RESEARCH ARTICLE

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Cancer patient experience, hospital performance and case mix: evidence from England

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ABSTRACT: **Aims:** This study aims to explore differences between crude and case mix-adjusted estimates of hospital performance with respect to the experience of cancer patients. **Materials & methods:** This study analyzed the English 2011/2012 Cancer Patient Experience Survey covering all English National Health Service hospitals providing cancer treatment (n = 160). Logistic regression analysis was used to predict hospital performance for each of the 64 evaluative questions, adjusting for age, gender, ethnic group and cancer diagnosis. The degree of reclassification was explored across three categories (bottom 20%, middle 60% and top 20% of hospitals). **Results:** There was high concordance between crude and adjusted ranks of hospitals (median Kendall's $\tau = 0.84$; interquartile range: 0.82–0.88). Across all questions, a median of 5.0% (eight) of hospitals (interquartile range: 3.8–6.4%; six to ten hospitals) moved out of the extreme performance categories after case mix adjustment. **Conclusion:** In this context, patient case mix has only a small impact on measured hospital performance for cancer patient experience.

Patient experience represents a dimension of the quality of health services, alongside safety and effectiveness [1,101]. Consequently, different health systems have recently invested in large surveys that examine the experience of hospital patients, such as the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey in the USA and the Adult Inpatients Survey in England [102,103]. Surveys of patients with any pathology can capture the overall experience of those treated in a given hospital, but interpretation of the findings and prioritization of improvement actions may be difficult. This may particularly be the case for patients with complex treatment pathways, as is the case for patients with cancer. Therefore, experience surveys specifically focusing on cancer patients have been advocated. The English Cancer Patient Experience Survey (CPES) program provides a unique example of a large national experience survey of cancer patients [104]. In the USA, the Institute of Medicine's recent report highlighted, among others, the need for engaging patients in care [2] and a survey of the experience of cancer patients is also under development [3,4].

In general, healthcare outcomes are influenced not only by the quality of care provided to patients, but also by 'exogenous' factors, such as the sociodemographic characteristics of patients and the severity of their illness. For this reason, observed (crude) scores of hospital clinical performance are often adjusted for patient 'case mix' [5]. However, the case for case mix adjustment of patient experience measures is less clear cut than for clinical measures. Unlike clinical events, such as inpatient mortality or hospital-acquired infection, which have a precise definition, judgments about the quality of care may be influenced by differential response tendencies between different patient groups. Therefore, adjusting patient experience hospital scores for patient case mix may mask legitimate

KEYWORDS

- cancer • case mix adjustment • disparity
- inequality • organizational quality • patient experience
- public reporting
- satisfaction

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Table 1. Variation in sociodemographic and cancer diagnosis case mix between hospitals in different categories of performance illustrated for question 70 (overall rating of experience of cancer care).

