BMJ Open What are the financial implications of an open right hemicolectomy to hospital trusts within NHS England? A cost analysis

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ABSTRACT

Objective This study aimed to quantify the actual costs to National Health Service (NHS) England of open right/extended right hemicolectomy (ORH) patient episodes compared with national tariffs to determine whether the total cost of care for these patients is adequately reimbursed to NHS Trusts.

Design 2017–2018 NHS Improvement reference cost data for elective and non-elective ORH Healthcare Resource Group 4+ (HRG4+)-coded procedures were used to calculate the actual mean initial admission costs of ORH and compare with corresponding 2017–2018 national tariffs. Costs of postoperative complications were estimated based on 2017–2018 Hospital Episode Statistics (intensive care unit (ICU)/high-dependency unit (HDU) stay and surgical site infection (SSI)) or further associated HRG4+ coded procedures (anastomotic leakage, SSI or hernia).

Setting and patient cohort Data were analysed for all ORH inpatients reported as treated at 140 secondary care Hospital Trusts in England during the 2017–2018 financial year.

Results 9812 ORH HRG4+ coded procedures were reported across 140 Hospital Trusts (74.0% elective; 26.0% non-elective). A total 1-year deficit of £993 335 was estimated between actual initial admission costs incurred and tariffs reimbursed for all patient episodes, 93.7% of which was associated with elective admissions. The cost of the average length of stay (LoS) in ICU/HDU after an ORH was £6818. The additional cost of an extended LoS in ICU/HDU due to an SSI was £45 316.

Conclusion The total cost of delivering care for these patients declared by NHS England was far higher than the tariff provided, which may be significantly underestimating the true cost of an ORH, leading to inadequate national tariff-setting by NHS Improvement.

INTRODUCTION

Colorectal surgery is associated with considerable risks for postoperative complications, which lead to additional costs associated with managing these complications being incurred by the hospital and a significant morbidity burden for the patient.¹ The most common causes of complications are anastomotic leakage (AL), which can result in further

Strengths and limitations of this study

- Given the continually rising costs of delivering care within the National Health Service (NHS) in England, this study is timely in its approach to demonstrating cost savings associated with colonic surgery that could be achieved for NHS Trusts.
- As reference cost data is the single largest body of data on costs within the NHS, this study is based on a large enough population to demonstrate a need for improvement.
- As the Healthcare Resource Group code structure allows for increased payments based on complexities and comorbidities, any underlying conditions are factored into the cost matrices, thereby removing associated uncertainty.
- Given the lack of an audit/review of clinical coding and/or finance accounting within NHS England, it may be assumed that some NHS Trust submissions contain errors.
- Due to a lack of data collection and reporting, our analysis cannot demonstrate any costs in primary care; therefore, it is reasonable to conclude that our figures are underestimated.

surgery,^{2 3} sepsis and the need for intensive care unit (ICU) support and surgical site infection (SSI),³ leading to a later surgical site occurrence (SSO), such as an incisional hernia.⁴

The development of a complication may delay discharge from the primary procedure, cause an unplanned readmission following discharge (within 30 days), or even necessitate further surgery to resolve the complication in the long term, such as repair of an incisional hernia or reversal of a stoma. Regardless of the cause, all complications can impact hospital resources and trigger an additional financial burden.^{5–7} In some cases, associated costs can run into tens of thousands of pounds^{5–7}; therefore, it is important to ensure that funds received by hospitals

from those who commission the service adequately cover the costs of treating these patients.

At present, National Health Service (NHS) England does not collect data at a line-item level for all consumables used on an individual patient. Therefore, reference cost data reported on an annual basis to NHS Improvement by individual Trusts are used to inform national tariff setting. Funding between commissioners and healthcare providers within NHS England is managed via Healthcare Resource Groups (HRGs), which determine tariffs for clinically similar treatments that are presumed to use similar levels of healthcare resource.⁸ HRG-coded reference cover the diagnosis, associated treatments, and average length of stay (LoS). This allows patient episodes to be ascribed tariff codes that enable NHS Trusts to charge commissioners accordingly for healthcare services provided. However, this system may be prone to inaccuracies and the true cost of delivering care incurred by healthcare providers may be underestimated.

