacle to improvement.

• There needs to be better dissemination of what data does exist – the Public Health Observatories have a potentially important role but it is not yet clear that this is being fulfilled.

• There needs to be much better coding of co-morbidities and use of secondary diagnosis coding.

• Clinical coding and coding for ethnicity requires attention.

• Chief executives are required to sign off HES, often to very short deadlines, but clinicians themselves need to ensure that their HES records are valid. The Royal College of Physicians encourages its members to do this.12 Other colleges could follow this lead.

• To date, the role of data quality in HES has been underplayed. Data quality is part of the star ratings system. The Healthcare Commission should be encouraged to make HES and related data an explicit keystone from 2004/05. This, and the obvious links with calculation of the national tariffs in payment-by-results implementation, make attention to data quality essential for all NHS managers and clinicians.

Self-regulation

Even in our increasingly regulatory culture, there is still an important role for professionals to take responsibility for audit and improvement. Highly successful examples of this are found in audits such as those undertaken by the Intensive Care National Audit and Research Centre (ICNARC) and the Society of Cardiothoracic Surgeons. More initiatives of this type are needed and should be encouraged, along with the value of sharing emerging results.

Further work is warranted to better understand why these positive audit examples prosper and how this could inform the development of similar initiatives in other areas.

Redesigning systems

Wennberg makes the important point that a great deal of variation is due to poor system design rather than bad doctors. It is to be hoped that the Shipman Inquiry keeps sight of this key point. There is scope to reduce variation and improve safety by designing features that help clinicians navigate the system and take optimal decisions. Many of the problems of patient flow and poor productivity are amenable to redesign solutions such as seven-day working or extended hours.

Pathways and other types of decision-support systems, if properly designed, are a particularly effective way of reducing variations in care, without creating a straight-jacket that inhibits the proper use of clinical judgement or innovation. However, pathways are not easy to introduce, and the level of evidence available to support them is not always of the first order.

Recent evidence suggests that pathways need to be more precise in their definition of the clinical behaviour required. An effective approach along these lines is the use of care bundles – pioneered in critical care in the US. A similar British antecedent of the care bundle approach used the administration of a specific combination of therapies as an indicator of quality of care in myocardial infarction. Almost 100 critical care units in the UK are developing this approach, working with the NHS Modernisation Agency (see Figure 7). It would be worth exploring where else this approach might be applied.

Becoming more proactive

A significant weakness of the current system is that it is insufficiently forward-looking and slow to respond in the face of emerging unwarranted variations. It appears that where clinical teams seem able to deal with variance early, they have systems that pick up weak signals and leading indicators of problems. Tools such as statistical
process control, for example run charts, are a particularly useful way to develop more reliable estimates of the distribution of results and identify and respond to special cause variation – variation that is the result of real underlying causes rather than random variation. Wider application of these tools could allow safety and quality to be built into more systems and could provide a more clinically meaningful way of monitoring and improving performance than crude benchmarks or performance targets. It also has the advantages of providing much more rapid feedback and focusing attention on the underlying causes of variation.

Kind and Williams suggest that the process itself of thinking about ways to include and use ‘real’ outcomes data – based on measurements such as self-reported health status, for example EQ-5D – could improve the way the NHS does things. Initiating does require managerial buy-in, however. Given the low cost and high information yield of EQ-5D, it would be interesting to know more from NHS organisations that have initiated, or are initiating, such activity themselves.

**Commissioning and payment by results**

Variation is much more likely in a system that has not explicitly articulated what it wants and expects. This is the role of commissioning, which has the potential to use the data to reduce variation and improve quality. Creating effective service change and improvement, however, requires a whole new range of commissioning skills and approaches. Commissioners and providers need to work together to identify where it is appropriate to define and standardise care. The aim is to consider commissioning as a clinical and managerial dialogue, centring on local health community priorities, and find opportunities to collectively agree the clinical pathways. There needs to be a clear focus on dealing with the high-volume cases, to ensure that, as far as possible, variation is caused by differences in the patient population or in patients’ individual preferences, not in provider preferences.

To support this, the design of the payment by results regime needs particular attention. We need a more coherent description of what is being provided than Healthcare Resource Groups (HRGs) can give. For high-volume cases and chronic conditions, more standardised pathways and an
understanding of the content and costs of care for patients over a long period is required.

