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Trust-level 30-day mortality after systemic anticancer treatment for breast and lung cancer in England

Companion report

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Foreword

In a paper published in the September 2016 issue of the *Lancet Oncology*[1], we described the use of NHS systemic anticancer therapy (SACT) information on a national scale to examine deaths among lung and breast cancer patients within 30 days of receiving SACT ('30-day mortality') in 2014. This represents a significant milestone on the way to providing timely, clinically relevant data on the outcomes of oncology care. Our study includes almost 28,4000 women with breast cancer and over 15,000 patients with lung cancer receiving SACT in 2014 at 147 English NHS trusts.There is huge potential for this information to support NHS hospital trusts in improving the care of their cancer patients.

The following is a companion report to the *Lancet Oncology* paper, providing trust-level analyses. We based the analyses in both publications on routine data from the systemic anticancer therapy (SACT) dataset. NHS hospital trusts began submitting data in April 2012, and submission became mandatory for all NHS hospital trusts in England from April 2014. Public Health England (PHE) led data collection and analysis, in partnership with NHS England and Cancer Research UK, and with invaluable support from the clinical community. This work is only possible because of data that the NHS routinely collects as part of patient care.

The paper and this companion report are the first major outputs from this data source. The paper describes the level and variation of 30-day mortality following systemic anticancer therapy (SACT) in patients with breast and lung cancer on a national level, while this report focuses on the variation between NHS hospital trusts. Both publications highlight the potential to use routine data on SACT to monitor and improve cancer patient care and outcomes, and enhance the data quality and reporting by trusts to that end.

In line with findings from previous studies, our analyses show that 30-day mortality following SACT occurs in a minority of patients but is a risk that cancer treatment teams must manage and discuss with patients. For palliatively treated breast cancer patients 30-day mortality was 7.5% while for palliatively treated lung cancer patients (small and non-small cell lung cancer combined) it was 10.0%. These figures show the importance of those discussions with patients when SACT is used in the context of palliative treatment - given with the intention of relieving symptoms, improving quality of life and prolonging survival for modest periods. For curatively treated breast cancer patients 30-day mortality was 0.3% while for curatively treated lung cancer patients (small and non-small cell lung cancer combined) it was 2.9%. As expected these figures are lower than those for palliative treatment. But they are higher than those reported from clinical trials[2,3].

Our paper shows that 30-day mortality varies depending on treatment intent, age, performance status, gender (in the case of non-small cell lung cancer, NSCLC), and whether patients had previously received any previous SACT treatments. There are also some NHS hospital trusts with 30-day mortality rates that appear significantly higher or lower than the English national average, which we explore in more detail in this companion report.

It is important to acknowledge that while SACT often improves survival overall, the beneficial and harmful effects of treatment must be carefully balanced. That is because many of these therapies have a narrow therapeutic index, in which the benefits to the patient outweigh the toxic effects. However, avoiding prescribing systemic anticancer therapies or reducing recommended doses in an attempt to reduce toxicity and the risk of 30-day mortality could mean that overall fewer patients survive the disease. Focusing only on reducing rates of 30-day mortality close to zero would therefore not necessarily mean that patients receive better care.

We hope that providing clinicians and patients with information from in-depth assessments of the factors that affect 30-day mortality, and variation between trusts, could help improve treatment decisions and in turn improve patient care. Such information will, we feel, provide a better understanding of the likelihood that systemic anticancer therapy will provide net benefit versus net harm from side-effects in specific patient groups.

This report is the first in a planned series. In the future, as data completeness and quality improve, more comprehensive analyses will provide a better understanding of the causes of national and trust-level variations. That work will also be able to benefit from increasingly sophisticated linkages between the SACT dataset and other National Cancer Registration Service (NCRS) datasets.

We hope these findings will help hospital trusts to examine their own care in the context of national data, and lead to improvements in care, shared decision making, and patient selection for treatment. This will lead to improved outcomes for people receiving SACT treatment.

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Main Findings

The recently-published paper in the *Lancet Oncology*[1] established national levels of 30-day mortality among breast and lung cancer patients treated with curative or palliative intent in 2014, and this companion report examines variation in 30-day mortality between the NHS hospital trusts treating those patients.

We also identify the strengths and limitations of these data in relation to our national and trust-level analyses in the paper and this report, respectively. These are important to consider when interpreting the results, and will inform our approach to future studies.

We found that 30-day mortality:

- is higher than expected based on findings from previous randomized controlled trials in patients receiving curative systemic anticancer therapy for both breast and lung cancer
- increases with age for both breast cancer and NSCLC patients given SACT with curative intent, and decreases with age for breast cancer and NSCLC patients given SACT with palliative intent (breast curative $p < 0.0001$, NSCLC curative $p = 0.0033$, breast palliative $p = 0.0034$, NSCLC palliative $p = 0.0015$)
- is higher for breast and NSCLC patients treated with the intent of relieving symptoms and extending lifespan (‘palliative’) compared with curative intent;
- is higher for those that had higher performance status scores of 2-4 (symptomatic patients requiring any amount of bed rest during the day, or who were completely bed bound) compared with those who had the lowest (PS 0, asymptomatic) (breast curative $p=0{\cdot}0021$, breast palliative $p < 0.0001$, NSCLC palliative $p < 0.0001$)
- is higher for those for whom no previous SACT was reported between 2012 and 2014 (‘treatment-naïve’) compared with those who had received previous SACT (breast palliative $p < 0.0001$, NSCLC curative $p < 0.0001$, NSCLC palliative $p < 0.0001$);
- varies between NHS hospital trusts, with several outliers identified at 95% and 98.8% confidence limits. However, issues with the data provided by those trusts may at least in part explain their outlier status

We found that the SACT database:

- holds many possibilities for future investigations, eg for assessing in more detail how patient, tumour and treatment-related factors affect 30-day mortality
- needs even more accurate, detailed and complete data feeds from NHS hospital trusts in order to provide more definitive national and trust-level estimates of 30-day mortality.

Strengths and limitations of this study

The main strengths of our analyses

- the study methodology has been extensively peer-reviewed to ensure the most robust challenge of these first analyses and to ensure as independent and objective interpretation of SACT data possible
- they provide 30-day mortality information following SACT at both national and NHS hospital trust levels from a real cancer patient population
- trusts identified as outliers have been given an opportunity to re-examine the data they provided, for quality and completeness issues that may affect their 30-day mortality estimates
- they focus on breast and lung cancer, for which data on 93.6% and 92.3% of patients receiving treatment, respectively, is available in the SACT dataset for 2014

The main limitations of our analyses

- some trusts provided incomplete data which meant that SACT cycle start date was absent for some records, resulting in the exclusion of 748/29,112 (2.6%) breast cancer and 500/15,545 (3.2%) lung cancer patients from this study
- for some patients, only the first cycle of SACT was reported, which may have artificially reduced 30-day mortality rates for some of the NHS hospital trusts, and made 30-day mortality appear higher for any genuine first cycles of SACT reported in the dataset
- we were unable to comprehensively correct our analyses for some aspects of case-mix, due to low reporting of patient demographic health related information such as co-morbidities
- some of the patients reported to have died were recorded as having been prescribed SACTs that were not actually administered, which may artificially increase 30-day mortality
- some trusts provided incorrect names for the combinations of SACT drugs ('regimens') given to breast and lung cancer patients, e.g. two lung cancer patients reportedly given enzalutamide, a prostate cancer regimen
- oral treatments, e.g. erlotinib or capecitabine, may not have been reported by some trusts as they are not always included on e-prescribing systems, which may have affected 30-day mortality for trusts that did not report on these treatments

Further discussion of these points can be found in our *Lancet Oncology* paper[1].

Principal recommendations & next steps

Improve data collection

We will only be able to use the SACT database to its full potential to improve patient outcomes if data quality and completeness continue to improve further. Although SACT data reporting is mandatory, completeness of a number of fields could be better, and there are issues with the accuracy and consistency of some of the information recorded.

We hope that publishing these data will now encourage NHS hospital trusts to improve the data feeds they provide. Accurate and comprehensive collection of SACT data from all trusts in England creates a powerful resource to improve patient care and allows trusts to examine and improve their services more effectively.

Our principal recommendations to improve data quality are:

- all trusts must report the full SACT dataset for all SACTs given by whatever route of administration and must adopt e-prescribing systems that better support this
- trusts must report all cycle start dates to provide a more accurate picture of 30-day mortality by trust
- all trusts must introduce data management processes that allow them to avoid reporting treatments that have been prescribed but which the patient, for some reason, did not receive

Use these findings to improve patient care

Both the national levels of 30-day mortality following SACT and the variation between NHS hospital trusts highlight certain issues that are a cause for concern. These results, for the first time, provide estimates of one adverse outcome experienced by some patients receiving SACT in the general population. We must now examine how that information can support clinicians and patients to make decisions about the most appropriate care.

Currently issues with data completeness and quality mean that we should treat these findings as indicative and interpret them alongside data from local audit, mortality review and governance processes and the results from prospective studies. However, they do clearly show the potential for SACT data to provide a better understanding of the balance of benefits and harms particular patients are likely to experience from different treatments.

Our principal recommendations and next steps for using the SACT dataset to improve patient care are:

- a priority area for further analyses must be 30-day mortality and toxic effects of SACTs in relation to patient performance status, and co-morbidities (when data completeness in that field improves), with a view to integrating this information into decisions (and the associated consent processes) around giving patients SACT
- trusts with higher than average 30-day mortality should, as a priority, recheck their own mortality data and encourage treating teams to reflect on practice and service provision in team meetings, audit, mortality and morbidity meetings and through any other established governance processes they have
- we will continue, with input from clinicians, to analyse the SACT dataset to provide a better understanding of the balance of benefits and harms particular patients are likely to experience from different treatments based on disease-related and demographic factors
- we will link the SACT dataset to other available datasets within the National Cancer Registration and Analysis Service (NCRAS) so that we can provide analyses on all aspects of the patient pathway to measure and improve outcomes
- we are investigating how we can support routine 30-day mortality audits – for a range of tumour types – using SACT data.