Demographic	Top 20%; n (%)	Middle 60%; n (%)	Bottom 20%; n (%)
Age (years)			
16–24	68 (0.6)	253 (0.5)	34 (0.3)
25–34	138 (1.2)	653 (1.4)	163 (1.6)
35–44	549 (4.8)	1998 (4.2)	452 (4.5)
45–54	1597 (13.8)	6075 (12.8)	1239 (12.3)
55–64	2867 (24.8)	11,629 (24.5)	2474 (24.5)
65–74	3787 (32.8)	15,708 (33.1)	3254 (32.2)
75–84	2132 (18.4)	9331 (19.7)	2101 (20.8)
85+	419 (3.6)	1781 (3.8)	384 (3.8)
Median (IQR)	66 (57–74)	66 (58–74)	66 (58–74)
Gender			
Male	5102 (44.1)	22,487 (47.4)	4874 (48.3)
Female	6455 (55.9)	24,941 (52.6)	5227 (51.7)
Ethnic group			
White	11,255 (97.4)	45,898 (96.8)	9268 (91.8)
Mixed	35 (0.3)	183 (0.4)	60 (0.6)
Asian	123 (1.1)	659 (1.4)	364 (3.6)
Black	98 (0.8)	511 (1.1)	340 (3.4)
Chinese	24 (0.2)	94 (0.2)	32 (0.3)
Other	22 (0.2)	83 (0.2)	37 (0.4)
Hospital			
Teaching hospital	2320 (20.1)	13,555 (28.6)	2883 (28.5)
Other hospital type	9237 (79.9)	33,873 (71.4)	7218 (71.5)
Cancer diagnosis			
Breast	2378 (20.6)	9017 (19.0)	2001 (19.8)
DCIS	155 (1.3)	639 (1.3)	122 (1.2)
Ovarian	336 (2.9)	1257 (2.7)	230 (2.3)
Endometrial	273 (2.4)	1020 (2.2)	185 (1.8)
Cervical	88 (0.8)	269 (0.6)	48 (0.5)
Vulval/vaginal	43 (0.4)	170 (0.4)	23 (0.2)
Other gynecological	23 (0.2)	57 (0.1)	8 (0.1)
Thyroid	66 (0.6)	353 (0.7)	74 (0.7)
Laryngeal	45 (0.4)	271 (0.6)	45 (0.4)
Other head and neck	215 (1.9)	906 (1.9)	159 (1.6)
Non-Hodgkin's lymphoma	653 (5.7)	2973 (6.3)	664 (6.6)
Multiple myeloma	561 (4.9)	2167 (4.6)	508 (5.0)
Leukemia	338 (2.9)	1742 (3.7)	399 (4.0)
Hodgkin's lymphoma	66 (0.6)	325 (0.7)	96 (1.0)
Rectal	590 (5.1)	2384 (5.0)	567 (5.6)
Colon	856 (7.4)	3387 (7.1)	811 (8.0)
Anal	39 (0.3)	170 (0.4)	33 (0.3)
Other lower gastrointestinal	37 (0.3)	152 (0.3)	26 (0.3)
Lung	634 (5.5)	2483 (5.2)	581 (5.8)
Mesothelioma	88 (0.8)	254 (0.5)	50 (0.5)
Brain	55 (0.5)	358 (0.8)	70 (0.7)
Other CNS	5 (0.0)	38 (0.1)	16 (0.2)

DCIS: Ductal carcinoma *in situ*; IQR: Interquartile range.

Table 1. Variation in sociodemographic and cancer diagnosis case mix between hospitals in different categories of performance illustrated for question 70 (overall rating of experience of cancer care) (cont.).

Demographic	Top 20%; n (%)	Middle 60%; n (%)	Bottom 20%; n (%)
Cancer diagnosis (cont.)			
Esophageal	186 (1.6)	957 (2.0)	219 (2.2)
Stomach	169 (1.5)	694 (1.5)	156 (1.5)
Pancreatic	102 (0.9)	474 (1.0)	97 (1.0)
Hepatobiliary/gallbladder	67 (0.6)	446 (0.9)	55 (0.5)
Bladder	852 (7.4)	4621 (9.7)	1030 (10.2)
Prostate	948 (8.2)	3778 (8.0)	842 (8.3)
Renal	103 (0.9)	708 (1.5)	139 (1.4)
Other urological	49 (0.4)	254 (0.5)	46 (0.5)
Testicular	35 (0.3)	190 (0.4)	31 (0.3)
Secondary	949 (8.2)	2866 (6.0)	493 (4.9)
Melanoma	282 (2.4)	1142 (2.4)	122 (1.2)
Soft tissue sarcoma	124 (1.1)	397 (0.8)	54 (0.5)
Bone sarcoma	26 (0.2)	133 (0.3)	15 (0.1)
Any other cancer diagnosis	121 (1.0)	376 (0.8)	86 (0.9)

DCIS: Ductal carcinoma *in situ*; IQR: Interquartile range.

differences in expectations of quality between different patient groups [6]. Furthermore, it may be that different patient groups actually receive different qualities of care universally and, in such situations, case mix adjustment still allows hospitals to be judged on an even playing field of how they would perform with comparable populations. Independent of these considerations, when poor apparent performance does chiefly reflect patient case mix, erroneously attributing it to deficiencies in care quality can demoralize frontline members of staff. It can also adversely affect the organization's reputation and effectiveness, including making it more difficult for a hospital to attract and retain staff and patients [6]. Finally, as with any type of misclassification, opportunities to focus on genuine problems are foregone.

