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Learning from practice variation to improve the quality of care

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ABSTRACT – Modern medicine is complex and delivered by interdependent teams. Conscious redesign of the way in which these teams interact can contribute to improving the quality of care by reducing practice variation. This requires techniques that are different to those used for individual patient care. In this paper, we describe some of these quality improvement (QI) techniques. The first section deals with the identification of practice variation as the starting point of a systematic QI endeavour. This involves collecting data in multiple centres on a set of quality indicators as well as on case-mix variables that are thought to affect those indicators. Reporting the collected indicator data in longitudinal run charts supports teams in monitoring the effect of their QI effort. After identifying the opportunities for improvement, the second section discusses how to reduce practice variation. This includes selecting the `package' of clinical actions to implement, identifying subsidiary actions to achieve the improvement aim, designing the implementation strategy and ways to incentivise QI.

Introduction

Over the past few decades, the practice of physicians has been transformed by a growing evidence base quantifying the benefits and risks of interventions in disease states, and the development of clinical practice guidelines summarising this evidence base. Although this has eroded the traditional autonomy of physicians to choose the treatment that they considered right for 'their' patient, considerable variation in the quality of care delivered to patients across the National Health Service (NHS) seems to persist.[1,2] This implies that many patients leave healthcare encounters having not been offered treatments for their condition for which there is high-quality (Grading of Recommendations Assessment, Development and Evaluation (GRADE) level 1) evidence. This might partly be explained by the growing demand from patients that they be active partners in their own care, taking decisions on therapeutic options based on their own preferences and using topic-specific patient decision aids.[3] Also, the clear tension between standardisation of care and the need to allow innovation[4,5] might account for some of the observed variation. However, often the failure to offer treatments for which there is level 1 evidence is caused by systems that are not designed for reliable delivery of care and are susceptible to human factors.[6] Therefore, service redesign is an important way to reduce practice variation and improve the quality of care.

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Box 1. Dimensions of the quality of care, as defined by the Royal College of Physicians.[7]

- Patient experience
- Effectiveness
- Efficiency
- Timeliness
- Safety
- Equity
- Sustainability

Quality has several dimensions: we have adopted the definition of quality suggested by the Royal College of Physicians (RCP) (Box 1).[7] Although there might, on occasion, be tensions between one dimension and another (most commonly between efficiency (health gain per pound spent) and the 'clinical' dimensions of patient experience, timeliness and safety), it is frequently the case that safer and more reliable systems of care delivery are also more efficient.[8,9] Thus, service redesign, using quality improvement (QI) techniques, is also a good way to maintain clinical quality when budgets are under pressure. Here, we describe some of these techniques.

Identifying practice variation

Measuring practice variation

The mantra 'If you cannot measure it, you cannot improve it' is widely used in QI and reflects the pivotal role of measurement in systematic attempts to decrease practice variation. At the core of any measurement initiative is a quality indicator set[10] that ideally combines measures of structure, process and outcomes of care (Box 2).[11,12] The choice of measures to monitor the success of QI is complex. Process measures are easier to influence, whereas outcome measures are more 'meaningful' clinically. The latter are also more susceptible to case-mix variation, care processes outside the direct control of the QI team and to variation in how the case mix is coded.[10,13–16]

Practice variation can only be identified by collecting data on several providers or facilities and comparing the results. Therefore, measurement usually occurs at the regional or national level. Examples of such measurement initiatives are NHS programmes such as the Quality and Outcomes Framework

Box 2. Three categories of quality indicators.[11]

Structure indicators

Factors associated with the healthcare setting. Example: the availability of an electronic prescription system

Process indicators

The care that is being delivered and the extent to which this is in line with established clinical standards. Example: the percentage of eligible patients that receive ß adrenoceptor blockers after an acute myocardial infarction.

Outcome indicators

The ultimate status of the patient after having received treatment. Example: the mortality rate among coronary artery bypass surgery patients, or quality of life after kidney transplantation.

(www.qof.ic.nhs.uk), the Patient Reported Outcomes Measures initiative (www.ic.nhs.uk/proms); the Intensive Care National Audit & Research Centre (www.icnarc.org); and the UK renal registry (www.renalreg.com).

