How many Doctors does it take to manage an Elective General Surgical patient?

Individualised Surgeon Specific Outcomes Data misrepresent modern team centred work practices

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Abstract

Introduction:

The recent adoption of publishing surgeon specific mortality data in some settings has prompted concerns that the complex team working environment is misrepresented. This led to consideration that outcomes data would be more accurately conveyed if team-based outcomes were published. However, there has been little investigation into what constitutes a clinical team within the surgical setting, and if team size increases in more complex patients. Here, we seek to address these questions in elective colorectal surgery.

Methods:

This is a multi-centre retrospective case cohort study. Data were obtained from three Scottish sites. All elective colorectal resection procedures within a two-month period were included. A standardised pro forma was used to establish the number of professionals involved in patient care, diagnosis, management and outcome. Data were obtained from referral to discharge from cancer resection.

Results:

Thirty-eight cases were included. Median age was 69.5 with 63.2% being male. The number of patients with underlying co-morbidities was 15. The mean number of doctors involved in care was 19 (range 26-87). Complications were associated with a larger in-hospital medical team ($p < 0.001$) but there were no differences in team size by co-morbidity status.

Conclusion

Our study would suggest that publication of outcomes based upon one named clinician is an oversimplification of modern patient management. The publication of team-based outcomes may both be more transparent with regard to clinical pathways, and in turn support individual clinicians. Such reporting may enhance transparency whilst protecting individuals in an increasing culture of blame.

Introduction

Monitoring clinical outcomes and adopting strategies for their improvement are key hallmarks of surgical quality assurance[1]. In recent years, emphasis has been placed upon quality improvement, effectiveness in health care, and economic pragmatism[2]. This has emphasised public reporting of accurate information in order to provide transparency of clinical pathways and their results. Accordingly, different clinical outcome reporting styles have been proposed[3].One such style that has been recently adopted is the publication of surgeon specific mortality data (SSMD) in which the results of operative intervention are displayed by categorising patients by operating consultant[4]. SSMD has been adopted in NHS England for colorectal malignancy resections since 2012[5]. However, out-with specific specialties such as cardiothoracic surgery[1], they have yet to be published for doctors working in NHS Scotland.

Concerns have been raised that SSMD over-simplify the complex team working ethos seen in the modern National Health Service[6 7]. Furthermore, publication of SSMD may promote 'risk adverse' behaviour by surgeons [6]. Here, co-morbid patients may be refused operative intervention due to a perceived increased risk of adverse outcome without appropriate risk stratification. Fear of adverse outcomes impacting on published individual clinician outcome rates can therefore influence clinical practice[6]. Indeed, it has been suggested that despite protecting surgical data, this prompts the use of less effective therapies in high risk patients, thereby paradoxically increasing healthcare cost and burden on a population level[8]. Furthermore, the right to equitable care without bias or discrimination has been proposed as being compromised by SSMD reporting[8].

In an effort to improve the accuracy and fairness of surgical outcomes, a method of risk adjustment was developed. 'Failure to rescue' (FTR) is a term coined in the United States, and is a method of analysis which accepts that all centres will have the same incidence of post-operative complications (related to patient co-morbidity) but managing these events will vary and therefore distinguish high and low mortality centres[6]. Multiple factors, ranging from the technical to managerial have been found to impact on FTR[9]. It has been shown that many events are outside the control of the operating surgeon and raises doubt on SSMD as a method of quality improvement[10].

SSMD can also be incorrectly perceived as a reflection of a particular surgeon's technical ability[6]. However, cumulative team experience and consistency, as well as operating room procedures also have an intrinsic roles in operative excellence and outcome[6 7]. In one study, the influence of attending-fellow pair experience far exceeded the influence of attending experience alone[2]. Indeed, in a further study applying human factors methodology within the operating room, results showed that teamwork related failures were closely related with surgical error[11]. Thus, SSMD potentially undermines the importance of team working when reporting on outcomes.

This prompted consideration of the notion that surgical outcomes data would be more representative of current NHS care pathways if team based data were published [7]. However, it is unclear to date what or who constitutes a team. Here, we ask how many doctors are involved in commonly undertaken processes such as the management of colorectal cancer. Therefore, we sought to determine and estimate the clinician team utilised in the patient journey.