In England, the performance of each National Health Service (NHS) hospital trust (hereafter referred to as a hospital) in respect of cancer patient experience is reported publicly, without case mix adjustment [104]. Earlier reports indicate that younger patients with cancer, and those who belong to ethnic minority groups and suffer from some rarer cancers, tend to evaluate their care experience more critically [7,8,104]. It is therefore possible that hospitals that serve a higher than average proportion of patients with these characteristics or diagnoses are more likely to be seen as poorly performing. However, the degree to which patient case mix influences hospital

scores of cancer patient experience is unknown. Not addressing legitimate concerns of hospital practitioners and managers regarding the potential importance of case mix on hospital performance scores may lead to a lack of confidence in publicly reported data and disengagement with quality improvement efforts [9]. We have therefore set out to explore differences between the crude and case mix-adjusted performance of NHS hospitals with respect to cancer patient experience.

Materials & methods

• Data

We used data from the 2011/2012 CPES, a postal survey of all cancer patients treated by 160 English NHS hospital trusts during the 3-month period between September and November 2011, carried out by Quality Health (a specialist patient survey provider) for the Department of Health [105].

• Patient experience measures

Survey questions were developed and validated by the survey providers following standard cognitive testing techniques [104]. The survey instrument included 65 evaluative questions. These included questions about the experience of relevant care before cancer diagnosis; diagnostic testing; communication about the diagnosis; decision-making about cancer treatment; inpatient, day case and outpatient treatment (including experience of cancer surgery, radiotherapy and chemotherapy);

Figure 1. Impact of case mix adjustment on ranked hospital performance of each hospital for question 70 ‘Overall, how would you rate your care?’ The + signs indicate that a hospital’s estimated performance improved following case mix adjustment, while a - indicates that it got worse (o indicates no change).

and experience of primary or social care after hospital discharge. Most questions comprised of four or five ordinal response categories ranging from most positive to most negative experience categories [104]. For public reporting purposes, these response options are aggregated into binary outcomes (a ‘good’ or ‘very good’ experience vs all other categories [104]). Therefore, the same binary categorizations have been used in this analysis rather than the full Likert scale responses.

• Patient case mix variables

The choice of case mix adjusters was informed by previous work indicating variation between patients with different sociodemographic characteristics and cancer diagnosis [7,8,104]. We used information on patients’ gender, age group (16–24 years, six 10-year groups from 25–34 to 75–84 years and 85+ years), ethnicity (white, mixed race, Asian or Asian British, Black or Black British, Chinese and other) and cancer (36 organ-specific diagnosis groups, see [Supplementary Table 1](#) online at www.futuremedicine.com/doi/suppl/10.2217/FON.13.266). Information on age, gender and cancer diagnosis was based on the hospital patient records and was complete. Ethnic group information relates to the Office of National Statistics classification and is based on participant responses to survey question 77 [10,106].

• Analysis

The rationale and underlying methodology for the case mix adjustment of patient experience measures has been described elsewhere [11,12]. Here, we describe the specific application of these methodological principles to this study.

For each survey question, public reporting of hospital performance is based on reporting of the centile rank of each hospital. A further coarser aggregation into three ordinal performance categories is also used. Specifically, based on their relative performance ranks, hospitals are categorized in the top 20% (‘green’), middle 60% (‘amber’) or bottom 20% (‘red’) categories [104]. Given the overall number of surveyed hospitals ($n = 160$), there are 32 hospitals in the top or bottom 20% categories, and 96 hospitals in the middle 60% categories.

Initially, to illustrate variation in patient case mix across hospitals we described the characteristics of survey respondents for hospitals in the crude (i.e., unadjusted) bottom 20%, middle 60% and top 20% performance categories.

Case mix-adjusted hospital scores were predicted from logistic regression models (one per question), including fixed effects for hospital of treatment, adjusting for patient age, gender, ethnic group and cancer diagnosis. Fixed effects were used for hospitals, rather than random effects, as they avoid various problems associated with differential reliability due to differing hospital sample sizes. We include case mix variables only as main effects and do not consider interactions. The case mix-adjusted hospital scores were then used to calculate the case mix-adjusted centile rank and respective performance category of each hospital. Comparing unadjusted and case mix-adjusted ranks for each question, we estimated the degree of rank concordance with the Kendall’s τ statistic and counted the number of hospitals that changed performance category after case mix adjustment.