Our study aimed to highlight the variability in costs associated with a single operation, an open right/extended right hemicolectomy (ORH), which accounted for the majority of colonic surgeries reported within the study period (72%), and therefore, provided a good sample size, and demonstrate the potential magnitude of the reimbursement shortfall for this patient cohort. Therefore, our objective was to quantify the actual costs to NHS England of initial (index) admissions and postoperative complications resulting in delayed discharge, unplanned readmission or further surgery, associated with ORH patient episodes and compare them with national tariffs.

METHODS

Patient cohort selection

A right hemicolectomy (excision of the right colon) and extended right hemicolectomy (excision of the right colon and transverse colon) were selected as suitable examples of open colorectal abdominal surgery for this analysis based on sample size. All Office of Population, Censuses and Surveys fourth revision (OPCS-4.8) Classification of Interventions and Procedures codes relevant to the right hemicolon or transverse colon were then identified based on published lists⁹ and confirmed via expert clinical opinion (OPCS-4.8 H06+, H07 +and H08+; online supplemental table S1). To quantify actual costs of initial (index) admission patient episodes and associated tariffs, identified OPCS-4.8 codes were subsequently mapped to HRG4 +codes FF32A, FF32B and FF32C (Proximal colon procedures; 19 years and over; and with complexity and comorbidity (CC) score 6+, CC score 3–5, or CC score 0–2, respectively) based on published lists¹⁰ and confirmed via expert clinical opinion.

Estimation of costs of initial (index) admission ORH patient episodes

The 2017–2018 NHS Improvement reference cost data for HRG4 +s FF32A, FF32B and FF32C were used to

calculate the actual initial admission cost of ORH patient episodes incurred by healthcare providers.¹¹ Reference cost data for a small number of outliers undergoing colonic surgery as outpatients were excluded from this analysis and assumed to be inaccuracies of coding, since open surgery requires an inpatient stay. These figures were then compared with 2017–2018 national tariffs published by NHS Improvement.¹² Both reference cost and national tariff data used in this comparison were categorised as elective (ie, planned) or non-elective (ie, emergency) admissions to identify variations in cost and reimbursement.

A further subanalysis considered only those patients with greater complexity and/or more comorbidities (ie, HRG4 +FF32A-coded procedures) to explore the possible association between case mix and actual initial admission costs reported by individual Trusts for these patient episodes.

Estimation of costs of postoperative complications resulting in delayed discharge of patients who underwent ORH

In a separate analysis, Hospital Episode Statistics (HES)¹³ were analysed to better understand the actual costs associated with postoperative complications that may delay discharge from a primary ORH procedure, such as SSIs and ICU or high-dependency unit (HDU). The 2017–2018 HES data were used to quantify the number of patients who underwent an ORH based on the OPCS-4.8 codes identified (as described above, online supplemental table S1) and categorised as elective or non-elective admissions. OPCS-4.8 code Y752 (Laparoscopic approach to abdominal cavity not elsewhere classified) was used to exclude patients who did not undergo an ORH from the analysis. To demonstrate the variability in treatment required across this patient cohort, it was relevant to include patients with and without complications in this analysis. Therefore, mean surgical ward LoS was reported for all patient episodes, as well as the proportion of patients who were admitted to a critical care facility (ICU/HDU) or had an SSI (identified by International Classification of Diseases 10th Revision diagnostic code T814), and the respective impact of an ICU/HDU stay, SSI or both, on LoS. The mean increase in surgical ward stay cost for patients with an SSI was also calculated based on the NHS Improvement 2017–2018 bed day tariff¹¹ and previously described HES LoS data.¹³ 2017–2018 NHS England reference cost data for a single ICU/HDU day (Critical care HRG4 +codes XC01Z–XC07Z)¹¹ were then used in combination with HES LoS data (as described above)¹³ to estimate the mean cost of ICU/HDU stays for these patients, with and without an SSI.

Estimation of costs of postoperative complications resulting in unplanned readmission or further surgery in patients who underwent ORH

Further HRG4+coded procedure reference costs were also identified, based on published lists¹⁰ and expert clinical opinion, and analysed to better understand the actual

costs associated with the development of common post-operative complications requiring readmission (eg, AL or SSI), sometimes leading to SSOs (eg, incisional hernia) in patients initially admitted for ORH procedures.

