Guidance on feedback of outcome data to improve performance in vascular surgery

Feedback of performance data is a well-established method of performance improvement in the health-care setting, although guidance has been limited in the context of surgical performance. This article outlines how optimal feedback can be achieved using surgeon outcome data.

Feedback is the provision of performance information in a given activity in order to guide and improve future performance (Ende, 1983). Performance can be defined and measured in several ways: quality, safety, efficiency and patient experience. Feedback is a well-established method of performance improvement in health care (Ivers et al, 2012). It is an important part of surgical training, and seeking feedback is recognized as a key non-technical skill in surgery (Hull et al, 2012). Although guidance on feedback is reported extensively in the literature (Hewson and Little, 1998; Bienstock et al, 2007; Cantillon and Sargeant, 2008; van de Ridder et al, 2008) this has been limited in the context of surgical performance.

The increased need for transparency in patient care has been indicated publicly by, for example, the Bristol Royal Infirmary inquiry (2009) and has led to the publication of UK surgeon outcome data since 2013. The database, available in the public domain, provides individual outcome measures for named consultant surgeons and trusts within the NHS in all surgical specialties (Royal College of Surgeons of England, 2014a). Outcomes are available for the vast majority of NHS consultant surgeons, with a small number of surgeons (fewer than 1%) not consenting to publication, chiefly as a result of concerns regarding data quality and risk adjustment (Wise, 2013).

For vascular surgery, outcome data are currently available for elective infra-renal abdominal aortic aneurysm repair – open and endovascular – and carotid endarterectomy (Vascular Society of Great Britain and Ireland, 2013c). It is hoped that public disclosure could encourage positive changes in surgeon performance, which would be measurable using patient outcomes, and also empower patient decision-making (Radford et al, 2014). However, the motion has been controversial, with concerns regarding potential data misuse (Alderson and Cromwell, 2014; Radford et al, 2014). Rather than allaying public patient safety concerns, it could lead to reputation damage for 'outliers'. For the risk-averse surgeon, it might decrease willingness to undertake more complex cases in order to maintain favourable statistics (Beed and Brindley, 2014). Nonetheless, existing results for UK cardiac surgeons, whose outcomes have already been publicly available since 2006, do not seem to reflect these fears (Bridgewater et al, 2007).

With an increasing emphasis on patient safety and transparency, surgeon performance is under greater scrutiny from patients and fellow surgeons (Vincent et al, 2004; Royal College of Surgeons of England, 2014b). In an environment of professional self-regulation, there is also a continual need for self-development and improvement of surgical practice (Jin et al, 2012; Leung et al, 2012). Recognizing the limits to one's competency is critical to ensuring patient safety, although surgeons are often expected to monitor and assess this themselves (Leung et al, 2012). Surgeon-specific outcome data would be a valuable resource for use in feedback for performance improvement. Inappropriately delivered feedback may harm performance (Kluger and DeNisi, 1996), so it is vital to establish the optimal method and setting.

Benefits of feedback

The primary benefit of feedback is improved surgical performance. This is important in surgical training and professional development; more importantly, it has a positive impact on patient safety and patient outcomes. Use of feedback has also been associated with a reduction in hospital costs (Maruthappu et al, 2014). One study focusing on carotid endarterectomy reported savings of almost 30% as a result of decreased preoperative angiography use and reduced length of stay (Olcott et al, 2000). The surgical learning curve shows increasing experience to correlate

Miss Mimi M Li is Medical Student in the Section of Vascular Surgery, Imperial College London, Charing Cross Hospital, London W6 8RF

Mr Joseph Shalhoub is Specialty Registrar in Vascular Surgery in the Section of Vascular Surgery, Imperial College Healthcare NHS Trust, London and Honorary Clinical Lecturer, Imperial College London, London

Professor Alun H Davies is Professor of Vascular Surgery in the Section of Vascular Surgery, Imperial College London, London and Honorary Consultant Surgeon, Imperial College Healthcare NHS Trust, London

Dr Mahiben Maruthappu is Academic Foundation Doctor in the Section of Vascular Surgery, Imperial College London, London

Correspondence to: Miss MM Li (mimi.li10@imperial.ac.uk)

with improved performance until a plateau phase is reached, whereby more experience is not associated with improved outcome. Deteriorations in performance beyond this plateau phase have been identified, suggesting that experience alone is not sufficient to maintain performance (Maruthappu et al, 2015). It is currently unclear as to why this is the case; feedback of outcome data may be able to contribute to attenuating this potential negative swing in performance.