In addition, we also considered hospital performance on a question-by-question basis and calculated the number of questions for which a hospital appears in the top 20% or the bottom 20% category before and after case mix adjustment. This metric is used by a major English cancer charity for purposes of summarizing and publicly reporting the results of the survey [107].

Finally, we estimated the proportion of apparent variation in performance between hospitals that can be explained by all three sociodemographic variables (age, gender and ethnicity) alone (i.e., without adjustment for cancer) or

by cancer diagnosis alone (i.e., without adjustment for sociodemographic variables). Mixed effects logistic regression models with hospital as a random effect were used to quantify the variance of between-hospital scores in terms of the variance of the random effect. The amount of between-hospital variation ‘uniquely explained’ by cancer diagnosis represents the difference between the total percentage of between-hospital variation explained by all case mix adjusters and the percentage explained by sociodemographic variables alone, and *vice versa*. For one question (question 28, exploring whether a patient was pleased to have been asked to take part in cancer research), the adjusted model did not converge, as patient experience was strongly positive across all hospitals. For consistency, this question was, therefore, excluded from all analyses and results relate to 64 evaluative questions.

All analysis was conducted on a complete case basis. A multiple imputation approach was not employed as there was only a very small amount of missing case mix data (3.7%). All analyses were carried out using Stata 11.2 (StataCorp, TX, USA).

Results

There were 71,793 cancer patients who responded to the survey (response rate: 68%). Information on self-reported ethnicity was missing for 2707 (3.7%) patients. Therefore, information from 69,086 respondents was subsequently analyzed, treated by a total of 160 different hospitals, with a mean of 432 responses per hospital.

There was a modest degree of variation in both sociodemographic and cancer diagnosis case mix between hospitals in different performance categories (Table 1). In particular, lower scoring (bottom 20%) hospitals tend to treat fewer women patients (51.7 vs 55.9%), more patients from ethnic minorities (8.2 vs 2.6%), more patients with bladder cancer (10.2 vs 7.4%) and fewer patients with secondary cancers (4.9 vs 8.2%) than higher-scoring (top 20%) hospitals.

• Reclassification of hospital rank & performance category owing to case mix adjustment

There was a high degree of concordance between crude and adjusted ranks before and after case mix adjustment (median Kendall's $\tau = 0.84$; interquartile range: 0.82–0.88; see Supplementary Table 2). After case mix adjustment, a median of 3.1% (five out of 160) of all hospitals across all questions (interquartile range: 1.9–3.8%; three

to six hospitals) moved out of the bottom 20% and into the middle 60% performance category after case mix adjustment (with the same number of hospitals reciprocally changing performance category from the middle 60% to the bottom 20%). At the other end of the performance spectrum, a median of 2.5% (four out of 160) of all hospitals across all questions (interquartile range: 2.5–6.3%; four to ten hospitals) moved out of the top 20% and into the middle 60% performance category after case mix adjustment. Across all questions, a median of 5.0% (eight) of hospitals (interquartile range: 3.8–6.4%; six to ten hospitals) moved out of the extreme performance categories after case mix adjustment.

The impact of case mix on hospital rank for one example question (question 70; ‘Overall, how would you rate your care?’) is shown in Figures 1 & 2. We see that after case mix adjustment most hospitals remain in their original performance categories (‘red’, ‘amber’ and ‘green’) with few exceptions. We also note that for those hospitals that do change performance category, changes in the respective centile ranks are typically small (for this reason, hospitals with crude ranks close to performance category boundaries are more likely to change performance classification). These observations represent a typical picture seen across the survey questions (Supplementary Figures 1–3).