The actual cost of patient readmissions due to postoperative complications was estimated for the most and least complex and/or comorbid cases using reference cost data for HRG4 +codes FF51A and FF51E (Major general abdominal procedures; 19 years and over; and with CC score 10+, or CC score 0, respectively),⁷ and compared with national tariff data.¹² Similarly, the actual cost of patients representing with complications requiring additional surgery was estimated for the most and least complex and/or comorbid cases using reference cost data for HRG4 +codes FF31A and FF31D (Complex large intestine procedures; 19 years and over; and with CC score 9+, or CC score 0–2, respectively),¹¹ and compared with national tariff data.¹² All data used in these comparisons were categorised as non-elective admissions, that is, emergency admissions.

Finally, the actual cost of patients subsequently representing with an incisional hernia was estimated for the least complex and/or comorbid cases using reference cost data for HRG4 +code FF61C (Abdominal hernia procedures; 19 years and over; and with CC score 0),¹¹ and compared with national tariff data.¹² All data used in this comparison were categorised as elective or non-elective admissions to identify variations in cost and reimbursement. A summary table of all data sources and uses is included in online supplemental table S2.

NHS England Trusts

To assess the financial burden of patients who underwent an ORH at a national level, information from all NHS

England Trusts that submitted both reference cost data to NHS Improvement and HES data reporting activity levels for the 2017–2018 financial year were included in this analysis.

Statistical methods

All statistical analyses were carried out using Microsoft Excel (Microsoft, 2016 version for Windows). For parametric HRG4 +data, mean±SD and range were reported. For HES data, descriptive statistics were reported (mean for continuous variables and number (percentage) for categorical variables).

Patient and public involvement

No patient involved.

RESULTS

One-hundred and forty of a possible 150 NHS England Trusts (93.3%) submitted both reference cost data to NHS Improvement for HRG4 +FF32 and HES data reporting activity levels for these procedures for the 2017–2018 financial year. In total, 9812 HRG4 +FF32 codes were reported between 1 April 2017 and 31 March 2018 across all 140 NHS England Trusts (table 1, figure 1). Elective admissions (ie, planned admissions) accounted for 74.0% (7260/9812) HRG4 +FF32 codes reported while non-elective admissions (ie, emergency admissions) accounted for 26.0% (2552/9812). Overall, ORH procedures in patients ≥19 years with lower complexity and/or fewer comorbidities (HRG4 +FF32C-coded procedures) accounted for 65.3% of reported activity across all Trusts (6,408/9,812). There were more elective admissions than non-elective admissions across all HRG4 +FF32 codes.

Table 1 Total Healthcare Resource Group 4 (HRG)+FF32 codes reported in 2017–2018 financial year by 140 National Health Service England Trusts, total actual initial (index) admission costs (2017–2018) and corresponding national tariff totals (2017–2018), categorised by code and by elective versus non-elective admission

HRG4 +code	Sum of actual initial (index) admission costs reported	Sum of national tariffs	Difference between tariff and actual initial (index) admission costs
FF32A—all (N=1020)	£9 446 648	£9 221 238	–£225 410
Elective (n=582)	£5 369 086	£7945×582 = £4 623 990	–£745 096
Non-elective (n=438)	£4 077 562	£10 496×438 = £4 597 248	£519 686
FF32B—all (N=2384)	£16 990 583	£15 223 688	–£1 766 895
Elective (n=1694)	£11 910 822	£5947×1694 = £10 074 218	–£1 836 604
Non-elective (n=690)	£5 079 761	£7463×690 = £5 149 470	£69 709
FF32C—all (N=6408)	£41 083 106	£33 142 176	–£7 940 930
Elective (n=4984)	£31 915 371	£5056×4984 = £25 199 104	–£6 716 267
Non-elective (n=1424)	£9 167 735	£5578×1424 = £7 943 072	–£1 224 663
Total FF32—all (N=9812)	£67 520 337	£57 587 102	–£9 933 235
Elective (n=7260)	£49 195 279	£39 897 312	–£9 297 967
Non-elective (n=2552)	£18 325 058	£17 689 790	–£635 268

Elective, planned; non-elective, emergency.

Figure 1 Total number of Healthcare Resource Group 4 (HRG)+FF32 codes reported in 2017–2018 financial year by each National Health Service (NHS) England Trust.