Feedback implementation in vascular surgery

The authors recommend that feedback could be provided using patient outcome data, with inclusion of benchmarking relative to peers, as well as an action plan and target for improvement (*Table 1*). Optimal results may be achieved using information delivered in both verbal and written form, given by a senior colleague and provided at regular intervals (Ivers et al, 2012). The use of a protocol may be advisable to standardize the feedback process.

Table 1. Summary of recommendations for feedback provision

Feedback content	Surgeon outcome data with:	■ A measurable target and action plan for improvement ■ Benchmarking relative to peers
Method of delivery	Written and verbal form	
Feedback delivered by	A senior colleague	
Frequency	Regular intervals	

Feedback content

There is clear evidence that feedback with outcome data has a positive effect on performance in both the general healthcare and surgical settings (Ivers et al, 2012; Maruthappu et al, 2014). The authors therefore recommend that feedback could be given with, but not limited to, objective outcome data. Outcome data could take the form of average length of stay, postoperative mortality, postoperative complication rate, readmission rate, average operative time, as well as patient satisfaction. Although not all of these outcomes are currently published, many of these data are already being collected across England.

Patient outcome data is a measure of clinical competency which reasonably satisfies all parties and stakeholders involved. For doctors, it provides a realistic measure of competency based on actual clinical performance. For patients and the wider public, it gives reassurance of safety (Norcini, 2003). Outcome data should be risk adjusted to take into account differences in case-mix. Without such adjustments, surgeons treating higher risk patients may be incorrectly identified as poor performers (Walker et al, 2013).

Vascular surgery outcomes in the UK are recorded by the National Vascular Registry, which was formed in 2013 as a merger of the existing National Vascular Database and UK Carotid Intervention Audit. Information is collected on a number of key procedures: abdominal aortic aneurysm repair, carotid endarterectomy, lower limb bypass and lower limb amputation (Vascular Society of Great Britain and Ireland, 2013b). Currently, outcomes are publicly available for elective infra-renal abdominal aortic aneurysm repair (postoperative in-hospital mortality) and carotid endarterectomy (30-day postoperative stroke rate and mortality). Previous studies focusing on carotid endarterectomy found that use of feedback was associated with a reduction in stroke and mortality rate of 56–100% (Olcott et al, 2000; Findlay et al, 2002). The authors recommend using outcomes for carotid endarterectomy and abdominal aortic aneurysm repair, as these are currently the best quality data available. In the USA, the Society for Vascular Surgery's Vascular Quality Initiative has similarly collected and analysed outcome data since 2011, with the chief aim of quality improvement. The data are collated into reports that are benchmarked against regional and national standards, and then fed back to individual surgeons and hospitals. This has allowed regular performance reviews, which have been effective in promoting change at both regional and national levels (Bensley and Beck, 2015).

The additional use of a measurable target and an action plan of how to achieve it may increase effectiveness. Both the feedback receiver and provider should be involved in target setting (Anonymous, 1992). Current literature suggests that the use of both a measurable target and action plan shows greater improvement compared to either intervention alone (Ivers et al, 2012). Benchmarking in relation to peer performance may confer additional benefit (Ivers et al, 2012). Existing literature suggests that the effects of benchmarking may be small (Wones, 1987; Kiefe et al, 2001; Søndergaard et al, 2002), and one study found its effects to be slightly detrimental (Schneider et al, 2008). Benchmarking could be in relation to others within the same trust or in comparison to the national average. Comparison to national averages is important in ensuring that performance falls within a safe accepted standard, whereas comparison to peers within the same trust or region could provide a stronger incentive for improvement. The evidence for use of other interventions in addition to outcome data is unclear. It is hoped that the small positive influence of several complementary interventions may, together, lead to a significant improvement. Since trust-wide and nationwide outcome data are already available, the provision of benchmarking should not incur significant additional cost. Inclusion of measurable targets and action plans are also unlikely to be costly (Ivers et al, 2012).