Table 2 shows the impact of case mix adjustment for the eight questions where its

		Case mix-adjusted performance classification		
		Bottom 20%	Middle 60%	Top 20%
Unadjusted performance classification	Top 20%	0 (0.0)	5 (3.1)	27 (16.9)
	Middle 60%	5 (3.1)	86 (53.8)	5 (3.1)
	Bottom 20%	27 (16.9)	5 (3.1)	0 (0.0)

Figure 2. Impact of case mix adjustment on hospital performance classification for question 70 ‘Overall, how would you rate your care?’ Data are represented as n (%).

Table 2. Survey questions with the largest and smallest impact of case mix adjustment on hospital performance.

Question number	Question	Concordance in rank of hospital performance before/after CMA (%)	All hospitals that change performance category after CMA (%)	Hospitals that move into/out of the bottom 20% (bottom 32 hospitals) after CMA (n)	Hospitals that move into/out of the top 20% (top 32 hospitals) after CMA (n)	Variation in hospital performance explained by CMA (%)	Between hospital variation explained by cancer diagnosis alone (%)	Between hospital variation explained by sociodemographic characteristics alone (%)
<i>Questions where CMA has least impact</i>								
63	Doctor had the right notes and other documentation with them	90.0	2.5	1	1	2.7	4.0	0.0
51	Always treated with respect and dignity by staff	90.1	5.0	3	1	6.6	2.2	3.6
58	Staff definitely did everything they could to help control pain	86.2	5.0	3	1	16.9	-2.1	20.6
61	Waited no longer than 30 min for OPD appointment to start	91.0	5.0	2	2	3.1	0.8	2.7
7	Staff completely explained what would be done during test	89.0	6.3	2	3	14.8	0.9	15.5
21	Patient finds it easy to contact their CNS	92.2	6.3	3	2	8.6	2.5	5.9
42	Nurses did not talk in front of patient as if they were not there	85.1	6.3	4	1	25.5	0.1	26.4
62	Patient thought doctor spent about the right amount of time with them	87.8	6.3	3	2	13.4	2.2	12.3
<i>Questions where CMA has most impact</i>								
29	Patient would have liked to have been asked (to take part in cancer research)	72.8	20	6	10	58.6	24.4	51.8
18	Patient given written information about side effects	77.2	20	11	5	31.5	20.3	20.7
14	Patient given written information about the type of cancer they had	76.8	20	8	8	26.2	22.9	2.4
3	Percentage that saw a hospital doctor in less than 3 months	68.9	20	6	10	63.8	35.1	44.4
2	Patient thought they were seen as soon as necessary	77.4	20	11	5	52.6	26.2	35.7
1	Saw GP once/twice before being told had to go to hospital	64.4	26.3	13	8	64.9	40.0	31.5

CMA: Case mix adjustment; CNS: Clinical nurse specialist; GP: General practitioner; OPD: Outpatient department.

Table 2. Survey questions with the largest and smallest impact of case mix adjustment on hospital performance (cont.).

Question number	Question	Concordance in rank of hospital performance before/after CMA (%)	All hospitals that change performance category after CMA (%)	Hospitals that move into/out of the bottom 20% (bottom 32 hospitals) after CMA (n)	Hospitals that move into/out of the top 20% (top 32 hospitals) after CMA (n)	Variation in hospital performance explained by CMA (%)	Between hospital variation explained by cancer diagnosis alone (%)	Between hospital variation explained by sociodemographic characteristics alone (%)
<i>Questions where CMA has most impact (cont.)</i>								
13	Patient completely understood the explanation of what was wrong	64.0	27.5	14	8	48.8	43.3	24.5
4	Patient's health got better or remained about the same while waiting	55.2	30.0	14	10	72.0	54.5	28.3
CMA: Case mix adjustment; CNS: Clinical nurse specialist; GP: General practitioner; OPD: Outpatient department.								

impact is largest and the eight questions where its impact is smallest. The impact was least for questions relating to the organization of hospital outpatient clinics (questions 63 and 61) and those relating to staff communication (questions 51, 7, 42 and 52). Conversely, case mix adjustment had the most impact on questions relating to prediagnosis care (including by general practitioners) before referral to hospital (questions 1–4), questions about the provision of written information (questions 14 and 18) and personal preferences for involvement in cancer research (question 29) (Table 2 & Supplementary Table 3).