Costs of initial (index) admission ORH patient episodes

The total actual costs of initial admissions for ORH procedures (HRG4 +s FF32A, FF32B and FF32C) incurred by 140 NHS England Trusts during the 2017–2018 financial year (categorised as elective or non-elective admissions) are shown in [table 1](#), alongside the corresponding HRG4 +2017–2018 national tariff totals for comparison. These figures suggest a total 1-year deficit between actual initial admission patient episode costs incurred and tariffs reimbursed across all 140 NHS England Trusts of £9933 235. Of this deficit, 93.6% was associated with elective admissions.

For all elective and non-elective HRG4 +FF32-coded procedures included in this analysis, mean±SD actual initial admission costs per patient episode of £7439 ± £3167 and £7093 ± £4095, respectively, were reported in 2017–2018 ([table 2](#)). The weighted average national tariffs for these procedures during 2017–2018 were £5496 and £6932, respectively, suggesting a potential loss of £1944 per elective patient procedure and a smaller potential loss of £162 per non-elective patient procedure for healthcare providers. Reference costs, reported by providers of these procedures, for all elective and non-elective HRG4 +FF32-coded procedures included in this analysis showed considerable variation, ranging from £83 to £25 722 and from £20 to £30 355, respectively.

Subanalysis on initial (index) admission costs of most complex patient episodes

The most complex patient episodes (ie, HRG4 +FF32A-coded procedures), reported by 133 of 140 Trusts, accounted for 8.0% (582/7260) of all elective procedures and 17.2% (438/2552) of all non-elective procedures analysed across all Trusts ([table 1](#)). Reported reference costs for these procedures ranged from £230 to £25 722 and from £113 to £30 355, respectively, suggesting surprisingly low costs reported for complex patients in

some cases, which are presumed inaccuracies in coding. However, mean±SD actual initial admissions costs per patient episode of £9182 ± £3871 and £8933 ± £5353, respectively, were reported ([table 2](#), [figures 2 and 3](#)). Given the 2017–2018 HRG4 +FF32A national tariffs for elective and non-elective admissions, these results suggest an average loss of £1237 per complex elective patient procedure but more than adequate reimbursement for healthcare providers per complex non-elective patient procedure ([table 2](#)).

Across all NHS England Trusts, 45.3% of the total reported HRG4 +FF32A elective admission activity was reported as costing above the calculated mean actual initial admission cost of £9182 ([figure 2](#)). Furthermore, 12.9% of the total reported HRG4 +FF32A elective admission activity cost was >1 SD (>£3871) above the calculated mean actual initial admission cost. This cohort of 12.9% of patients had an elevated mean actual initial admission cost per patient episode of £15 974.

A parallel analysis on HRG4 +FF32A non-elective admissions yielded similar results. Across all NHS England Trusts, 49.3% of the total reported HRG4 +FF32A non-elective admission activity was reported as costing above the calculated mean actual initial admission cost of £8933 ([figure 3](#)). Similarly, 12.6% of the total reported HRG4 +FF32A non-elective admission activity cost was >1 SD (>£5,353) above the calculated mean actual initial admission cost. This cohort of 12.6% of patient had a mean actual initial admission cost per patient episode of £18 717.

Costs of postoperative complications resulting in delayed discharge of patients who underwent ORH

Surgical ward stays, ICU/HDU stays and SSIs

Between 1 April 2017 and 31 March 2018, HES for patients who underwent an ORH (ie, OPCS-4.8-coded H06+, H07 +and H08+procedures) reported across all 140

Table 2 Mean±SD and range of actual costs for all analysed Healthcare Resource Group 4 (HRG)+-coded patient episodes reported by 140 National Health Service England Trusts (2017–2018) and corresponding weighted average national tariffs (2017–2018), categorised as elective or non-elective admissions (where appropriate)