Interpreting practice variation: the centre effect

If mortality from a particular condition is substantially higher among patients treated at centre A than at centre B, then some observers would conclude that centre B is 'better'. However, in clinical practice, it can be difficult to be sure that differences in mortality, or in other frequently used clinical outcomes (eg length of stay, readmission rate or patient-reported outcomes), are really the result of differences in the quality of care, rather than of the case mix ('But my patients are different: we treat sicker patients than other centres').[14]

Therefore, valid comparison between centres requires collection of reliable data on variables that might affect outcome (eg age, comorbidity and functional status) as well as reliable coding of the primary diagnosis. 'Coding depth' should also be assessed: hospitals that are systematically better at coding for comorbidities will appear 'better' in comparisons of mortality after adjustment for comorbidity.[17] 'Gaming' is also possible: because patients admitted for palliative care are not counted in most measures of adjusted hospital mortality, increasing the use of codes for palliative care will reduce apparent mortality, again without any real impact on clinical outcomes.[18]

Finally, collection of a reliable data set should be followed by a multilevel modelling statistical approach that analyses centre performance after adjustment for patient-level characteristics.[19]

Reporting practice variation

Quality improvement techniques are designed to allow teams to find, by repeated small tests of change, the best way of delivering a given package of changes within a given system, such as an outpatient clinic or operating theatre. The effects of these changes are measured and reported in 'real time', often using longitudinal 'run charts' (ie annotated time series charts) or statistical process control (SPC) charts.[20,21] This form of continuous audit is preferable to the traditional audit cycle, in which an audit might be performed once a year or even less frequently, for several reasons. Assume that an audit is performed on a set of cases in September 2009, and then repeated by a different junior doctor, after implementation of changes to a protocol, in August 2010, and that the second audit shows improvement compared with the first. This improvement could be the result of the change in protocol, but could also be due to progressive improvement over time for reasons unrelated to the protocol, to month-to-month variation, or to differences in data collection between the two audits. Collection and graphical display of data each month would enable distinction between these possibilities and also 'keeps teams to the task', making it easier to see whether a change in practice is temporally related to a change in outcome. In addition, the use of 'run chart rules' in longitudinal SPC charts enables the team to decide whether the change in outcome is a statistically significant departure from the previous baseline ('special cause') or just part of the normal fluctuation in outcome measures ('common cause'). However, to use SPC charts as a reliable reporting tool, they should be constructed with caution: a systematic review of the use of SPC charts in healthcare QI found that the single biggest methodological flaw was the failure to establish an adequate baseline before assessing the effects of a QI intervention.[22]

Provision of 'achievable benchmarks', based on high performance, is more likely to incentivise QI teams than are conventional performance measures, which sometimes encourage the mindset 'We're not an outlier, so that's OK'.[23,24]

Reducing practice variation

Selecting a 'package' of changes to implement

It is axiomatic that 'just trying harder' within the current system will seldom if ever generate sustained improvement; rather, a conscious programme to change some aspect of the system of care is required. Clinicians will usually choose to work on improving outcomes in an area in which existing audits have shown performance to be poor, but might not know how to achieve improvement.

Most QI programmes focus on the implementation of a 'change package' (a set of clinical actions predicted to improve the outcome in question). This 'change package' is often derived from clinical practice guidelines, based in turn on the highest quality evidence available. For instance, the 'change package' used in the '100,000 lives campaign' of the Institute for Healthcare Improvement, designed to reduce mortality after myocardial infarction, comprised practices derived from the American College of Cardiology/American Heart Association guidelines: prescription of aspirin early and at discharge; prescription of a beta-blocker early after admission and on discharge; prescription of angiotensin-converting enzyme inhibitor or angiotensin II receptor blockers (ARB) for patients with systolic dysfunction; timely reperfusion; and smoking cessation counselling.[25]

A change package might also comprise a set of practices underpinning the delivery of a given clinical intervention. For instance, Bradley *et al.* undertook a qualitative study to

document the range of practices associated with low door-to-balloon time for primary angioplasty,[26] and then performed a quantitative study to find out which candidate practices were independently associated with a fast door-to-balloon time after adjustment for potential confounders.[27] Working on incorporating these practices (eg empowering ambulance staff to 'phone ahead' to prepare the angioplasty suite) would be a good example of a QI intervention.

Incentivising and accelerating improvement

Relying on each individual centre to develop its own QI strategy wastes the opportunity for centres to learn from each other. The QI literature contains many examples of programmes designed to accelerate QI by encouraging collaboration and mutual support.