Feedback delivery method

Delivery of feedback by a senior colleague or mentor may provide optimal results. Evidence suggests that feedback delivered by a senior colleague or mentor has a much greater effect compared to feedback provided by study investigators or a professional standards review (Ivers et al, 2012). Receiving feedback from an expert was found to enhance technical performance in the operating theatre

(Hull et al, 2012). Sender credibility has been identified as an important factor in feedback acceptance. Feedback is more likely to be accepted if the sender is respected and perceived to have greater knowledge (Bing-You et al, 1997). A well-established professional relationship, such as that with a mentor, would tend towards satisfying both of these areas. For those of highest seniority, feedback instigators could be advisory members of their specialty's professional governing body, for example the Royal College of Surgeons of England.

Regarding delivery method, feedback given in both verbal and written form appears to be more beneficial than either form alone (Ivers et al, 2012). Providing written delivery alone does not guarantee that feedback will be read and reflected on appropriately. Using verbal feedback may be a more personal exchange, carrying greater weight and ensuring that suitable action plans and targets are made. However, good interpersonal skills are essential here. A sender's poor interpersonal skills, as well as judgemental or negative attitudes, may be barriers to the receptivity of feedback (Bing-You et al, 1997). A predefined structure or protocol for the feedback session may help to counteract this. Using both delivery methods together, written feedback could be used for reference if details of the verbal exchange were unclear or subsequently forgotten. Delivering feedback in person also comes with the challenge of finding sufficient time in the busy work schedules of both parties. The environment in which feedback is given may also play a role in its effectiveness. A setting that is private, relaxed and not time-pressured has been suggested as the ideal environment (Hewson and Little, 1998; Bienstock et al, 2007).

Frequency of feedback

The frequency of feedback should be at a specified regular interval, although the most effective interval is uncertain. A comparison of studies in a surgical setting found no difference in effectiveness between frequencies, although this was based on heterogeneous study populations (Maruthappu et al, 2014). A comparison of studies in a general health-care setting found feedback of a moderate frequency (up to monthly) to be more effective than weekly, less than monthly and once only, although evidence was again not strong (Ivers et al, 2012). The existing evidence does not provide a clear picture, although a monthly interval appears to be the most effective. What is more certain is that feedback needs to be provided more than once to be most effective (Ivers et al, 2012).

There are several considerations for deciding an appropriate feedback interval: in particular whether the dataset gathered is enough to provide good quality feedback. Low caseload may result in insufficient statistical power to detect poor performance, thus creating false reassurance. Conversely, low caseloads may also prevent detection of improvement. The best solution may be to increase the feedback interval, therefore analysing data from a longer time period. A balance must be struck, however, as longer time periods could slow the rate of improvement and allow continuation of undesirable behaviours without knowledge of their impact. Deteriorations in performance could also be concealed (Walker et al, 2013). Too short an interval may be insufficient time to fully implement plans for improvement. It would also require a greater time commitment than may be feasible or practical for both parties involved in the feedback process.

The most appropriate interval may also vary based on the stage of the surgeon's career: more junior surgeons may benefit from shorter feedback intervals, whereas those whose learning curves have plateaued may require it less frequently. Another important practical consideration is the ease of data analysis: the shorter the feedback interval, the greater the amount of work required. When designing a feedback programme, the provision of administrative support should therefore be considered for its successful implementation.