Methods

Study design

This is a multi-centre retrospective observational cohort study in conjunction with the Scottish Surgical Research Group (SSRG). The study included patients having operations in three General Surgical departments (Aberdeen Royal Infirmary, Aberdeen; Ninewells Hospital, Dundee and Raigmore Hospital, Inverness). All patients who had an elective colorectal cancer resection undertaken in November - December 2016 (inclusive) in any of the three hospitals were included. Cases were identified from prospectively collected electronically stored operation lists and case notes were retrospectively analysed using a single study proforma. The primary aim of the study was to assess the mean number of doctors caring for elective colorectal patients. Data relating to medical specialty was also collated. The secondary aim was to determine if increased co-morbidities or complications altered the number of physicians involved in patient care. Hospital data were anonymised at source and individual units anonymised on analysis.

Inclusion and exclusion criteria

All elective resectional colorectal procedures in patients over the age of 18 were included. Both laparoscopic and open cases were included. Patients <18 years of age, non resectional procedures (such as stricturoplasties or formation of loop stomas), emergency operations and unscheduled cases were excluded from this study.

Data collection

Data extractors used a standardised pro forma to retrospectively collect information related to the number of professionals involved in patient care from the paper case notes. Clinicians were grouped by speciality and by grade (consultant, specialist trainee and foundation programme/ core training). The number of clinicians were calculated from the point of referral, through subsequent outpatient investigations (including radiology, pathology and endoscopy), and within the inpatient stay. Data on age, co-morbidity (by age adjusted Lee Charlson index) [12] and complications (by Clavien Dindo [13] were also included.

Data analysis

Data were amalgamated after anonymous secure transfer to individual analysis (HO). Data were amalgamated and aggregated using Excel (Microsoft) and SPSS v 24 (IBM, New York). Categorical data were analysed using Chi squared calculations and scale data were analysed using Mann Whitney U tests. This was deemed a clinical audit and therefore no research ethics review was undertaken.

Results

Demographic characteristics

A total number of thirty-eight patients were included in this study, collected across three hospital sites. The median age was 69.5 years (range 26-87) and there were 24 male patients (63.2%). Table one lists the number of cases by centre. There were no differences in age or gender on analysis between sites. The median in hospital stay was 7 days (range 2-37 days). There were no in hospital deaths. Median time from diagnosis to operation was 106 days (range 29-294 days). All cases were discussed at a multidisciplinary team meeting before operation. A total of 11 patients had complications postoperatively, including one patient who returned to theatre for suspected bleeding (defined as a Clavien Dindo score of 2 or greater).

Number of doctors in care of patient

There were a median number of 19 doctors involved in the care of the patient during the total patient journey from referral to diagnosis. This number includes consultants (median number 11; range 5-19), specialist trainees (median 4; range 1-8) and junior doctors (median 4; 1-11). The number of doctors involved in the care of patients differed by unit ($p<0.005$) and procedure performed ($p<0.005$) with rectal operations having the highest number of involved clinicians.

The number of co-morbidities identified before the operative procedure had no effect on the median number of doctors caring for the individual patient (Table 2). Having a complication also significantly increased the total number of doctors involved in clinical care (Table 3, $p<0.001$ for Consultants and Core trainees/Foundation Year doctors). Furthermore, patients who suffered complications had a higher number of clinicians involved in their in-hospital stay (Table 4). However, neither age greater than 65, nor co-morbidity status influenced the total number of doctors involved in care (Figure 1).

Discussion

During this cohort study, we have described the clinical team involved in the care of elective colorectal cancer patients from the point of referral, to secondary care to post-operative discharge. We identify that there is a median of 11 consultants, 4 specialist trainees and 4 junior middle grade doctors involved in the care of these patients. As this work has been performed across three representative Scottish units, we infer that these data demonstrate the likely complexities in team working across the modern NHS Scotland surgical services.