A 'collaborative' is a programme in which teams from different centres work together on a specific topic (eg the prevention of wound infection after surgery) in a structured way. Typically, the teams meet for a 2-day period to be taught about the change package and the principles of QI methodology (often using the 'Model for Improvement'[28]) that they will use to implement the package. The teams are encouraged to start testing changes immediately, using small, incremental tests of change, using 'Plan, Do, Study Act' cycles, and to plot data in as close to real time as possible. Momentum is maintained by frequent exchange of progress reports between the participating teams, typically with a monthly teleconference and the use of an 'extranet' to post protocols, algorithms, checklists and results, with further physical meetings at 6 and 12 months. The collaborative model has been widely used in the NHS, for instance in the Safer Patients Initiative funded by the Health Foundation.[29] Keeping in mind that evaluating the impact of such nationwide programmes is methodologically challenging, the overall conclusion was that any improvement seen in this programme was similar to that seen in non-participating hospitals. A recent systematic review concluded that there was limited but positive evidence that collaboratives generate improvement.[30]

Alternative models to promote improvement include top-down regulation (eg performance management or closure of 'outlier' centres); financial incentives (eg the Quality and Outcomes framework in UK primary care, Commissioning for Quality and Innovation (CQUIN) payments, or non-payment of the costs of admissions complicated by a 'never event'); in a market system, competition to attract referrals based on quality; or a 'Call to Action', based on the theory of social movements, generating 'bottom-up' improvement driven by a set of common values.

Achieving change in practice: 'diagnosis'

The challenge for most QI efforts is that they occur in parallel with routine clinical work, which can seldom be suspended or even slowed down while changes are being implemented. This is only not the case when a new system or care pathway is being designed 'from scratch', for instance when moving into a new hospital building. Success is most likely if the task is broken down into small segments, with different teams working on different parts of the care pathway. Often, a 'driver diagram' can help in deciding where to focus efforts to improve an important clinical outcome. Say, for example, that a dialysis unit had decided to attempt to reduce the incidence of sudden death among a population of patients undergoing haemodialysis. Fig 1 lists a few of the potential contributors to the high incidence of sudden death in this group, with some 'secondary drivers' that underlie each of the 'primary drivers'. For each secondary driver, there will be a series of subsidiary actions that will help to achieve the aim. For instance, achieving 'dietary restriction of high potassium foods' could involve individual or group dietetic education sessions; provision of written information, for example diet sheets and recipes; providing patients with paper or web-based access to their test results and other strategies aimed at increasing patient 'empowerment'; one-to-one psychologist input for 'problem' patients; and encouraging competition among patients.

'Process mapping' and 'value stream mapping' are techniques for breaking down a patient pathway into its component steps, while assessing the value that each step adds.[31] It is useful in the 'diagnostic' phase of a QI programme, and can open the eyes of staff to opportunities to remove wasteful steps from the system. Having a patient participate (or, failing that, a staff member acting as a 'mystery shopper') often casts light on repetition and delays that individual members of staff, operating at different parts of the pathway, might be completely unaware of.

'Barrier analysis' is an additional way of designing QI interventions; questionnaires or surveys administered to staff whose practice would have to change to achieve improvement can identify barriers and facilitators of change, which can then be targeted in the QI intervention.[32,33]

Achieving change in practice: 'treatment'

Once the diagnostic phase has been completed, and a clearly articulated aim and measurement strategy have been defined, the remaining challenge is to design the implementation strategy. Although this depends on the changes being implemented, there are some generic lessons from the QI literature. In our systematic review of QI interventions in renal replacement therapy, for instance, we classified implementation strategies into educational activities; audit and feedback; treatment protocols and algorithms; reminders and prompts; structural changes; changes in staff roles or responsibilities; financial strategies; and patient-oriented strategies. We found weak evidence, confirming other studies,[34] that multifaceted interventions are more likely to generate improvement than is a single intervention.[35]

The concept of a 'care bundle' of measures, all of which should be reliably applied in a given clinical situation, is an extension of the use of treatment protocols, in which adherence is measured as 'all or none' rather than measuring adherence to each facet of the intervention independently.[36]