Cost of implementation

Feedback itself is a relatively low-cost intervention: fundamentally, it simply involves gathering and relaying performance information. These data are already being collected and analysed within the existing infrastructure, so minimal additional cost should be involved in data collection. A senior consultant's time is important (British Medical Association, 2014), and this should be taken into consideration when deciding the length and frequency of interventions (Bing-You et al, 1997). As of December 2012, UK surgeons are required to undergo revalidation in the form of an annual appraisal, overseen by an appointed 'responsible officer' (a senior doctor in the trust), and 5-yearly renewal of their licence to practise (Federation of Surgical Specialty Associations, 2014). Incorporating outcome data feedback into this existing process could minimize the additional costs of requiring a senior consultant's time. Ultimately, the financial cost of feedback delivery may be balanced by, and indeed be insignificant in comparison to, the savings that come from positive performance changes instigated by the feedback itself.

Limitations

Using outcome data as a measure of performance makes the broad assumption that the surgeon is solely responsible for the patient's quality of care. In fact, the surgeon is only one member of a whole team of health-care professionals, and there are many contributing factors other than surgical performance (Norcini, 2003). For some procedures, the lead surgeon is unclear; in other cases the lead operator may not be a surgeon at all, for example an interventional radiologist may lead an endovascular aortic aneurysm repair. Additionally, mortality may not be the best measure of surgical outcome; bias could still occur as a result of uneven case-mix despite risk adjustment. Patients also value other factors such as postoperative complication rate, function and symptom recurrence (Walker et al, 2013).

Reliability of the outcome data itself will depend on the reliability of data collection. Vascular surgery outcomes are collected through a well-established clinical audit programme, with hospital sites self-reporting data as part of their NHS contracts (Vascular Society of Great Britain and Ireland, 2013a). It should be noted that data for trainees, for whom feedback may be most beneficial, are not currently collected in this way. However, having an existing infrastructure could simplify potential trainee data collection.

KEY POINTS

- The use of feedback in health care has been shown to improve surgical performance, patient outcomes and costs.
- Published surgeon-specific outcome data in vascular surgery, currently available for aortic aneurysm repair and carotid endarterectomy, could be a valuable resource for performance improvement.
- Based on current evidence, optimal results may be achieved with feedback of outcome data, with inclusion of benchmarking and targets, given at regular intervals by a senior colleague.

Conclusions

It is clear that feedback is an effective intervention in surgical performance improvement. Future work should focus on how to optimize delivery of feedback. Owing to the heterogeneity of the literature, it was difficult to draw firm conclusions for certain aspects of implementation, particularly feedback frequency. A large proportion of existing studies were found to be at moderate and high risk of bias (Ivers et al, 2012). Standardized and clearer reporting of methods, especially the interventions and study participant or patient demographics, could help reduce bias. In the vascular surgery setting, more work is needed to identify effects of feedback on specific procedures, as well as whether existing or additional outcomes are the most appropriate to use as markers of surgical performance. The existing use of feedback in the vascular surgery setting has already shown promise with regard to clinical quality improvement. **BJHM**

Conflict of interest: none.

Alderson D, Cromwell D (2014) Publication of surgeon-specific outcomes. *Br J Surg* **101**(11): 1335–7 (doi: 10.1002/bjs.9641)

Anonymous (1992) Medical audit in general practice. I: Effects on doctors' clinical behaviour for common childhood conditions. North of England Study of Standards and Performance in General Practice. *BMJ* **304**(6840): 1480–4

Beed M, Brindley PG (2014) Publication of surgical outcomes-data: whose team are we on? *Br J Anaesth* **112**(4): 615–17 (doi: 10.1093/bja/aet432)

Bensley RP, Beck AW (2015) Using the Vascular Quality Initiative to improve quality of care and patient outcomes for vascular surgery patients. *Semin Vasc Surg* **28**(2): 97–102 (doi: 10.1053/j.semvascsurg.2015.09.003)