This work was performed to describe the clinical environment in which modern surgical management is undertaken. Although neither age nor previous co-morbidity influenced the size of the multi-disciplinary team involved in the care of colorectal cancer patients, having a complication (defined as Clavien Dindo score of 2 or more) led to a significantly higher number of doctors involved with the inpatient treatment. Thus, those patients whose care has been complex have an increased number of involved clinicians. Prioritising the need for debate and consensus of multi-specialty teams will lead to patient-centred care plans [14]. In addition to these data further enforcing the proposal that SSMD is superficial as an outcome measure, it also highlights the key role hand-over and communication will have in clinical care of complex patients. In addition, it is worth to consider the implications of the shape of training and work patterns on patient care. The adoption of the European Working Time Directive has resulted in more frequent clinical handover and rotation of clinical staff. There remains, however, a limited evidence base evaluating effects on patient care.

There has been a move to sophisticate the analysis and reporting of surgical outcomes data through 'FTR' and other analytical processes. These have been shown to be more predictive of mortality rates. [3] Nevertheless, displaying results of surgical processes by listing them against

a single member of a team where the workload is typically split between several individuals seems incongruous. Modern surgical departments will work to a rota, and cases will be distributed in that fashion. Each patient will have contact with not only different members of a particular team, but different specialist teams. Such multidisciplinary team working, undertaken in a cohesive manner, has significant benefits to the clinical management of any individual patient[15]. However, this again would support the notion that outcomes should be presented in a team based manner.

The strengths of this study lie in the fact that it is the first review of its type. In addition, the multi-centre review of colorectal surgical lists removes single centre bias. The fact that the study has been conducted in a retrospective fashion is important as this eliminates the Hawthorn effect. Weakness lies in the fact that this is a single specialty review (colorectal surgery). However, this was deliberate to ensure volume of comparable cases could be observed across different units and to ensure a relative level of standardisation between surgical procedures. We acknowledge the low sample size. However, the study design was to undertake a snapshot of current clinical practice and increasing the number of observed cases in the three units in question is unlikely to alter our results. Furthermore, we have only determined the size of the medical team and, due to the nature of the case note review, it was not possible to accurately establish the size of the nursing, and professions allied to medicine teams.

Conclusion

This study was performed in order to understand whether single surgeon outcome data versus team based performance data would be more reflective of current NHS practice. It has been demonstrated that there is a median of 11 consultants involved with the care of one patient during treatment of a colorectal cancer. In turn, it has been shown that this number increases relative to length of admission and complication rate. [16]The reporting of surgical outcomes promotes transparency between the health service and the general public. [2] In order to reflect the working environment in which patient care is contained, we conclude that the reporting of these figures should be presented as team based data, in preference to surgeon specific.

Bibliography

1 Westaby S, De Silva R, Petrou M, Bond S, Taggart D. Surgeon-specific mortality data disguise wider failings in delivery of safe surgical services. *Eur J Cardiothorac Surg*. 2015; 47: 341–345.

2 Dehmer GJ, Drozda JP, Brindis RG, *et al.* Public Reporting of Clinical Quality Data. *J Am Coll Cardiol*. 2014; 63: 1239–1245.

3 Reddy HG, Shih T, Englesbe MJ *et al.* Analyzing "Failure to Rescue": Is This an Opportunity for Outcome Improvement in Cardiac Surgery? Ann Thorac Surg; 2013; 95: 1976–1981.

4 Radford PD, Derbyshire LF, Shalhoub J *et al*. Publication of surgeon specific outcome data: A review of implementation, controversies and the potential impact on surgical training. *Int J Surg*. 2015; 13: 211–216.

5 Almoudaris AM, Burns EM, Bottle A, Aylin P, Darzi A, Faiz O. A colorectal perspective on voluntary submission of outcome data to clinical registries. *Br J Surg*. 2011; 98:132–139.

6 Westaby S. Publishing individual surgeons' death rates prompts risk averse behaviour. *BMJ*. 2014; 349: 5026.

7 Elbardissi AW, Duclos A, Rawn JD, Orgill DP, Carty MJ. Cumulative team experience matters more than individual surgeon experience in cardiac surgery. *The Journal of Thoracic and Cardiovascular Surgery*. 2013; 145: 328–333.