Introduction

This is the first time to our knowledge that 30-day mortality following recently reported systemic anticancer therapy (SACT) has been investigated on such a large scale in a population that reflects the real diversity of patients with breast and lung cancer being treated in the NHS.

This work allows benchmarks to be established that allow patient care to be reviewed and improved and shows the huge potential of the SACT dataset.

Examining 30-day mortality to improve patient care

The 2011 national cancer strategy for England proposed 30-day mortality as a national clinical indicator of avoidable harm from SACT[4]; it has also been used as a clinically relevant indicator for SACT in previously published work[5].

It is important to note that for some patients who die within 30 days of treatment, the disease may be intrinsically resistant to the therapy and rapidly progress, causing premature death even when the treatment itself is well tolerated.

It also important to consider that avoiding prescribing SACTs or reducing recommended doses in an attempt to reduce toxicity and the risk of early mortality could mean that overall fewer patients survive the disease over longer periods of time, or reduce the symptomatic benefits of palliative SACT. This would mean that if we were only to focus on reducing rates of 30-day mortality close to zero, patients may not necessarily receive better care.

Despite these considerations, if a patient dies within 30 days of receiving SACT, it is very unlikely that they have benefited from that treatment and it is more likely that they have suffered harm. It is important to examine whether any factors might have enabled healthcare providers to anticipate or avoid that harm.

Main questions raised by 30-day mortality data include:

- were the deaths treatment related?

- were adverse effects recognised and adequate supportive treatment provided?
- were the treatments appropriate?

The SACT dataset

The SACT dataset that made this study possible was set up to provide assurance of the appropriate use, efficacy, safety and cost-effectiveness of systemic anticancer therapy used for the treatment of malignant disease in England[6]. Further information about the SACT dataset, including a list of the data collected, is available in the *Lancet Oncology* paper and on the SACT dataset website at: http://www.chemodataset.nhs.uk/home.

The data and analyses used in this companion report update and build upon unpublished analyses on 30-day mortality that were shared with all provider trusts in England in 2014. All individual trusts were able to check data accuracy and to review their own data prior to the publication of our *Lancet Oncology* paper and this companion report; we also informed trusts about our intent to publish the data.

Methods

Objectives

Our aims were:

1. to establish national baseline levels of 30-day mortality and identify the factors influencing that outcome (presented in the *Lancet Oncology* paper)
2. Establish a standard for presenting and interpreting data on NHS hospital trust-level 30-day mortality following SACT across England
3. Identify where and how we can work with trusts to improve data reporting and quality in the SACT database

In this initial stage of analysis, we examined 30-day mortality rates for breast cancer and NSCLC between trusts by treatment intent (curative and palliative), adjusting these data for patient performance status (PS, a measure of patient general wellbeing), body mass index (BMI) and stage at diagnosis, where available.

Data overview

As with the national-level analyses we report in our research paper[1], we focused our trust-level analyses on breast and lung cancer patients who died within 30 days of receiving their most recent cycle of SACT between Jan-Dec 2014. This is because SACT data were most complete for these cancer types and reporting period.

We defined SACT as any cytotoxic chemotherapy, active anticancer therapies such as monoclonal antibodies (eg, trastuzumab), and targeted biological treatments such as EGFR tyrosine kinase inhibitors. We excluded endocrine therapy and supportive therapy treatments such as bisphosphonates, denosumab, and anti-emetics. We did not distinguish between patients receiving combined chemo-radiotherapy and those receiving chemotherapy only, as this was poorly recorded in the SACT dataset at this stage. A full list of the regimens we included is in Appendix 1.

Our paper contains more detail on how we identified the patients included in our analysis (as above), and the methods we used to:

- calculate 30-day mortality for each patient, based on the date of most recently reported cycle of SACT and date of death
- categorise patient treatment intent as ‘curative’ or ‘palliative’ which allowed us to conduct our trust-level analyses separately for each treatment intent (see below), since 30-day mortality was substantially higher for patients receiving palliative SACT
- categorise patient stage at diagnosis, PS, and BMI, which we used to risk-adjust our trust-level analyses (see below), as with the national-level analyses in our published paper

Assessing trust-level variation in 30-day mortality rates

For every trust, we calculated risk-adjusted mortality rates and patient volumes treated with SACT for the following patient categories:

- breast cancer curative
- breast cancer palliative
- NSCLC curative
- NSCLC palliative

Some of the main factors included in the risk adjustment were:

- PS
- BMI
- cancer stage

We used this data to create funnel plots using the ‘funnelcompar’ command in STATA, which gave the 95% and 99.8% control limits (the inner and outer dashed lines on the graphs) and the national 30-day mortality rate (the horizontal line on each graph).

Further detail on the analyses used in this study are available from the *Lancet Oncology* paper[1].

Results

30-day mortality by NHS trust: Breast and lung cancer

Main findings: In the analyses of both breast and NSCLC cancer patients receiving SACT with both curative and palliative intent at NHS trust level, there were 20 trusts identified as outliers in one or more category.

The causes of trust level variations in 30-day mortality require further exploration, and high 30-day mortality does not necessarily reflect sub-optimal treatment practices relative to other trusts, as problems with data accuracy and completeness may artificially raise 30-day mortality.

While we were able to adjust our trust-level 30-day mortality estimates for available data on PS, BMI, and cancer stage at diagnosis (for NSCLC only), we were unable to carry out a more comprehensive case-mix adjustment at this stage. We aim to achieve this in future analyses.

The funnel plots in this section show the percentage of patients who died within 30 days of SACT plotted against the total number of patients in each trust (Figures 2–8). Each dot in the funnel plot represents a trust providing systemic anticancer therapy for patients with cancer.

Trusts that lay above the 95% and 99.8% upper confidence limits (designated by the short and long dotted lines at the top edge of the graphs) had significantly higher 30-day mortality rates than the national average (designated by the red line on each graph).

Conversely, those that lay below the lower confidence limits (designated by short and long dotted lines at the bottom edge of the graphs) had significantly lower 30-day mortality. We provide individual trust-level data by cancer type and treatment intent in appendix 2, and a table in the accompanying Excel file, which includes each trust's crude and risk-adjusted 30-day mortality.

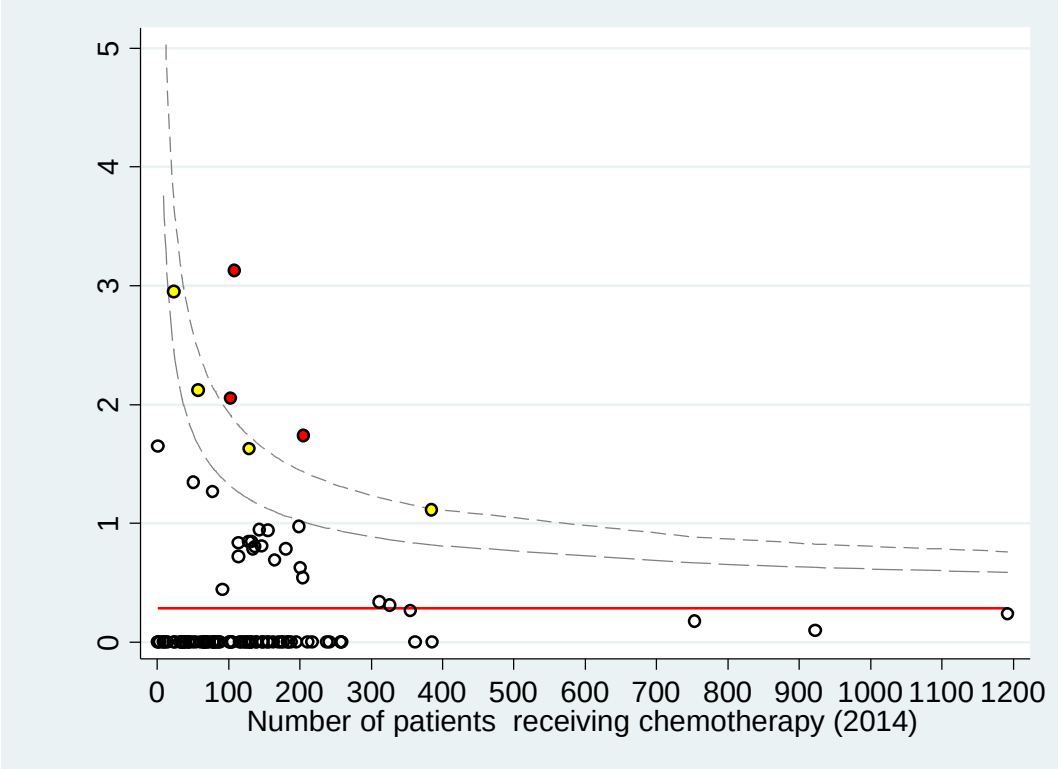
We notified all trusts of their 30-day mortality levels, and gave them an opportunity to respond. Trusts were notified of our intention to publish these data; we have included their responses in Appendix 3.

Trusts with high and low 30-day mortality, which lay outside the upper 95% and 99.8% control limits, need to review their clinical practice and data management as a matter of urgency to ensure they address any issues.