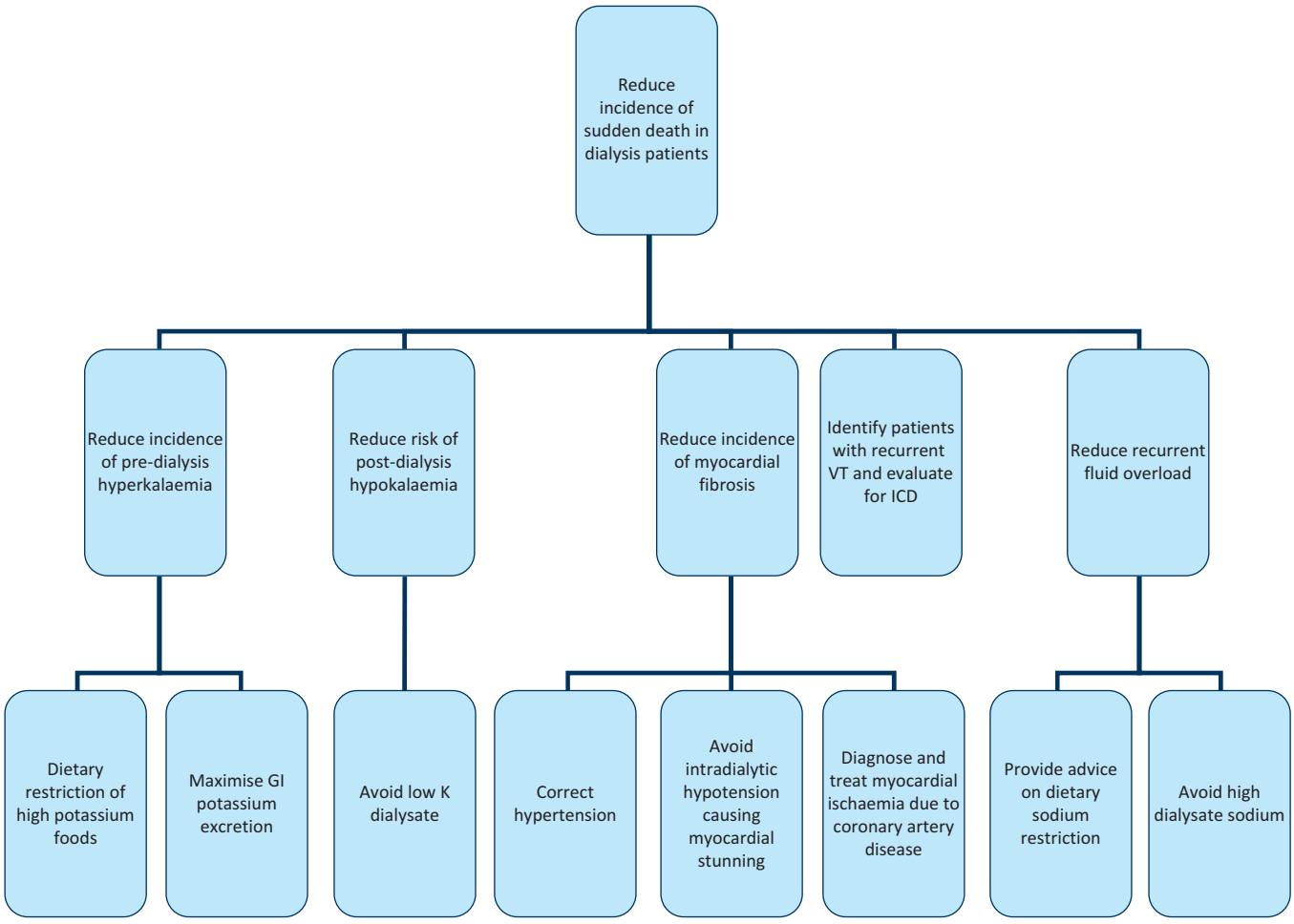

Fig 1. An example of a driver diagram to identify ways of reducing the incidence of sudden death in a dialysis centre. Below the top level, showing this overall improvement goal, the middle level lists primary 'drivers' that potentially contribute to the high incidence of sudden death. The bottom level contains secondary drivers underlying these primary drivers. Next, the dialysis centre can focus on selecting subsidiary actions that are expected to have an impact on the secondary drivers.

Evaluating QI

It is more difficult to evaluate QI interventions than conventional medical treatments, for instance drug treatment, and some have argued that different standards of proof should be applied. There are undoubted methodological problems in evaluating QI interventions, because the 'unit of randomisation' is often at organisational level (eg a hospital or outpatient clinic) rather than at the level of the individual patient. However, randomised controlled trials are possible,[24,37] and other methodologies (eg rigorous time series analyses or stepped wedge design) can also provide convincing evidence. In addition, given that potential confounders are more difficult to predict than in traditional observational epidemiology, and that QI interventions cost money and might well have unintended consequences, rigorous evaluation should be considered mandatory.[38]

Summary and conclusions

The evolving science of QI recognises explicitly that modern medicine is delivered by complex, interdependent teams and that conscious redesign of the way in which teams interact is at least as important as the competencies of any single individual within the team. This requires different language and techniques to those used for individual patient care. Those who resist 'cookbook medicine' (an ill-chosen term for the delivery of reliable, high-efficiency, protocol-driven care) and imply that it is preferable for each individual doctor to decide the best treatment for 'their' patient in each and every clinical situation, based on their own critical analysis of the literature, are yesterday's men. Our energies should rather be spent on learning when a given situation justifies departing from 'the way we do it round here'.

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