It is possible to use the reimbursement regime to directly incentivise effective care and the achievement of appropriate outcomes. However, this is not going to be possible where prices are based on averages, and where there are no opportunities to calibrate reimbursement rates to fit the policy objectives of the system. For example, commissioners might wish to pay lower rates for supply-sensitive or less effective care and higher rates for activity they wish to encourage, or to set lower rates in areas where there appears to be excess use of certain types of care.

Patients as part of the solution

Wennberg suggests using patient empowerment as a method of reducing variation in preference-sensitive care. He argues that using an educational approach with decision-support techniques can redress the imbalance in knowledge.

Initiatives such as the Expert Patient Programme can also be used to equip patients to ask more questions and to know more about what they might expect. The US experience reflected by Wennberg shows particular success with educational approaches in conditions such as prostate cancer and benign prostatic hyperplasia.

The NHS Modernisation Agency has a number of projects experimenting with this decision-support technique.

Leadership and management

An issue that emerged in our discussions is the relatively low level of managerial interest or focus on this subject. The participants felt that there is a need for much greater challenge and questioning by boards and leaders – particularly clinical leaders – of variations in results, of how providers compare with similar organisations, and the actions that should be taken. It is not clear what questions boards should ask or whether they always have the skills to do this. We would be interested in members’ views about whether this is the case.

Collaboration between middle managers and clinical teams is pivotal in tackling variations in productivity and patient flow. Almost all the solutions listed here benefit from strong local management, especially clinical leadership, rather than top-down imposed solutions.

Public disclosure

The evidence is that the public disclosure of information about variation in outcomes or other aspects of quality has relatively little impact on choices made by patients, although it does affect provider and commissioner behaviour. While the aim should be to disclose as much as possible to the public, more will need to be done to explain the statistics involved. Some balance will need to be struck in order that clinicians are not discouraged from collecting data and benchmarking.
Conclusions

This report has looked at the different types of variation, focusing on what can be done to reduce unwarranted variation in health service delivery. It highlights the potential for a sophisticated approach to tackling variation that would offer the NHS an important additional source of service improvement.

At a time when there is a very public search for improved efficiency in NHS administrative overheads, this report argues that in addition to monitoring, which ensures resources are directed to frontline services, there is a need for rigorous scrutiny in the area where the vast majority of NHS resources are used: the provision of clinical care.

The most significant objection to tackling variation has been that it is not always obvious what the right level of care should be or what action should be taken. This might be true in some cases, but there are increasingly large areas where it is possible to be definite about what constitutes unwarranted variation, and that there are interventions that work.

Reducing variation and improving the quality and richness of data are important to high-quality commissioning and to improving care and the patient experience. They are also crucial for the implementation of a number of NHS policy developments such as Choice, NSFs, payment by results, treatment centres, fee-for-service contracts, GMC revalidation, doctors’ appraisal and the new GMS contract.

This report argues that to address the issue of unwarranted variation, there is a need for:

- more clinical ownership of HES and other data to improve the overall validity and quality of information
- the development of organisational and management techniques that address variations in productivity and patient flow
- changing the role and nature of commissioning by the better use of data to reduce variation and improve quality
- the more widespread use of existing data and methods such as run charts.

It is clear that almost all the solutions listed here are already in practice in some areas. This could offer greater benefits to the NHS, if taken up more widely. The key ingredient for success is strong local management, especially clinical leadership, rather than top-down imposed solutions.

This paper is based on an NHS Confederation seminar with Professor Sir Brian Jarman and Professor Alan Maynard. We are grateful to NHS Confederation members and other experts who attended.

For more information about the NHS Confederation’s work in this area, please contact Nigel Edwards, Policy Director at: nigel.edwards@nhsconfed.org
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9 Data provided by Drew Gaffney, Associate Dean for Clinical Affairs, The Vanderbilt Clinic, Nashville, from his study of Swedish hospitals.


12 Royal College of Physicians. www.rcplondon.ac.uk/college/hiu/index.htm

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Variation in healthcare

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*Variation in healthcare – does it matter and can anything be done?* looks at variations in outcomes, access, productivity, performance and patient flow. It explores the extent to which variation indicates an opportunity for improvement, the issues that need to be considered, the main areas that would repay attention, and the implications for policy.

This NHS Confederation report is essential reading for all NHS managers and clinicians, and for anyone working with patients.

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