HRG4 +code	Mean±SD actual cost reported	Range of actual costs reported	Weighted average national tariff	Difference between tariff and actual cost
Initial (index) admission costs				
FF32—all				
Elective	£7439±£3167	£83–£25 722	£5496	–£1944
Non-elective	£7093±£4095	£20–£30 355	£6932	–£162
FF32A				
Elective	£918±£3871	£230–£25 722	£7945	–£1237
Non-elective	£8933±£5353	£113–£30 355	£10 496	+£1563
FF32B				
Elective	£7281±£2734	£509–£23 935	£5947	–£1784
Non-elective	£6964±£3511	£20–£19 592	£7463	+£499
FF32C				
Elective	£6405±£2405	£83–£17 723	£5056	–£1349
Non-elective	£6011±£3041	£73–£21 585	£5578	–£433
Costs of postoperative complications resulting in unplanned readmission or further surgery				
FF51A				
Elective	N/A	N/A	N/A	N/A
Non-elective	£8,985 ± £9017	£61–£89 389	£11 541	+£2556
FF51E				
Elective	N/A	N/A	N/A	N/A
Non-elective	£3664±£3092	£99–£50 646	£2935	–£729
FF31A				
Elective	N/A	N/A	N/A	N/A
Non-elective	£11 048±£10 066	£20–£87 003	£12 347	+£1299
FF31D				
Elective	N/A	N/A	N/A	N/A
Non-elective	£6630±£5753	£20–£109 516	£6520	–£110
FF61C				
Elective	£2862±£1800	£8–£16 833	£1872	–£990
Non-elective	£2974±£1628	£242–£12 147	£2650	–£324

Elective, planned; N/A, not applicable; non-elective, emergency.

NHS England Trusts (N=6667) indicated a mean surgical ward LoS for all patient episodes of 13.3 days per patient (table 3). Mean surgical ward LoS for patients with an SSI increased to 29.0 days per patient, an additional 15.7 days per patient above the mean for all ORH patient episodes. The cost of the average extended surgical ward LoS associated with an SSI was estimated at £6139 using the published 2017–2018 NHS England surgical ward bed day rate of £391.¹²

Furthermore, 2.0% (133/6,667) of patients who underwent an ORH (including elective and non-elective procedures) were admitted to an ICU/HDU for a mean LoS of 6.5 days per patient. Of the patients requiring ICU/HDUs, 18.8% had an SSI (25/133), which increased the mean LoS in ICU/HDU to 49.7 days per patient, an

additional 43.2 days per patient above the mean for all ORH patient episodes. NHS England reference costs for a single ICU/HDU day are stratified by number of organs supported (online supplemental table S3) and 2017–2018 actual reported costs ranged from £693 per day for zero organs supported to £2359 per day for six or more organs supported, with a weighted average cost of £1395. However, HRG4 +code XC06Z (Adult critical care, 1 organ supported, £1049 per day) was considered the most likely HRG4 +code to be used for most patients with an ORH in ICU/HDU. Therefore, based on a cost of £1049/day, the cost of the average LoS in ICU/HDU associated with a patient transferred to ICU/HDU after an ORH was estimated at £6818 and the additional cost of an extended LoS in ICU/HDU as a result of an SSI was estimated at £45 316.

Figure 2 Range of actual initial (index) admission patient episode costs of Healthcare Resource Group 4+FF32A-coded procedures incurred by 133 NHS England Trusts (2017–2018) for elective admissions (ie, planned). NHS, National Health Service.

Costs of postoperative complications resulting in unplanned readmission or further surgery in patients who underwent ORH

Unplanned patient readmissions

Reported 2017–2018 reference costs for non-elective patient readmissions assigned HRG4 +FF51A (Major

general abdominal procedures, 19 years and over, with CC score 10+) and FF51E (Major general abdominal procedures, 19 years and over, with CC score 0) codes (table 2), also showed significant ranges: from £61 to £89 389 and from £99 to £50 646, respectively. Compared with weighted average tariffs for patient episodes associated

Figure 3 Range of actual initial (index) admission patient episode costs of Healthcare Resource Group 4+FF32A-coded procedures incurred by 133 NHS England Trusts (2017–2018) for non-elective admissions (ie, emergency). NHS, National Health Service.