Across all questions, we found that seven of the bottom ten and seven of the top ten hospitals identified in the publicly reported league tables [107] are identified by both unadjusted and case mix-adjusted approaches.

• Overall variation in hospital scores explained by case mix variables

Across all questions, a median of 14.3% (interquartile range: 3.3–25.7%) of the variance in performance between hospitals was attributable to patient case mix, with a median of 4.4% attributable to clinical case mix (of which a median of 2.3% is uniquely attributable, i.e., cannot be explained by sociodemographic case mix) and 11.6% attributable to sociodemographic characteristics (of which a median of 7.0% is uniquely attributable) (Table 2 & Supplementary Table 4). Whether cancer diagnosis or sociodemographic characteristics explained most of the variation differed by question. For example, for question 4 (whether a patient's health got worse while waiting to be seen by the hospital), cancer diagnosis explained most of the variation, whereas for question 29 (whether patients who had not been asked to take part in research would have liked to have been), sociodemographic variables explained most of the variation. For 58% (38) of questions, sociodemographic characteristics explained more variance in hospital scores than clinical case mix. In a few cases, the variation between hospitals was larger after case mix adjustment than before (which appears as a negative percentage of between-hospital variance as explained in Supplementary Table 4). This occurs when the groups of patients reporting worse scores are concentrated in the better performing hospitals. In these circumstances, if we were to consider crude hospital scores, patient case mix would be masking true variation between hospitals rather than exaggerating it.

Discussion

Using data from a large national survey of cancer patient experience we examined the potential importance of patient case mix as a determinant of hospital performance. We found that patient case mix has an overall small impact on crude hospital ranks and performance categories. When reclassification of performance category did occur, the absolute change in hospital ranks was typically small. The impact of case mix was minimal for aspects of the patient experience that are directly under the control of the hospital (e.g., outpatient waiting times or experience of inpatient care).

In principle, patient case mix may have a large impact on hospital performance, but in the context of our study we found this impact to be only small. Similarly, a small impact of case mix on hospital performance was reported for clinical quality measures for the management of acute myocardial infarction in US hospitals [13] and when examining patient experience hospital scores of the HCAPHS survey [14]. As national CPESs have so far been unique to England, we are not aware of previous studies specifically exploring the influence of case mix on hospital performance with respect to the experience of cancer patients. However, this may also mean that the findings may have limited generalizability to other healthcare systems (e.g., outside the UK). A particular feature of UK hospitals is that there may be a higher degree of homogeneity of patient case mix than between hospitals operating in a more diverse ('pluralistic') market of competing hospitals, such as in the USA.

The main strength of our study is its unique context (large national patient experience survey of cancer patients with a diverse number of both common and rarer cancers). Other strengths include the ability to adjust for a range of important case mix variables, including self-reported ethnicity and cancer diagnosis, and the relatively high (for a postal patient survey) response rate of 68% – by contrast, HCAPHS survey response rates do not exceed 40% [15].

Certain limitations are also worth considering. The lack of available data means that we have not been able to adjust for some other case mix variables of potential interest. For example, we were not able to adjust for patient socioeconomic status. However, in supplementary analysis of data from the 2010 survey we observed no appreciable differences between crude and case mix-adjusted hospital ranks above and beyond those observed after adjustment for gender, age group, ethnicity

and cancer diagnosis (data not shown). This finding reflects only limited and inconsistent associations between the experience of English cancer patients and their socioeconomic status as previously described [7,8,104]. There is potential for some residual confounding of hospital performance by disease severity (e.g., if some hospitals treat patients diagnosed at a more advanced disease stage). While such potential differences may impact crude hospital scores, it is worth observing that adjustment for cancer diagnosis only had limited impact and this minimizes concerns about potential residual confounding by disease severity.

In this study, we only consider the impact of case mix on reclassification of hospital performance. There is the further issue of misclassification of (true) hospital performance, which can occur due to the imprecision of hospital performance estimates [16]. The degree of this misclassification depends on the reliability of the estimated performance scores. The reliability (also termed 'rankability') of quality indicators is both a function of the achieved sample size and the degree of heterogeneity in the performance of different hospitals [17,18]. In practice, and particularly for small hospitals, reliability limitations may introduce a degree of misclassification of true hospital performance that will be greater than the degree of reclassification because of patient case mix. Further empirical exploration of the reliability of questions included in the survey is warranted.