30-day mortality: Breast cancer by NHS hospital trust

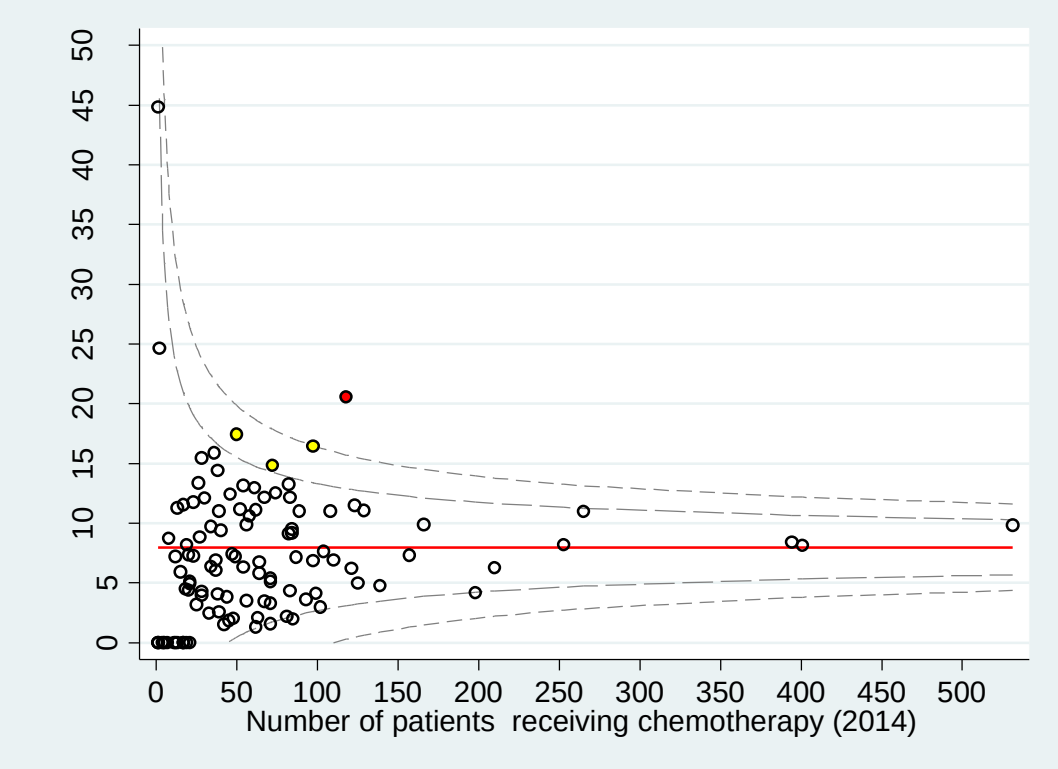
Main finding: Mortality rates for women with breast cancer in most trusts were similar to the national average. For curative and palliative treatment intents there were only seven and four trusts, respectively, that were outliers with higher than average mortality rates.

Figure 2. Funnel plot showing variation in risk-adjusted 30-day mortality in breast cancer patients given systemic anticancer therapy (SACT) with curative intent, by hospital trust.



Each circle represents a separate hospital trust; yellow and red circles represent outliers beyond the 95% and 99.8% confidence limits that are represented as dashed lines above the England average risk-adjusted mortality percentage, which is represented as a red horizontal line.

Figure 3. Funnel plot showing variation in risk-adjusted 30-day mortality in breast cancer patients given systemic anticancer therapy (SACT) with palliative intent, by hospital trust.

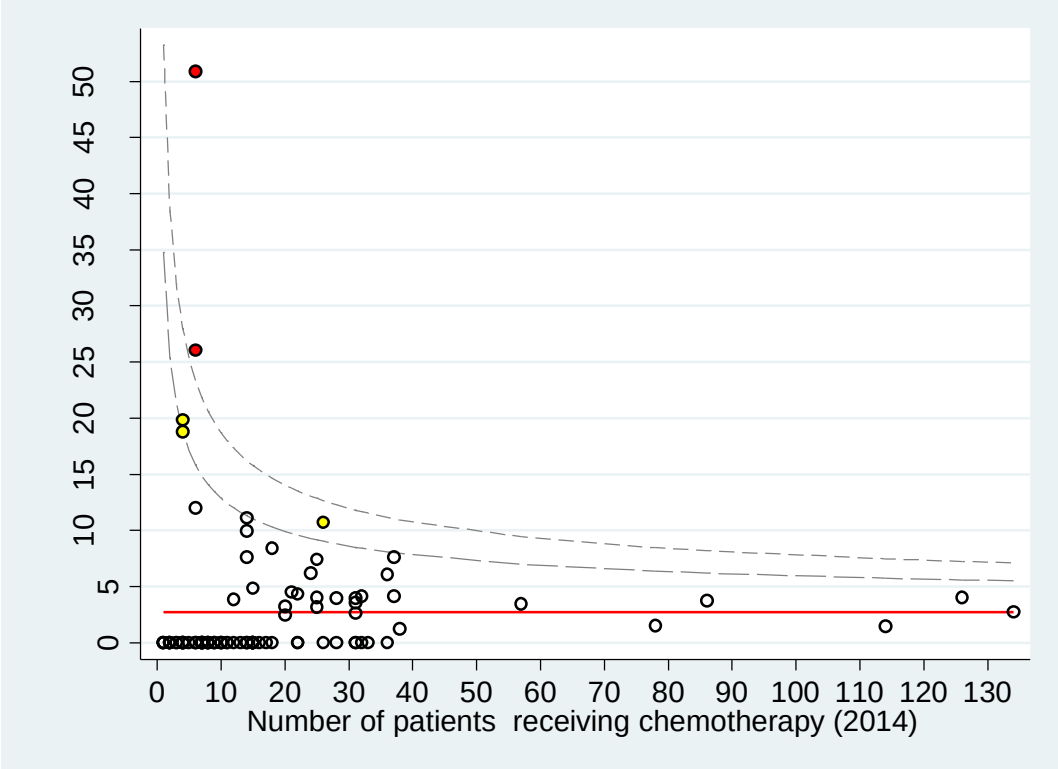


Each circle represents a separate hospital trust; yellow and red circles represent outliers beyond the 95% and 99.8% confidence limits that are represented as dashed lines above the England average risk-adjusted mortality percentage, which is represented as a red horizontal line.

30-day mortality: Lung cancer by NHS hospital trust

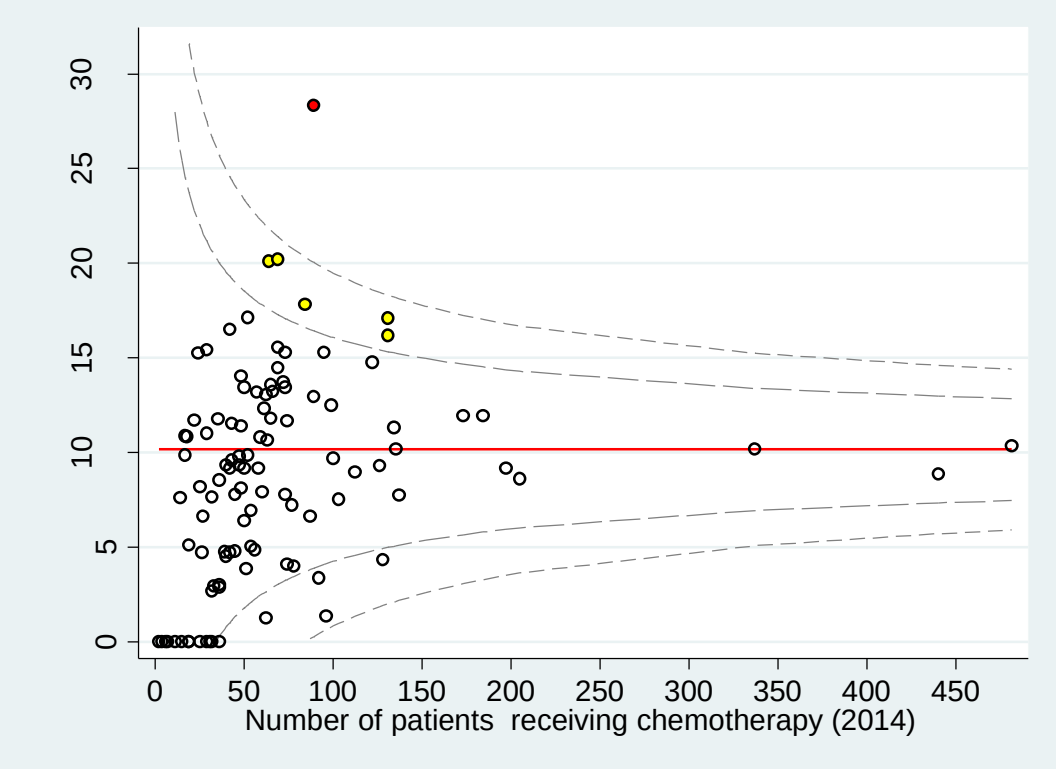
Main finding: Mortality rates for patients with NSCLC were similar to the national average in most trusts. For curative and palliative treatment intents, there were only five and seven trusts, respectively, with higher than average 30-day mortality.

Figure 4. Funnel plot showing variation in risk-adjusted 30-day mortality in NSCLC patients given systemic anticancer therapy (SACT) with curative intent, by hospital trust.



Each circle represents a separate hospital trust; yellow and red circles represent outliers beyond the 95% and 99.8% confidence limits that are represented as dashed lines above the England average risk-adjusted mortality percentage, which is represented as a red horizontal line.

Figure 5. Funnel plot showing variation in risk-adjusted 30-day mortality in NSCLC patients given systemic anticancer therapy (SACT) with palliative intent, by hospital trust.



Each circle represents a separate hospital trust; yellow and red circles represent outliers beyond the 95% and 99.8% confidence limits that are represented as dashed lines above the England average risk-adjusted mortality percentage, which is represented as a red horizontal line.