Bienstock JL, Katz NT, Cox SM, Hueppchen N, Erickson S, Puscheck EE, the Association of Professors of Gynecology and Obstetrics Undergraduate Medical Education Committee (2007) To the point: medical education reviews—providing feedback. *Am J Obstet Gynecol* **196**(6): 508–13 (doi: 10.1016/j.ajog.2006.08.021)

Bing-You RG, Paterson J, Levine MA (1997) Feedback falling on deaf ears: residents' receptivity to feedback tempered by sender credibility. *Med Teach* **19**(1): 40–4 (doi: 10.3109/01421599709019346)

Bridgewater B, Grayson AD, Brooks N et al, and the North West Quality Improvement Programme in Cardiac Interventions. (2007) Has the publication of cardiac surgery outcome data been associated with changes in practice in northwest England: an analysis of 25 730 patients undergoing CABG surgery under 30 surgeons over eight years. *Heart* **93**(6): 744–8 (doi: 10.1136/hrt.2006.106393)

Bristol Royal Infirmary Inquiry (2009) Final Report. http://webarchive.nationalarchives.gov.uk/20090811143745/http://www.bristol-inquiry.org.uk/final_report/report/index.htm (accessed 12 January 2015)

British Medical Association (2014) Pay scales for consultants in England 2014. http://bma.org.uk/practical-support-at-work/pay-fees-allowances/pay-scales/consultants-england (accessed 12 January 2015)

Cantillon P, Sargeant J (2008) Giving feedback in clinical settings. *BMJ* **337**: a1961 (doi: 10.1136/bmj.a1961)

Ende J (1983) Feedback in clinical medical education. *JAMA* **250**(6): 777–81 (doi: 10.1001/jama.1983.03340060055026)

Federation of Surgical Specialty Associations (2014) Revalidation Guide for Surgery. www.rcseng.ac.uk/surgeons/surgical-standards/docs/revalidation-guide-for-surgery (accessed 12 January 2015)

Findlay JM, Nykolyn L, Lubkey TB, Wong JH, Mouradian M, Senthilselvan A (2002) Auditing carotid endarterectomy: a regional experience. *Can J Neurol Sci* **29**(4): 326–32

Hewson MG, Little ML (1998) Giving feedback in medical education. *J Gen Intern Med* **13**(2): 111–16 (doi: 10.1046/j.1525-1497.1998.00027.x)

Hull L, Arora S, Aggarwal R, Darzi A, Vincent C, Sevdalis N (2012) The impact of nontechnical skills on technical performance in surgery: a systematic review. *J Am Coll Surg* **214**(2): 214–30 (doi: 10.1016/j.jamcollsurg.2011.10.016)

Ivers N, Jamtvedt G, Flottorp S et al (2012) Audit and feedback: effects on professional practice and healthcare outcomes. *Cochrane Database Syst Rev* **6**: CD000259

Jin CJ, Martimianakis MA, Kitto S, Moulton CE (2012) Pressures to "measure up" in surgery: managing your image and managing your patient. *Ann Surg* **256**(6): 989–93 (doi: 10.1097/SLA.0b013e3182583135)

Kiefe CI, Allison JJ, Williams OD, Person SD, Weaver MT, Weissman NW (2001) Improving quality improvement using achievable benchmarks for physician feedback: a randomized controlled trial. *JAMA* **285**(22): 2871–9 (doi: 10.1001/jama.285.22.2871)

Kluger AN, DeNisi A (1996) The effects of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychol Bull* **119**(2): 254–84 (doi: 10.1037/0033-2909.119.2.254)

Leung A, Luu S, Regehr G, Murnaghan ML, Gallinger S, Moulton C (2012) "First, do no harm": balancing competing priorities in surgical practice. *Acad Med* **87**(10): 1368–74 (doi: 10.1097/ACM.0b013e3182677587)

Maruthappu M, Trehan A, Barnett-Vanes A, McCulloch P, Carty MJ (2014) The impact of feedback of surgical outcome data on surgical performance: a systematic review. *World J Surg* **39**(4): 879–89 (doi: 10.1007/s00268-014-2897-0)