Table 3 Hospital Episode Statistics for patients with an open right or extended right hemicolectomy reported in 2017–2018 financial year by 140 National Health Service England Trusts (N=6667)

Surgical ward LoS, all patient episodes, mean	13.3 days/patient
No of patients with SSI, n (%)	364 (5.5%)
Surgical ward LoS, patients with SSI, mean	29.0 days/patient
No of patients with ICU/HDU stay, n (%)	133 (2.0%)
LoS in ICU/HDU, patients with ICU/HDU stay, mean	6.5 days/patient
No of patients with ICU/HDU stay and SSI, n (%)	25 (18.8%)*
LoS in ICU/HDU, patients with ICU/HDU stay and SSI, mean	49.7 days/patient

*Percentage calculated as proportion of patients with ICU stay. HDU, high-dependency unit; ICU, intensive care unit; LoS, length of stay; SSI, surgical site infection.

with these procedures, mean±SD actual costs suggested more than adequate reimbursement for more complex non-elective FF51A procedures but a potential loss of £729 per less complex non-elective FF51E procedure for healthcare providers.

Patients representing requiring additional colorectal surgery

Reported 2017–2018 reference costs for patients requiring additional non-elective colorectal surgery assigned HRG 4+FF31A (Complex large intestine procedures, 19 years and over, with CC score 9+) and FF31D (Complex large intestine procedures, 19 years and over, with CC score 0–2) codes (table 2), also showed significant ranges from £20 to £87 003 and £20 to £109 516, respectively. Similarly, mean±SD actual costs suggested more than adequate reimbursement for more patient episodes associated with complex non-elective FF31A additional colorectal surgery but a potential loss of £110 per less complex non-elective FF51E additional colorectal surgery patient episode, when compared with weighted average tariffs for these procedures.

Patients representing with an incisional hernia

When considering only the least complex patients representing with an incisional hernia (ie, HRG4 +FF61C-coded procedures), despite smaller ranges in reference costs reported for both elective and non-elective admissions, the results suggest average losses for healthcare providers of £990 per elective incisional hernia patient episode and £324 per non-elective incisional hernia patient episode (table 2).

DISCUSSION

Our study demonstrates the significant financial burden of one subset of colorectal surgical procedures (ie, ORH) to NHS England. We estimated a total 1-year deficit of

almost £10 000 000.00 between actual initial (index) admission costs incurred and tariffs reimbursed for almost 10 000 ORH procedures across 140 NHS England Trusts, even before factoring in the costs of postoperative complications associated with these patient episodes. At a top line level, this deficit illustrates the ‘out of kilter’ setting of tariffs versus the true costs to NHS Trusts; primary open surgery is shown to be more costly than the funding hospitals receive when tariffs are calculated based on cost means. Further analyses of the data demonstrated the variability in patient episodes coded similarly and explored the impact on costs.

The true impact of underfunded tariffs is masked as the range of reference costs reported by NHS Trusts for a procedure, which is used by NHS Improvement to set the tariff, is extensive. Three-quarters of the procedures in this analysis were elective admissions, accounting for more than 90% of the estimated deficit, and the range of costs submitted by NHS Trusts for elective ORH initial admissions was considerable (from about £80–£26 000 per patient episode). Perhaps understandably, the range of costs for unscheduled non-elective ORH initial admissions was greater (from about £20–£30 000 per patient episode), although these costs only accounted for a small proportion of the total estimated deficit. Furthermore, when considering the most complex patient episodes, which accounted for more non-elective than elective procedures, 49.3% and 45.3% of reported activity, respectively, was above the calculated mean actual initial admission cost for these procedures, with 12.6% and 12.9%, respectively, >1 SD above the mean. The results of this analysis suggest that outliers impacted the mean actual initial admission cost for both elective and non-elective procedures, as evidenced by the total 1-year deficit. Although there were a significant number of high-cost episodes reported, the effect of the very low-cost episodes reported appeared to impact the tariff to a greater extent, thereby reducing payments for complex patients. Based on these findings, we suggest that cost control for this type of surgery could benefit from a review, with consideration given to when and where the surgery should take place and assessed against evidence-based practice as outlined by the NHS improvement programme Getting It Right First Time.¹⁴ Given that the majority of NHS Trusts are performing ORH procedures throughout England, with reported costs ranging from £20 to over £30 000, it is our view that complex patients should potentially be centralised.

We also assessed the costs of common postoperative complications resulting in delayed discharge, unplanned readmission or further surgery associated with ORH. Our findings showed that the SSI rate for these patients and the impact on bed days have significant consequences for NHS Trusts. The National Institute for Health and Care Excellence (NICE) reports the average cost of a large bowel SSI in the NHS at £5518.¹⁵ We demonstrated that an SSI increased the average surgical ward LoS by 15.7 bed days at an additional cost of over £6000 per patient.