Discussion

We identified several trusts with significantly higher levels of 30-day mortality. We have written to all trusts to inform them of their 30-day mortality rates, and have specifically encouraged outlier trusts to review their clinical practice and data management systems. As with all complex, 'real world' data collection, there are some issues with data quality, consistency and completeness. Although all SACT data providers aim to provide robust and quality-assured data, it is possible that hospital trusts have been identified as outliers due sub-optimal data management practices rather than the delivery of sub-optimal clinical care.

Similarly, simply because a hospital trust fell within the control limits of the funnel plots, it does not guarantee that each patient received optimal treatment, as data issues may be obscuring instances of sub-optimal clinical decision making.

More comprehensive case-mix adjustment and better data completeness will, in time, allow national datasets such as the SACT dataset to be used as a continuous clinical improvement tool. However, trusts that lose their positive outlier status after case-mix adjustment may, for example, be treating a high proportion of older, frailer patients, who may not have benefitted from SACT. This highlights how important it is to consider 30-day mortality rates both before and after case-mix adjustment when reviewing treatment practices.

There is a suggestion from the funnel plots that smaller trusts may tend to have higher early mortality rates; some of these trusts are positive outliers based on only one death within 30 days of SACT. However, because of small numbers it is impossible to know from the data alone whether this effect is real or due to differences in case-mix and/or data quality and completeness. We intend to address this important question in future reports on the SACT dataset using subsequent years of SACT data.

Apart from data quality issues, it is also possible that hospitals with significantly lower 30-day mortality rates are not tolerating any risk and are treating only the fittest patients, which may have the unintended consequence of not treating patients who could have potentially benefitted from receiving SACT.

We hope that trusts with both higher and lower than average 30-day mortality figures will, as a priority, re-check their own mortality data to examine where their data reporting and/or patient care can improve. We encourage the treating teams to reflect on practice and service provision within team meetings, audit, mortality and morbidity meetings and other governance processes. The National Chemotherapy Board has recently published an audit pro-forma for this purpose (Appendix 4).

These trust-level data on early treatment-related deaths should be examined alongside longer-term survival data for all patients, to provide a more complete picture of risk/benefit profiles for the whole treatment 'approach' in each trust. For example, although a trust may have a high 30-day mortality rate for a given tumour type or stage, there may be benefits for other patients in terms of long-term survival or rates of cure by virtue of an aggressive treatment philosophy.

Conclusion

The SACT database is a powerful resource to study trust-level variation in outcomes based on data from large numbers of patients treated outside clinical trials. Together with the national-level analyses of factors affecting 30-day mortality presented in our paper, we have established a standard format for regularly reporting on 30-day mortality across England, with the ultimate aim of promoting improvements in patient outcomes in subsequent years.

However, data quality and case ascertainment still need to improve and we are making considerable efforts to address these issues with NHS hospital trusts. Overall, the analyses of patient and disease characteristics in our paper match clinical expectations in many areas and provide assurance that our findings are valid.

We decided that the data within SACT were now sufficiently accurate and mature and that these concerns should not prevent publication of the data, but because of the complexity and potential sensitivity of our analyses we wished to validate them through robust peer review including feedback received from *Lancet Oncology*.

We have continually engaged with trusts since data submission began in 2012 in efforts to encourage the uploading of complete and accurate data, but we cannot provide source data verification given the limitations of available resources and the large number of NHS hospital trusts and patients involved. We hope that this first look at the huge potential of the SACT database will stimulate greater efforts to improve data accuracy.

In summary, we have shown that:

1. Data on systemic anticancer therapy can be collected and analysed routinely on a national scale
2. The outcomes of NHS hospital trusts in the context of 30-day mortality can be compared, and vary for both breast and lung cancer

In future, we hope to:

1. Correct mortality rates more comprehensively for patient co-morbidities, performance status, social deprivation factors, and cancer stage at treatment, and also for whether or not the patient has already received other types of systemic anticancer therapy (lines of treatment)
2. Investigate 30-day mortality for other cancer types to determine commonalities and differences in risks between different cancers, and patterns of variation between trusts
3. Investigate specific SACT regimens to examine which ones are more likely to be linked with 30-day mortality

Individual trusts can now examine their own data, which we have reported here, in the context of national statistics. We hope that this will encourage improvements in SACT data reporting and completeness, which in turn will allow us to investigate factors affecting 30-day mortality more thoroughly in future reports.

We will continue to try to improve overall patient care by providing accessible, accurate, relevant and timely information on the outcomes of care received by cancer patients within the NHS.

Acknowledgements

We are grateful to staff of all the participating trusts for their co-operation in our study, which to our knowledge is a worldwide first of its kind using SACT data on a national scale. This work is only possible because of data that is routinely collected by the NHS as part of patient care.

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Appendix

Appendix 1: regimens included in analysis

This table lists the last reported treatment provided to patients between January and December 2014, and the number of patients who received that treatment.

Lung regimens included in analysis	Total patients
CARBOPLATIN + ETOPOSIDE	2,770
CARBOPLATIN + PEMETREXED	2,303
GEMCARBO	1,905
CISPLATIN + PEMETREXED	1,411
ERLOTINIB	1,120
CARBOPLATIN + VINORELBINE	1,080
CISPLATIN + VINORELBINE	1,065
PEMETREXED	735
DOCETAXEL	720
CISPLATIN + GEMCITABINE	470
CISPLATIN + ETOPOSIDE	422
GEFITINIB	381
VINORELBINE	266
CAV	263
CARBOPLATIN	255
[Unmapped regimens]	204
CARBOPLATIN + PACLITAXEL	182
TOPOTECAN	113
TRIAL	111
CRIZOTINIB	78
GEMCITABINE	61
PACLITAXEL	56
CISPLATIN + VINORELBINE + RT	54
AFATINIB	49
IPM	47
STOMP TRIAL	32
CISPLATIN + DOCETAXEL	29
CISPLATIN + ETOPOSIDE + RT	25
CAP*	24
CISPLATIN	20
ETOPOSIDE	17
BEP*	13
EP	12

Lung regimens included in analysis	Total patients
CVAD*	8
CAPECITABINE + TEMOZOLOMIDE*	7
CERITINIB	7
ATLANTIC TRIAL	7
CISPLATIN + RT	6
PAZOPANIB	6
DOXORUBICIN*	6
IPILIMUMAB	6
CHOP*	5
EVEROLIMUS*	5
CAPECITABINE + STREPTOZOCIN*	5
ICE TRIAL	5
COMMAND TRIAL	5
CISPLATIN + PACLITAXEL	4
OCTREOTIDE*	4
CYCLO + DOXORUBICIN + VINCRISTINE	4
IDEAL TRIAL	4
AFATANIB	4
CARBO + GEFITINIB + PEMETREXED	4
POPLAR TRIAL	4
METHOTREXATE HIGH DOSE*	4
CARBOPLATIN + GEMCITABINE	4
OAK TRIAL	4
OXALIPLATIN + MDG*	4
BEVACIZUMAB	3
ACE	3
TRASTUZUMAB*	3
HYDROXYCARBAMIDE*	3
DOXORUBICIN + IFOSFAMIDE*	3
BEVACIZUMAB + IRINOTECAN +	3

Lung regimens included in analysis	Total patients
MdG*	
DOCETAXEL + NINTEDANIB	3
LU-177*	2
SUNITINIB*	2
PIN TRIAL	2
CETUXIMAB*	2
IPO	2
DOCETAXEL + GEMCITABINE	2
CISPLATIN + VINCRISTINE	2
ENZALUTAMIDE*	2
SORAFENIB	2
EOX	2
IDEATE TRIAL	2
ADOC	2
IRINOTECAN + TEMOZOLOMIDE	2
CHOP R*	2
NIVOLUMAB	2
AUY922 LUNG TRIAL	2
CAPECITABINE + GEMCITABINE*	2
CISPLATIN + CYCLO + DOXORUBICIN*	2
CAPECITABINE + OXALIPLATIN*	2
FCIST*	2
CVD*	2
GEMCITABINE + OXALIPLATIN*	2
TRAP TRIAL	2
CARBOPLATIN + DOCETAXEL	2
DACARBAZINE*	2
CARBOPLATIN + VINORELBINE + RT	1
NINTEDANIB	1
TAC*	1
ECX*	1
OLAPARIB*	1
GEMCITABINE + PACLITAXEL	1
FLUOROURACIL*	1
HCX*	1
CISPLATIN + DOCETAXEL + FLUOROURACIL*	1
AZACITIDINE*	1
CARBOPLATIN + IRINOTECAN	1
ICE	1
CAPECITABINE + CISPLATIN + RT	1

Lung regimens included in analysis	Total patients
DHAP*	1
FEC + DOCETAXEL*	1
BCG*	1
STREPTOZOCIN + MDG*	1
CETUXIMAB + OXALIPLATIN + MDG*	1
TIMELY TRIAL	1
IFOSFAMIDE*	1
CYCLOPHOSPHAMIDE + LENALIDOMIDE*	1
VEMURAFENIB*	1
CETUXIMAB + RT*	1
DETERMINE TRIAL	1
CEV	1
CISPLATIN + IRINOTECAN*	1
CAPECITABINE + CARBOPLATIN*	1
CARBOPLATIN + ETOPOSIDE + PACLITAXEL	1
DOXORUBICIN EMBOLISATION*	1
DOCETAXEL + PERTUZUMAB + TRASTUZUMAB*	1
EC*	1
EPIRUBICIN*	1
RITUXIMAB*	1
LANREOTIDE*	1
OXALIPLATIN*	1
LIPOSOMAL DOXORUBICIN*	1
BEVACIZUMAB + CARBO + GEMCITABINE	1
ERIBULIN*	1
TIGER-2 TRIAL	1
METHOTREXATE*	1
CVP*	1
CAPECITABINE*	1
CAPECITABINE + RT*	1
MIC	1
CISPLATIN + DOXORUBICIN*	1
NAB-PACLITAXEL*	1
IMATINIB*	1
INTERFERON*	1

*Regimens not usually associated with lung cancer.