Maruthappu M, Gilbert BJ, El-Harasis MA, Nagendran M, McCulloch P, Duclos A, Carty MJ (2015) The influence of volume and experience on individual surgical performance: a systematic review. *Ann Surg* **261**(4): 642–7 (doi: 10.1097/SLA.0000000000000852)

Norcini JJ (2003) ABC of learning and teaching in medicine: Work based assessment. *BMJ* **326**(7392): 753–5 (doi: 10.1136/bmj.326.7392.753)

Olcott C IV, Mitchell RS, Steinberg GK, Zarins CK (2000) Institutional peer review can reduce the risk and cost of carotid endarterectomy. *Arch Surg* **135**(8): 939–42 (doi: 10.1001/archsurg.135.8.939)

Radford P, Derbyshire L, Shalhoub J, Fitzgerald J (2014) Publication of surgeon specific outcome data: a review of implementation, controversies and the potential impact on surgical training. *Int J Surg* **13**: 211–16 (doi: 10.1016/j.ijsu.2014.11.049)

Royal College of Surgeons of England (2014a) RCS hails landmark

publication of individual surgeons' outcomes data. www.rcseng.ac.uk/news/rcs-hails-landmark-publication-of-individual-surgeons2019-outcomes-data#.VIR3r2OsXKM (accessed 12 January 2015)
Royal College of Surgeons of England (2014b) RCS Statement on Duty of Candour. www.rcseng.ac.uk/policy/documents/rcs-position-on-duty-of-candour (accessed 12 January 2015)
Schneider A, Wensing M, Biessecker K, Quinzler R, Kaufmann-Kolle P, Szecsenyi J (2008) Impact of quality circles for improvement of asthma care: results of a randomized controlled trial. *J Eval Clin Pract* **14**(2): 185–90 (doi: 10.1111/j.1365-2753.2007.00827.x)
Søndergaard J, Andersen M, Vach K, Kragstrup J, Maclure M, Gram LF (2002) Detailed postal feedback about prescribing to asthma patients combined with a guideline statement showed no impact: a randomised controlled trial. *Eur J Clin Pharmacol* **58**(2): 127–32 (doi: 10.1007/s00228-002-0454-5)
van de Ridder JMM, Stokking KM, McGaghie WC, ten Cate OTJ (2008) What is feedback in clinical education? *Med Educ* **42**(2): 189–97 (doi: 10.1111/j.1365-2923.2007.02973.x)
Vascular Society of Great Britain and Ireland (2013a) FAQs. www.vsqip.org.uk/faqs/ (accessed 12 January 2015)
Vascular Society of Great Britain and Ireland (2013b) National Vascular Registry 2013 Report on Surgical Outcomes Consultant-level Statistics. www.rcseng.ac.uk/surgeons/research/surgical-research/docs/national-vascular-registry-report-on-surgical-outcomes (accessed 12 January 2015)
Vascular Society of Great Britain and Ireland (2013c) Surgeon Level Public Reporting of AAA and CEA. www.vsqip.org.uk/news/surgeon-level-public-reporting-of-aaa-and-cea/(accessed 12 January 2015)
Vincent C, Moorthy K, Sarker SK, Chang A, Darzi AW (2004) Systems approaches to surgical quality and safety: from concept to measurement. *Ann Surg* **239**(4): 475–82 (doi: 10.1097/01.sla.0000118753.22830.41)
Walker K, Neuburger J, Groene O, Cromwell DA, van der Meulen J (2013) Public reporting of surgeon outcomes: low numbers of procedures lead to false complacency. *Lancet* **382**(9905): 1674–7 (doi: 10.1016/S0140-6736(13)61491-9)
Wise J (2013) Surgeon leaders support publishing outcomes but warn of limitations. *BMJ* **346**: f4187 (doi: 10.1136/bmj.f4187)
Wones RG (1987) Failure of low-cost audits with feedback to reduce laboratory test utilization. *Medical Care* **25**(1): 78–82 (doi: 10.1097/00005650-198701000-00009)