8 Shahian DM, Edwards FH, Jacobs JP, *et al.* Public Reporting of Cardiac Surgery Performance: Part 1—History, Rationale, Consequences. Ann Thorac Surg. 2011; 92: S2–S11.

9 West MA, Borrill C, Dawson J, *et al.* The link between the management of employees and patient mortality in acute hospitals. *The International Journal of Human Resource Management*. 2002; 13: 1299–1310.

10 Aiken LH, Clarke SP, Sloane DM, Sochalski J, Silber JH. Hospital Nurse Staffing and Patient Mortality, Nurse Burnout, and Job Dissatisfaction. *JAMA* 2002; 288: 1987-93.

11 Wiegmann DA, ElBardissi AW, Dearani JA, Daly RC, Sundt TM. Disruptions in surgical flow and their relationship to surgical errors: an exploratory investigation. *Surgery*. 2007; 142: 658–665.

12 Charlson M, Peterson J, Szatrowski TP, MacKenzie R, Gold J. Long-term prognosis after peri-operative cardiac complications. *J Clin Epidemiol*. 1994; 47: 1389–1400.

13 Miyakita H, Sadahiro S, Suzuki T, Tanaka A, Okada K, Saito G. Risk evaluation of postoperative complication in patients undergoing rectal cancer surgery. *Journal of Clinical Oncology*. 2016; 34: 756–756.

14 Whiteman AR, Dhesi JK, Walker D. The high-risk surgical patient: a role for a multi-disciplinary team approach? *Br J Anaesth*. 2016; 116: 311–314.

15 Taylor C, Shewbridge A, Harris J, Green JS. Benefits of multidisciplinary teamwork in the management of breast cancer. *Breast Cancer* 2013; 5: 79–85.

16 Moonesinghe SR, Lowery J, Shahi N, Millen A, Beard JD. Impact of reduction in working hours for doctors in training on postgraduate medical education and patients' outcomes: systematic review. *BMJ*. 2011; 342: 1580.

	Unit 1	Unit 2	Unit 3	p value
Number of cases	20	11	7	
Median age (range)	69 (34-83)	70 (43-86)	69 (26-87)	0.959
Co-morbidities (no cases with Charlson Lee <3 (%)	8 (40%)	5 (45%)	2 (28.5%)	0.593
Operation Anterior resection APER Right hemicolectomy Extended right hemicolectomy Left hemicolectomy Sigmoid colectomy	 10 1 7 1 0 1	 2 1 3 1 0 1	 1 0 5 0 1 0	n/a
Median Length of post operative stay (range)	7.5 (3-37)	6 (3-20)	7 (3-15)	0.285
Patients with complications (%)	6 (30%)	4 (36.4%)	1 (14.3%)	0.816

Table one- demographics and operative breakdown of cohort

	Median number of Consultants	Median number of ST trainees	Median number of FY/CT doctors
Co-morbidities	11 (6-17)	3 (2-7)	4 (2-7)
No co-morbidities	11 (5-19)	4 (1-8)	1 (1-11)
P value	0.786	0.991	0.837

Table two: number of doctors by co-morbidity status (defined as Lee Chalson score >2)

	Median number of Consultants	Median number of ST trainees	Median number of FY/CT doctors
Complications	11 (10-19)	4 (2-6)	7 (3-11)
No complications	10 (5-17)	4 (1-8)	4 (1-7)
P value	0.078	0.645	0.002

Table three: total number of doctors by complication (defined as Clavien Dindo $\geq$2) from diagnosis to discharge.

	Median number of Consultants	Median number of ST trainees	Median number of FY/CT doctors
Complications	2.5 (1-6)	3 (1-5)	6 (1-10)
No complications	1 (0-2)	1 (0-3)	3 (1-7)
P value	< 0.001	0.001	< 0.001

Table four: total number of doctors involved in the post-operative ward care of patient by complication (defined as Clavien Dindo $\geq$2) and seniority.

Figure 1: The median total number of involved clinicians separated by Complications (left), Age (middle) and Comorbidity status (right). Error Bars are 95% confidence intervals. *** depicts $p<0.001$ on T test analysis. ns = not significant.