Breast regimens included in analysis	Total patients
TRASTUZUMAB	6,844
FEC	4,376
DOCETAXEL	3,222
FEC + DOCETAXEL	2,748
PACLITAXEL	1,858
CAPECITABINE	1,686
EC	1,182
CYCLOPHOSPHAMIDE + DOCETAXEL	587
ERIBULIN	576
TRASTUZUMAB EMTANSINE	485
EVEROLIMUS	461
VINORELBINE	433
[Unmapped regimens]	311
GEMCARBO	295
DOCETAXEL + PERTUZUMAB + TRASTUZUMAB	276
TAC	262
FEC + DOCETAXEL + TRASTUZUMAB	255
CYCLOPHOSPHAMIDE + DOCETAXEL + EPIRUBICIN	250
EPIRUBICIN	235
PERTUZUMAB + TRASTUZUMAB	188
CAPECITABINE + LAPATINIB	176
CARBOPLATIN	170
DOCETAXEL + TRASTUZUMAB	165
PERSEPHONE TRIAL	159
CMF	153
TCH	117
NAB-PACLITAXEL	106
AC	101
PERTUZUMAB	100
TRASTUZUMAB SUBCUTANEOUS	80
BEVACIZUMAB + PACLITAXEL	73
EC + DOCETAXEL	72
CARBOPLATIN + PACLITAXEL	71

Breast regimens included in analysis	Total patients
TRIAL	63
CARBOPLATIN + DOCETAXEL	62
CARBO + DOCETAXEL + TRASTUZUMAB	58
FEC + TRASTUZUMAB	54
PACLITAXEL + TRASTUZUMAB	47
BEVACIZUMAB	47
CAPECITABINE + VINORELBINE	44
EPIRUBICIN + CMF	41
FLUOROURACIL**	39
DOXORUBICIN	36
SAFEHER TRIAL	32
CYCLOPHOSPHAMIDE	32
APHINITY TRIAL	28
CISPLATIN + GEMCITABINE**	26
EC + PACLITAXEL	20
CYCLO + DOCETAXEL + TRASTUZUMAB	20
TAC + TRASTUZUMAB	19
MMM	19
CARBOPLATIN + ETOPOSIDE**	17
GEMCITABINE + PACLITAXEL	17
LAPATINIB	16
EC + DOCETAXEL + TRASTUZUMAB	16
ARISTACAT TRIAL	15
CYCLOPHOSPHAMIDE + DOCETAXEL + TRASTUZUMAB	15
PACLITAXEL + BEVACIZUMAB	14
DENOSUMAB + PACLITAXEL	14
METHOTREXATE HIGH DOSE**	13
CYCLO + DOCETAXEL + FLUOROURACIL	13
KAITLIN TRIAL	12
TRASTUZUMAB + VINORELBINE	12
CARBOPLATIN + PEMETREXED**	11
CYCLOPHOSPHAMIDE + ETOPOSIDE**	11
FEC 60 OR 75 + DOCETAXEL	10

Breast regimens included in analysis	Total patients
CAPECITABINE + OXALIPLATIN**	9
PEGGY TRIAL**	9
CAPECITABINE + TRASTUZUMAB	9
LIPOSOMAL DOXORUBICIN	8
GEMCITABINE**	8
CISPLATIN + PEMETREXED**	7
TNT TRIAL	7
MM	7
MITOXANTRONE + PACLITAXEL	7
CAPECITABINE + DOCETAXEL	7
HCX**	6
IMATINIB**	6
FEC + PACLITAXEL	6
BLEOMYCIN**	6
GEMCITABINE + TREOSULPHAN**	5
RITUXIMAB**	5
OLYMPIAD TRIAL	5
CYCLOPHOSPHAMIDE + MTX	5
CYCLOPHOSPHAMIDE + DOXORUBICIN	4
CISPLATIN	4
OXALIPLATIN + MDG**	4
METHOTREXATE INTRATHECAL	4
CHOP R**	4
OLAPARIB	4
EVEROLIMUS + EXEMESTANE	4
EPHOS-B TRIAL	4
PACLITAXEL + PERTUZUMAB + TRASTUZUMAB	4
CARBOPLATIN + VINORELBINE**	3
RADICAL TRIAL**	3
NEOEXCEL TRIAL	3
MDV3100 TRIAL**	3
CISPLATIN + ETOPOSIDE**	3
ENZALUTAMIDE**	3
FALCON TRIAL**	3
CARBOPLATIN + DOCETAXEL + TRASTUZUMAB	3

Breast regimens included in analysis	Total patients
HYDROXYCARBAMIDE**	3
CETUXIMAB**	3
PAZOPANIB**	3
FEC + DOCETAXEL + CARBOPLATIN	3
ERLOTINIB**	3
BEVACIZUMAB + CAPECITABINE	2
EPIRUBICIN + VINORELBINE	2
CISPLATIN + DOXORUBICIN	2
CYCLOPHOSPHAMIDE + LIPOSOMAL DOX (MYOCET)	2
CVD**	2
DACARBAZINE**	2
ABIRATERONE**	2
CARBOPLATIN + TRASTUZUMAB	2
PAKT TRIAL**	2
IRINOTECAN**	2
CISPLATIN + VINORELBINE**	2
IRINOTECAN + MDG**	2
TEYSUNO**	2
LENALIDOMIDE**	2
BEVACIZUMAB + CARBO + PACLITAXEL**	2
MAP**	2
FEC 100 + DOCETAXEL + TRASTUZUMAB	2
MERIDIAN TRIAL**	2
ECX**	2
EPIRUBICIN + CMF + TRASTUZUMAB	1
DHAP**	1
RCEOP**	1
MANTRA TRIAL**	1
BOSUTINIB**	1
CYCLOPHOSPHAMIDE + NAB-PACLITAXEL	1
DOCETAXEL + GEMCITABINE	1
LIPOSOMAL DOX	1
CVP**	1

Breast regimens included in analysis	Total patients
MELPHALAN**	1
BEVACIZUMAB + CARBO + GEMCITABINE**	1
MERCAPTOPURINE + METHOTREXATE**	1
VINORELBINE + TRASTUZUMAB	1
CYCLOPHOSPHAMIDE + PACLITAXEL	1
EPIRUBICIN + FLUOROURACIL	1
METHOTREXATE	1
PRESENT TRIAL**	1
CAV**	1
BOLERO 6 TRIAL	1
CAPECITABINE + CARBOPLATIN	1
BEVACIZUMAB + CAPE + OXALIPLATIN**	1
CHLORAMBUCIL + RITUXIMAB**	1
KAMILLA TRIAL**	1
DOXORUBICIN + IFOSFAMIDE**	1
ABVD**	1
CAPECITABINE + CISPLATIN**	1
VINCRISTINE**	1
MVCARBO**	1
AZACITIDINE**	1
PEMETREXED**	1
NAB-PACLITAXEL + TRASTUZUMAB	1
IPILIMUMAB**	1
FLUOROURACIL + IRINOTECAN + OXALIPLATIN**	1
PERTUZUMAB + TRASTUZUMAB EMTANSINE	1
NILOTINIB**	1
CISPLATIN + VINORELBINE + RT**	1
OCTREOTIDE**	1
ANAGRELIDE**	1
CAPECITABINE + EPIRUBICIN	1
SAFHER TRIAL	1
ECF	1

Breast regimens included in analysis	Total patients
FCIST**	1
FLAG + IDARUBICIN**	1
TEMOZOLOMIDE**	1
OXALIPLATIN + RALTITREXED**	1
THALIDOMIDE**	1
CISPLATIN + FLUOROURACIL + RT**	1
TOPOTECAN**	1
EOX**	1
AXITINIB**	1
PACLITAXEL + GEMCITABINE**	1
LAPATINIB + PACLITAXEL**	1
BENDAMUSTINE**	1
VEMURAFENIB**	1
BENDAMUSTINE + RITUXIMAB**	1
CARBOPLATIN + FEC + DOCETAXEL**	1
FLUOROURACIL + MITOMYCIN + RT**	1
Z-DEX**	1
CISPLATIN + RT**	1
DOCETAXEL + DENOSUMAB	1
PCV**	1

**Regimens not usually associated with breast cancer.

Appendix 2: Trust-level 30-day mortality data

30-day post-chemotherapy mortality for patients with breast cancer treated with curative or palliative intent in 2014, by NHS hospital trust in London.