This 118% increase in bed days uses vital bed capacity, which could be a factor with respect to recent reporting of waiting times within NHS England Trusts.¹⁶ Moreover, this study only considered ORH patient episodes. We did not consider laparoscopic right hemicolectomies, which are reported to have a higher cost despite a reported shorter LoS.¹⁷ It must also be recognised that there are many open (and laparoscopic) colorectal procedures that could potentially have an equivalent, if not greater, impact on bed capacity.

Some patients do require ICU/HCU care. However, with the risk of an SSI because of an ORH, it was reported that each patient who presented with an SSI leading to an ICU/HCU admission cost more than an additional £45 000 due to an average extended LoS of 43.2 days (49.7–6.5 days). Moreover, this calculation was based on the patient having a single organ supported, whereas in some cases, the number of organs supported could be greater, significantly increasing the associated costs. This led to a 665% increase in mean LoS in ICU/HDU due to an SSI. Once again, this impacts on already overstretched resources.

With a number of patient pathways, it has been extensively reported that readmissions to hospital are common due to later events, such as incisional hernia development.¹⁸ We found that the corresponding national tariffs for the most complex non-elective patient readmissions or representations requiring additional surgery were more than adequate, likely because the initial presentation was elective and the later readmission was often for a non-elective procedure and, therefore, funded separately. However, national tariffs for less complex readmissions or representations fell short of mean reported costs. Similarly, national tariffs for the least complex patients representing with incisional hernias, whether elective or non-elective, were also insufficient to cover healthcare providers' costs.

Limitations

This study has identified several limitations with respect to the reference cost data due to current data collection and reporting processes within and across NHS Trusts. The data used for this analysis was of higher quality than that available in previous years, as 2017–2018 reference cost data includes NHS Trust-submitted patient-level information costing system. These are reported at a more granular level, for the first time, and should, therefore, more accurately reflect the true cost of patient care. However, the quality of NHS Improvement reference cost data is not audited; therefore, we were unable to remove any outliers. In this regard, the range of actual costs reported and the SDs associated with mean actual costs reported throughout this study provide further evidence of varied cost collection and submission procedures for complex surgeries across NHS England. This could impact the overall mean costs reported; however, we have shown a weighted average in all cases where data were available.

Unfortunately, our analysis was unable to demonstrate any costs in primary care, due to the lack of relevant data collection and reporting in this setting. Therefore, it is reasonable to suggest that our findings are an underestimate of the total cost of patient care.

Furthermore, HES for complex surgeries are reliant on the clinical codes assigned by hospital coding teams, which are translated from the surgeons' operation notes. The latest NHS England report indicated a mean margin of error of 7.0% (range 1.1%–45.8%) in clinical coding of HES data across the country.¹⁹ Although these errors influence the HRG4 +groupings, they do not change the actual costs associated with delivering surgeries. As NHS England evolves towards reporting more patient-level cost data for all treatments, greater clarity should emerge. It is highly likely that this will generate a greater focus on actual cost submissions, challenging NHS Trusts on irregular cost reporting.

CONCLUSION

After completing the analysis of both the initial (index) admission costs, tariffs and financial implications of postoperative complications, it is clear the total costs of delivering care for patients who undergo an ORH declared by all NHS Trusts is far higher than the tariff provided. In addition to underfunded initial admission cost tariffs for some patient episodes, postoperative complication costs add to the total cost of care for many patients but are not always adequately reimbursed to NHS Trusts.

These findings demonstrate a potential lack of understanding of the costing system, evidenced by NHS Trusts submitting reference costs as low as £20 for a non-elective primary ORH procedure seemingly without thought to the impact on the national tariff, and a need to better understand the optimum pathway for these patients. Significant savings could potentially be achieved by better recognition of the range of costs contributing to the complete care of these patients.

Although some patients will require a planned elective or postoperative ICU/HDU stay, aftercare is crucial to ensure avoidable readmission costs are either reduced or eliminated where possible. By using evidence-based care and comparing this to individual patient pathways, it may be possible to reduce SSIs and other complications in the future, thereby potentially eliminating the cost of managing these complications. System changes such as these would benefit both NHS England and patients.

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