We believe that the findings add substantially to debates about the use of case mix adjustment in the reporting of organizational performance, and have implications for policy and research. First, the results extend previous work regarding the influence of patient case mix on hospital scores to encompass the experience of cancer patients. The findings can be of interest to policy makers in countries other than England when considering the commissioning of cancer patient surveys and the introduction of relevant public reporting schemes to motivate quality improvement efforts. Second, in the setting of our study, the findings indicate that typically patient case mix only has a small impact on crude (observed) hospital scores. This realization may help to 'win hearts and minds' of sceptical clinicians and managers in poorly performing hospitals, who may have (in good faith, but wrongly) hypothesized that the poor performance of their hospital may be attributable to patient case mix. In doing so, it can help frontline staff to more proactively and effectively engage with quality improvement

efforts to improve patient experience. Third, we believe that the findings add further support to the argument for parallel (simultaneous) reporting of both crude and case mix-adjusted scores of hospital performance [19]. When, as in the case of our study, both case mix and crude scores are similar, such parallel reporting can help to dispel any perceptions of unfair comparisons between hospitals serving different patient populations. Alternatively, in instances where patient case mix appears to influence apparent organizational performance substantially, parallel reporting of both crude and adjusted performance may help poorly performing hospitals to prioritize improvement efforts specifically focusing on patient groups that report worse experiences.

Conclusion & future perspective

In conclusion, we have considered the impact of patient case mix on crude hospital performance with respect to cancer patient experience and found that it has a marginal impact. This means that hospitals classified as better performing are largely not at an unfair advantage. Conversely, for those classified as poorly performing hospitals, patient case mix is by and large not to blame. We nevertheless advocate public reporting of both

crude and case mix-adjusted performance simultaneously, to help improve perceptions of fairness and staff engagement with improvement efforts. In the future, we envision greater use of patient experience to support quality improvement efforts in oncology and that the performance of hospitals and teams will be reported as both crude and case mix-adjusted scores.

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EXECUTIVE SUMMARY

Background

- Patient experience represents a key dimension of the quality-of-health services, alongside safety and effectiveness. However, research on patient experience of oncology services is so far limited.
- In England, the experience of cancer patients is measured using a nationwide postal survey of patients treated in English National Health Service hospitals during a 3-month period (the Cancer Patient Experience Survey).
- Earlier work indicates that younger patients, those who belong to ethnic minorities and those suffering from some rarer cancers tend to evaluate their care experience more critically.
- Inequalities in cancer patient experience may mean that patient case mix can influence hospital scores. This is because hospitals serving higher than average proportions of patients with characteristics or diagnoses associated with poorer experience may be more likely to be seen as poorly performing.
- Perceptions of unfair judgment of hospital performance may disengage clinicians and managers from performance improvement efforts.

Results

- Our analysis shows that adjustment for patient case mix makes little difference to crude ranks of hospital performance.
- Typically, for each survey question, between three and five hospitals move out of the group of 32 hospitals categorized as poor performing (the bottom 20% hospitals).

Discussion

- The implication of our findings is that hospitals classified as poorly performing are by and large not judged unfairly; conversely, hospitals classified as better performing are largely not at an unfair advantage.
- Nevertheless, we advocate public reporting of both crude and case mix-adjusted performance simultaneously, to help improve perceptions of fairness and the engagement of oncology staff with improvement efforts.

in the concept, design, analysis and interpretation of data, nor in the drafting of the manuscript and decision to submit for publication. The views expressed in this publication are those of the authors and not necessarily those of Macmillan Cancer Support, the NHS, the National Institute for Health Research or the Department of Health. The authors have no other relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript apart from those disclosed.

No writing assistance was utilized in the production of this manuscript.

Ethical conduct of research

The authors state that they have obtained appropriate institutional review board approval or have followed the principles outlined in the Declaration of Helsinki for all human or animal experimental investigations. In addition, for investigations involving human subjects, informed consent has been obtained from the participants involved.

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