	Breast, curative						Breast, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**15,626**	**41**	**0.3%**				**7,602**	**569**	**7.5%**			
Barking, Havering & Redbridge Univerisity Hospitals	217	0	0%	0%	1.0%	1.4%	121	9	7.4%	6.2%	12.8%	15.6%
Barts Health	114	1	0.9%	0.8%	1.3%	1.8%	67	2	3.0%	3.4%	14.5%	18.2%
Chelsea and Westminster Hospital	73	0	0%	0%	1.5%	2.2%	28	1	3.6%	4.0%	18.0%	23.8%
Guy's and St Thomas'	258	0	0%	0%	0.9%	1.3%	198	8	4.0%	4.2%	11.8%	13.9%
Homerton University Hospital	1	1	100%	1.6%	10.7%	16.7%						
Imperial College Healthcare	257	0	0%	0%	0.9%	1.3%	139	7	5.0%	4.8%	12.5%	15.1%
King's College Hospital	122	0	0%	0%	1.2%	1.8%	38	2	5.3%	4.1%	16.6%	21.6%
Lewisham and Greenwich	65	0	0%	0%	1.6%	2.3%	33	1	3.0%	2.4%	17.2%	22.6%
London North West Healthcare	23	0	0%	0%	2.5%	3.7%	7	0	0%	0%	28.1%	39.7%
North Middlesex University Hospital	140	0	0%	0%	1.2%	1.7%	56	6	10.7%	9.9%	15.1%	19.2%
Royal Free London	165	1	0.6%	0.7%	1.1%	1.6%	87	5	5.7%	7.1%	13.7%	17.0%
St George's Healthcare	156	0	0%	0%	1.1%	1.6%	89	4	4.5%	11.0%	13.6%	16.9%
The Royal Marsden	259	0	0%	0%	0.9%	1.3%	210	12	5.7%	6.2%	11.7%	13.8%
The Whittington Hospital	33	0	0%	0%	2.1%	3.1%	13	0	0%	0%	22.7%	31.2%
University College London Hospitals	117	0	0%	0%	1.2%	1.8%	34	3	8.8%	6.3%	17.1%	22.4%

30-day post-chemotherapy mortality for patients with breast cancer treated with curative or palliative intent in 2014, by NHS hospital trust in the Midlands and East of England.

	Breast, curative						Breast, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**15,626**	**41**	**0.3%**				**7,602**	**569**	**7.5%**			
Bedford Hospital	67	0	0%	0%	1.6%	2.3%	27	2	7.4%	8.8%	18.2%	24.1%
Burton Hospitals	23‡	1	4.3%	3.0%*	2.5%	3.7%	12	0	0%	0%	23.3%	32.2%
Cambridge University Hospitals	195	0	0%	0%	1.0%	1.5%	118	20	16.9%	20.5%*	12.9%	15.7%
Colchester Hospital University	71	0	0%	0%	1.5%	2.2%	40	4	10.0%	9.4%	16.4%	21.2%
Derby Teaching Hospitals	183	0	0%	0%	1.1%	1.5%	72	11	15.3%	14.8%*	14.3%	17.9%
East and North Hertfordshire	361	0	0%	0%	0.8%	1.1%	265	25	9.4%	11.0%	11.3%	13.1%
George Eliot Hospital	69	0	0%	0%	1.5%	2.3%	21	0	0%	0%	19.6%	26.3%
Heart of England	326	1	0.3%	0.3%	0.9%	1.2%	67	5	7.5%	12.1%	14.5%	18.2%
Hinchingbrooke Health Care	54	0	0%	0%	1.7%	2.5%	26	3	11.5%	13.4%	18.4%	24.4%
Ipswich Hospital	129	2	1.6%	1.6%*	1.2%	1.7%	54	9	16.7%	13.2%	15.2%	19.4%
James Paget University Hospitals	78	1	1.3%	1.3%	1.5%	2.1%	50	8	16.0%	17.4%*	15.5%	19.8%
Kettering General Hospital	108	2	1.9%	3.1%*	1.3%	1.9%	21	1	4.8%	4.9%	19.6%	26.3%
Luton and Dunstable University Hospital	25	0	0%	0%	2.4%	3.6%	15	1	6.7%	5.9%	21.7%	29.6%
Mid Essex Hospital Services	45	0	0%	0%	1.8%	2.7%	19	2	10.5%	8.2%	20.2%	27.2%
Milton Keynes Hospital	35	0	0%	0%	2.0%	3.1%	25	1	4.0%	3.2%	18.6%	24.7%

30-day post-chemotherapy mortality for patients with breast cancer treated with curative or palliative intent in 2014, by NHS hospital trust in the Midlands and East of England.

	Breast, curative						Breast, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**15,626**	**41**	**0.3%**				**7,602**	**569**	**7.5%**			
Norfolk and Norwich University Hospitals	241	0	0%	0%	1.0%	1.3%	157	9	5.7%	7.3%	12.2%	14.7%
Northampton General Hospital	155	1	0.6%	0.9%	1.1%	1.6%	71	1	1.4%	1.6%	14.3%	17.9%
Nottingham University Hospitals	355	1	0.3%	0.3%	0.8%	1.2%	253	19	7.5%	8.2%	11.3%	13.3%
Peterborough and Stamford Hospitals	81	0	0%	0%	1.4%	2.1%	17	2	11.8%	11.6%	20.9%	28.3%
Sandwell and West Birmingham Hospitals	128	1	0.8%	0.8%	1.2%	1.7%	1	0	0%	0%	61.1%	91.8%
Sherwood forest Hospitals	51	1	2.0%	1.3%	1.7%	2.6%	37	2	5.4%	6.0%	16.7%	21.8%
Shrewsbury and Telford Hospital	177	0	0%	0%	1.1%	1.5%	39	2	5.1%	11.0%	16.5%	21.4%
South Warwickshire	103	1	1.0%	**2.0%***	1.3%	1.9%	46	3	6.5%	12.4%	15.8%	20.3%
The Dudley Group	32	0	0%	0%	2.1%	3.2%	2	1	50.0%	24.6%	45.6%	67.2%
Southend University Hospital	238	0	0%	0%	1.0%	1.3%	123	16	13.0%	11.5%	12.8%	15.5%
The Queen Elizabeth Hospital, King's Lynn	61	0	0%	0%	1.6%	2.4%	38	4	10.5%	14.4%	16.6%	21.6%
The Royal Wolverhampton	91	1	1.1%	0.4%	1.4%	2.0%	37	3	8.1%	6.9%	16.7%	21.8%
United Lincolnshire Hospitals	187	0	0%	0%	1.0%	1.5%	63	2	3.2%	2.0%	14.7%	18.5%
University Hospitals Birmingham	154	0	0%	0%	1.1%	1.6%	23	2	8.7%	7.3%	19.1%	25.5%
University Hospitals Coventry and Warwickshire	205	3	1.5%	**1.7%***	1.0%	1.4%	97	12	12.4%	**16.4%***	13.4%	16.5%

30-day post-chemotherapy mortality for patients with breast cancer treated with curative or palliative intent in 2014, by NHS hospital trust in the Midlands and East of England.

	Breast, curative						Breast, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**15,626**	**41**	**0.3%**				**7,602**	**569**	**7.5%**			
University Hospitals of Leicester	386	0	0%	0%	0.8%	1.1%	166	15	9.0%	9.9%	12.1%	14.5%
University Hospitals of North Midlands	116	0	0%	0%	1.3%	1.8%	99	3	3.0%	4.1%	13.3%	16.4%
Walsall Healthcare	80	0	0%	0%	1.4%	2.1%	21	1	4.8%	5.1%	19.6%	26.3%
West Suffolk	103	0	0%	0%	1.3%	1.9%	19	0	0%	0%	20.2%	27.2%
Worcestershire Acute Hospitals	201	1	0.5%	0.6%	1.0%	1.4%	84	9	10.7%	9.5%	13.8%	17.1%

‡ Small numbers may contribute to statistical outliers.

30-day post-chemotherapy mortality for patients with breast cancer treated with curative or palliative intent in 2014, by NHS hospital trust in the North of England.

	Breast, curative						Breast, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**15,626**	**41**	**0.3%**				**7,602**	**569**	**7.5%**			
Airedale	79	0	0%	0%	1.5%	2.1%	36	5	13.9%	15.9%	16.8%	22.0%
Blackpool Teaching Hospitals	9	0	0%	0%	3.8%	5.8%	5	0	0%	0%	31.8%	45.5%
Bolton	40	0	0%	0%	1.9%	2.9%	11	0	0%	0%	24.0%	33.2%
Bradford Teaching Hospitals	124	0	0%	0%	1.2%	1.8%	52	4	7.7%	11.2%	15.4%	19.6%
Calderdale and Huddersfield	139	0	0%	0%	1.2%	1.7%	62	9	14.5%	11.1%	14.7%	18.6%
City Hospitals Sunderland	79	0	0%	0%	1.5%	2.1%	49	3	6.1%	7.2%	15.6%	20.0%
East Lancashire Hospitals	35	0	0%	0%	2.0%	3.1%	58	6	10.3%	10.6%	15.0%	19.0%
Gateshead Health	84	0	0%	0%	1.4%	2.1%	30	3	10.0%	12.1%	17.7%	23.3%
Harrogate and District	37	0	0%	0%	2.0%	3.0%	45	1	2.2%	1.9%	15.9%	20.5%
Hull and East Yorkshire Hospitals	170	0	0%	0%	1.1%	1.5%	62	1	1.6%	1.3%	14.7%	18.6%
Lancashire Teaching Hospitals	103	0	0%	0%	1.3%	1.9%	82	7	8.5%	13.3%	13.9%	17.2%
Leeds Teaching Hospitals	184	0	0%	0%	1.1%	1.5%	83	4	4.8%	4.3%	13.8%	17.2%
Mid Cheshire Hospitals												
Mid Yorkshire Hospitals	204	1	0.5%	0.5%	1.0%	1.4%	108	12	11.1%	11.0%	13.1%	16.0%
North Cumbria University Hospitals	15	0	0%	0%	3.0%	4.5%						

30-day post-chemotherapy mortality for patients with breast cancer treated with curative or palliative intent in 2014, by NHS hospital trust in the North of England.

	Breast, curative						Breast, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**15,626**	**41**	**0.3%**				**7,602**	**569**	**7.5%**			
North Tees and Hartlepool	86	0	0%	0%	1.4%	2.1%	12	1	8.3%	7.2%	23.3%	32.2%
Northern Lincolnshire and Goole	88	0	0%	0%	1.4%	2.0%	17	0	0%	0%	20.9%	28.3%
Northumbria Healthcare	211	0	0%	0%	1.0%	1.4%	54	3	5.6%	6.3%	15.2%	19.4%
Pennine Acute Hospitals	12	0	0%	0%	3.3%	5.0%	1	1	100%	44.8%	61.1%	91.8%
Sheffield Teaching Hospitals	754	1	0.1%	0.2%	0.7%	0.9%	401	32	8.0%	8.1%	10.6%	12.2%
South Tyneside	45	0	0%	0%	1.8%	2.7%	23	2	8.7%	11.7%	19.1%	25.5%
Stockport	1	0	0%	0%	10.7%	16.7%	1	0	0%	0%	61.1%	91.8%
The Christie	1,192	3	0.3%	0.2%	0.6%	0.8%	531	47	8.9%	9.9%	10.3%	11.6%
The Clatterbridge Cancer Centre	922	1	0.1%	0.1%	0.6%	0.8%	394	33	8.4%	8.4%	10.7%	12.2%
The Newcastle Upon Tyne Hospitals	163	0	0%	0%	1.1%	1.6%	64	4	6.3%	6.7%	14.6%	18.5%
University Hospital of South Manchester												
University Hospitals of Morecambe Bay	133	0	0%	0%	1.2%	1.7%	56	2	3.6%	3.5%	15.1%	19.2%
Wrightington, Wigan and Leigh	10	0	0%	0%	3.6%	5.5%	4	0	0%	0%	34.6%	49.9%
York Teaching Hospital	143	1	0.7%	0.9%	1.2%	1.7%	85	2	2.4%	2.0%	13.8%	17.1%

30-day post-chemotherapy mortality for patients with breast cancer treated with curative or palliative intent in 2014, by NHS hospital trust in the South of England.

	Breast, curative						Breast, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**15,626**	**41**	**0.3%**				**7,602**	**569**	**7.5%**			
Ashford and St Peter's Hospitals	37	0	0%	0%	2.0%	3.0%	1	0	0%	0%	61.1%	91.8%
Brighton and Sussex University Hospitals	174	0	0%	0%	1.1%	1.5%	81	2	2.5%	2.2%	13.9%	17.3%
Buckinghamshire Healthcare	81	0	0%	0%	1.4%	2.1%	104	9	8.7%	7.6%	13.2%	16.2%
Dartford and Gravesham	106	0	0%	0%	1.3%	1.9%	20	2	10.0%	7.4%	19.9%	26.7%
Dorset County Hospital	57	1	1.8%	2.1%*	1.7%	2.5%	34	3	8.8%	9.7%	17.1%	22.4%
East Kent Hospitals University	311	1	0.3%	0.3%	0.9%	1.2%	129	11	8.5%	11.1%	12.7%	15.4%
East Sussex Healthcare	134	1	0.7%	0.8%	1.2%	1.7%	64	5	7.8%	5.8%	14.6%	18.5%
Frimley Health	64	0	0%	0%	1.6%	2.3%	48	1	2.1%	2.0%	15.7%	20.1%
Gloucestershire Hospitals	385	4	1.0%	1.1%*	0.8%	1.1%	110	9	8.2%	6.9%	13.1%	16.0%
Great Western Hospitals	105	0	0%	0%	1.3%	1.9%	44	2	4.5%	3.8%	16.0%	20.6%
Hampshire Hospitals							18	1	5.6%	4.5%	20.5%	27.7%
Isle of Wight							5	0	0%	0%	31.8%	45.5%
Maidstone and Tunbridge Wells	180	1	0.6%	0.8%	1.1%	1.5%	71	4	5.6%	5.1%	14.3%	17.9%
Medway	128	0	0%	0%	1.2%	1.7%	84	8	9.5%	9.2%	13.8%	17.1%
Northern Devon Healthcare	45	0	0%	0%	1.8%	2.7%	13	1	7.7%	11.3%	22.7%	31.2%

30-day post-chemotherapy mortality for patients with breast cancer treated with curative or palliative intent in 2014, by NHS hospital trust in the North of England.

	Breast, curative						Breast, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**15,626**	**41**	**0.3%**				**7,602**	**569**	**7.5%**			
Oxford University Hospitals	146	1	0.7%	0.8%	1.1%	1.6%	125	7	5.6%	5.0%	12.7%	15.5%
Plymouth Hospitals	3	0	0%	0%	6.3%	9.8%	97	8	8.2%	6.8%	13.4%	16.5%
Poole Hospital	133	1	0.8%	0.8%	1.2%	1.7%	74	5	6.8%	12.5%	14.2%	17.7%
Portsmouth Hospitals	132	0	0%	0%	1.2%	1.7%	28	1	3.6%	4.3%	18.0%	23.8%
Royal Berkshire	131	0	0%	0%	1.2%	1.7%	71	2	2.8%	3.3%	14.3%	17.9%
Royal Cornwall Hospitals	127	0	0%	0%	1.2%	1.7%	93	4	4.3%	3.6%	13.5%	16.7%
Royal Devon and Exeter	199	2	1.0%	1.0%	1.0%	1.4%	82	6	7.3%	9.1%	13.9%	17.2%
Royal Surrey County Hospital	137	1	0.7%	0.8%	1.2%	1.7%	102	4	3.9%	3.0%	13.2%	16.3%
Royal United Hospital Bath	147	0	0%	0%	1.1%	1.6%	47	5	10.6%	7.4%	15.7%	20.2%
Salisbury	1	0	0%	0%	10.7%	16.7%	17	0	0%	0%	20.9%	28.3%
Torbay and South Devon NHS Foundation Trust	114	1	0.9%	0.7%	1.3%	1.8%	20	1	5.0%	4.4%	19.9%	26.7%
Surrey and Sussex Healthcare	66	0	0%	0%	1.6%	2.3%	28	3	10.7%	15.4%	18.0%	23.8%
Taunton and Somerset	148	0	0%	0%	1.1%	1.6%	83	10	12.0%	12.1%	13.8%	17.2%
The Royal Bournemouth and Christchurch Hospitals	50	0	0%	0%	1.8%	2.6%	17	0	0%	0%	20.9%	28.3%
University Hospital Southampton							42	1	2.4%	1.5%	16.2%	20.9%

30-day post-chemotherapy mortality for patients with breast cancer treated with curative or palliative intent in 2014, by NHS hospital trust in the North of England.

	Breast, curative						Breast, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**15,626**	**41**	**0.3%**				**7,602**	**569**	**7.5%**			
University Hospitals Bristol	101	0	0%	0%	1.3%	1.9%	71	3	4.2%	5.4%	14.3%	17.9%
Western Sussex Hospitals	131	0	0%	0%	1.2%	1.7%	61	9	14.8%	12.9%	14.8%	18.7%
Weston Area Health	39	0	0%	0%	2.0%	2.9%	8	1	12.5%	8.7%	26.8%	37.6%
Yeovil District Hospital	38	0	0%	0%	2.0%	3.0%	39	1	2.6%	2.6%	16.5%	21.4%

30-day post-chemotherapy mortality for patients with NSCLC treated with curative or palliative intent in 2014, by NHS hospital trust in London.

	NSCLC, curative						NSCLC, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**1,961**	**53**	**2.7%**				**7,673**	**720**	**9.4%**			
Barking, Havering & Redbridge University Hospitals	25	1	4.0%	3.2%	9.1%	12.8%	87	6	6.9%	6.6%	16.5%	20.2%
Barts Health	10	0	0%	0%	12.9%	18.7%	25	0	0%	0%	22.0%	28.8%
Chelsea and Westminster Hospital	2	0	0%	0%	25.4%	38.4%	33	1	3.0%	2.9%	20.5%	26.4%
Guy's and St Thomas'	78	1	1.3%	1.5%	6.4%	8.5%	205	19	9.3%	8.6%	14.3%	16.7%
Homerton University Hospital												
Imperial College Healthcare	31	0	0%	0%	8.5%	11.8%	134	16	11.9%	11.3%	15.3%	18.2%
King's College Hospital							2	0	0%	0%	52.0%	76.1%
Lewisham and Greenwich	6	1	16.7%	12.0%	15.8%	23.3%	32	1	3.1%	2.7%	20.6%	26.7%
London North West Healthcare							32	3	9.4%	7.6%	20.6%	26.7%
North Middlesex University Hospital	10	0	0%	0%	12.9%	18.7%	45	2	4.4%	4.8%	19.0%	24.1%
Royal Free London	10	0	0%	0%	12.9%	18.7%	72	9	12.5%	13.7%	17.1%	21.2%
St George's Healthcare	9	0	0%	0%	13.4%	19.6%	69	6	8.7%	14.4%	17.3%	21.4%
The Royal Marsden	25	1	4.0%	4.0%	9.1%	12.8%	128	5	3.9%	4.3%	15.4%	18.4%
The Whittington Hospital							7	0	0%	0%	32.5%	45.4%
University College London Hospitals	33	0	0%	0%	8.3%	11.5%	48	5	10.4%	8.1%	18.7%	23.6%

30-day post-chemotherapy mortality for patients with NSCLC treated with curative or palliative intent in 2014, by NHS hospital trust in the Midlands and East of England.

	NSCLC, curative						NSCLC, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**1,961**	**53**	**2.7%**				**7,673**	**720**	**9.4%**			
Bedford Hospital	6	0	0%	0%	15.8%	23.3%	29	5	17.2%	15.4%	21.1%	27.5%
Burton Hospitals	6	0	0%	0%	15.8%	23.3%	22	2	9.1%	11.7%	22.8%	30.1%
Cambridge University Hospitals	32	1	3.1%	4.1%	8.4%	11.7%	92	2	2.2%	3.4%	16.3%	19.9%
Colchester Hospital University	7	0	0%	0%	14.8%	21.8%	52	8	15.4%	17.1%	18.4%	23.1%
Derby Teaching Hospitals	18	1	5.6%	8.4%	10.3%	14.6%	69	9	13.0%	15.5%	17.3%	21.4%
East and North Hertfordshire	31	0	0%	0%	8.5%	11.8%	197	16	8.1%	9.2%	14.4%	16.8%
George Eliot Hospital	2	0	0%	0%	25.4%	38.4%	6	0	0%	0%	34.3%	48.3%
Heart of England	36	0	0%	0%	8.1%	11.2%	126	9	7.1%	9.3%	15.4%	18.5%
Hinchingbrooke Health Care	8	0	0%	0%	14.1%	20.6%	18	2	11.1%	10.9%	24.1%	32.2%
Ipswich Hospital	7	0	0%	0%	14.8%	21.8%	40	2	5.0%	4.5%	19.5%	24.9%
James Paget University Hospitals	21	1	4.8%	4.5%	9.7%	13.8%	95	11	11.6%	15.3%	16.2%	19.7%
Kettering General Hospital	9	0	0%	0%	13.4%	19.6%	43	4	9.3%	11.5%	19.2%	24.4%
Luton and Dunstable University Hospital							4	0	0%	0%	39.8%	56.8%
Mid Essex Hospital Services	2	0	0%	0%	25.4%	38.4%	32	0	0%	0%	20.6%	26.7%
Milton Keynes Hospital	6‡	1	16.7%	50.9%*	15.8%	23.3%	25	2	8.0%	8.2%	22.0%	28.8%

30-day post-chemotherapy mortality for patients with NSCLC treated with curative or palliative intent in 2014, by NHS hospital trust in the Midlands and East of England.

	NSCLC, curative						NSCLC, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**1,961**	**53**	**2.7%**				**7,673**	**720**	**9.4%**			
Norfolk and Norwich University Hospitals	57	2	3.5%	3.4%	7.0%	9.4%	122	13	10.7%	14.8%	15.5%	18.6%
Northampton General Hospital	15	0	0%	0%	11.0%	15.8%	45	3	6.7%	7.8%	19.0%	24.1%
Nottingham University Hospitals	37	1	2.7%	4.1%	8.0%	11.0%	184	20	10.9%	11.9%	14.5%	17.0%
Peterborough and Stamford Hospitals	18	0	0%	0%	10.3%	14.6%	26	2	7.7%	4.7%	21.8%	28.5%
Sandwell and West Birmingham Hospitals	13	0	0%	0%	11.6%	16.7%	19	0	0%	0%	23.7%	31.6%
Sherwood forest Hospitals	1	0	0%	0%	34.7%	53.2%	50	4	8.0%	9.1%	18.5%	23.4%
Shrewsbury and Telford Hospital	11	0	0%	0%	12.4%	18.0%	48	3	6.3%	11.4%	18.7%	23.6%
South Warwickshire	11	0	0%	0%	12.4%	18.0%	42	5	11.9%	16.5%	19.3%	24.6%
Southend University Hospital[1]	16	0	0%	0%		10.7%						
The Dudley Group	2	0	0%	0%	25.4%	38.4%	54	3	5.6%	5.0%	18.2%	22.9%
The Queen Elizabeth Hospital, King's Lynn,	9	0	0%	0%	13.4%	19.6%	29	0	0%	0%	21.1%	27.5%
The Royal Wolverhampton	12	1	8.3%	3.8%	12.0%	17.3%	52	6	11.5%	9.9%	18.4%	23.1%
United Lincolnshire Hospitals	20	1	5.0%	3.2%	9.9%	14.0%	51	4	7.8%	3.8%	18.4%	23.2%
University Hospitals Birmingham	14	2	14.3%	7.6%	11.3%	16.2%	42	4	9.5%	9.2%	19.3%	24.6%
University Hospitals Coventry and Warwickshire	32	0	0%	0%	8.4%	11.7%	84	12	14.3%	**17.8%***	16.6%	20.3%

30-day post-chemotherapy mortality for patients with NSCLC treated with curative or palliative intent in 2014, by NHS hospital trust in the Midlands and East of England.

	NSCLC, curative						NSCLC, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**1,961**	**53**	**2.7%**				**7,673**	**720**	**9.4%**			
University Hospitals of Leicester	36	2	5.6%	6.1%	8.1%	11.2%	173	17	9.8%	11.9%	14.7%	17.2%
University Hospitals of North Midlands	15	0	0%	0%	11.0%	15.8%	131	16	12.2%	**17.1%***	15.3%	18.3%
Walsall Healthcare	15	0	0%	0%	11.0%	15.8%	40	4	10.0%	9.3%	19.5%	24.9%
West Suffolk	8	0	0%	0%	14.1%	20.6%	36	1	2.8%	2.9%	20.0%	25.7%
Worcestershire Acute Hospitals	8	0	0%	0%	14.1%	20.6%	61	8	13.1%	12.3%	17.7%	22.1%

‡ Small numbers may contribute to statistical outliers. [1]Data for NSCLC patients treated with palliative intent at Southend University Hospital are not available due to identified data quality issues at PHE, but they are not an outlier based on our current information.

30-day post-chemotherapy mortality for patients with NSCLC treated with curative or palliative intent in 2014, by NHS hospital trust in the North of England

	NSCLC, curative						NSCLC, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**1,961**	**53**	**2.7%**				**7,673**	**720**	**9.4%**			
Airedale	6	0	0%	0%	15.8%	23.3%	65	7	10.8%	13.6%	17.5%	21.7%
Blackpool Teaching Hospitals	14	2	14.3%	11.1%	11.3%	16.2%	64	11	17.2%	**20.1%***	17.6%	21.8%
Bolton												
Bradford Teaching Hospitals	14	0	0%	0%	11.3%	16.2%	47	4	8.5%	9.8%	18.8%	23.8%
Calderdale and Huddersfield	15	0	0%	0%	11.0%	15.8%	63	6	9.5%	10.6%	17.6%	21.9%
City Hospitals Sunderland	10	0	0%	0%	12.9%	18.7%	103	7	6.8%	7.5%	16.0%	19.3%
East Lancashire Hospitals	25	2	8.0%	7.4%	9.1%	12.8%	131	22	16.8%	**16.2%***	15.3%	18.3%
Gateshead Health	4	0	0%	0%	18.7%	28.0%	19	0	0%	0%	23.7%	31.6%
Harrogate and District	4	0	0%	0%	18.7%	28.0%	48	7	14.6%	14.0%	18.7%	23.6%
Hull and East Yorkshire Hospitals	26	0	0%	0%	9.0%	12.6%	62	1	1.6%	1.2%	17.7%	22.0%
Lancashire Teaching Hospitals	31	1	3.2%	3.9%	8.5%	11.8%	89	16	18.0%	**28.3%***	16.4%	20.0%
Leeds Teaching Hospitals	31	1	3.2%	2.6%	8.5%	11.8%	78	3	3.8%	4.0%	16.9%	20.7%
Mid Cheshire Hospitals	1	0	0%	0%	34.7%	53.2%						
Mid Yorkshire Hospitals	22	1	4.5%	4.3%	9.6%	13.5%	135	12	8.9%	10.2%	15.2%	18.2%

30-day post-chemotherapy mortality for patients with NSCLC treated with curative or palliative intent in 2014, by NHS hospital trust in the North of England

	NSCLC, curative						NSCLC, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**1,961**	**53**	**2.7%**				**7,673**	**720**	**9.4%**			
North Cumbria University Hospitals	8	0	0%	0%	14.1%	20.6%	11	0	0%	0%	28.0%	38.3%
North Tees and Hartlepool	20	1	5.0%	2.4%	9.9%	14.0%	56	5	8.9%	4.9%	18.1%	22.6%
Northern Lincolnshire and Goole	12	0	0%	0%	12.0%	17.3%	39	3	7.7%	4.7%	19.6%	25.1%
Northumbria Healthcare	15	1	6.7%	4.8%	11.0%	15.8%	112	8	7.1%	8.9%	15.7%	19.0%
Pennine Acute Hospitals												
Sheffield Teaching Hospitals	86	3	3.5%	3.7%	6.2%	8.2%	440	39	8.9%	8.9%	13.0%	14.6%
South Tyneside	4‡	1	25.0%	**18.8%***	18.7%	28.0%	57	6	10.5%	13.2%	18.0%	22.5%
Stockport												
The Christie	126	6	4.8%	4.0%	5.6%	7.2%	337	29	8.6%	10.2%	13.4%	15.2%
The Clatterbridge Cancer Centre	134	4	3.0%	2.7%	5.5%	7.1%	481	52	10.8%	10.3%	12.9%	14.4%
The Newcastle Upon Tyne Hospitals	22	0	0%	0%	9.6%	13.5%	77	6	7.8%	7.2%	16.9%	20.8%
University Hospital of South Manchester	114	1	0.9%	1.5%	5.7%	7.5%	89	9	10.1%	12.9%	16.4%	20.0%
University Hospitals of Morecambe Bay	7	0	0%	0%	14.8%	21.8%	66	7	10.6%	13.2%	17.4%	21.6%
Wrightington, Wigan and Leigh	1	0	0%	0%	34.7%	53.2%						
York Teaching Hospital	15	0	0%	0%	11.0%	15.8%	73	6	8.2%	7.8%	17.1%	21.1%

‡ Small numbers may contribute to statistical outliers.

30-day post-chemotherapy mortality for patients with NSCLC treated with curative or palliative intent in 2014, by NHS hospital trust in the South of England

	NSCLC, curative						NSCLC, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**1,961**	**53**	**2.7%**				**7,673**	**720**	**9.4%**			
Ashford and St Peter's Hospitals												
Brighton and Sussex University Hospitals	15	0	0%	0%	11.0%	15.8%	47	6	12.8%	9.3%	18.8%	23.8%
Buckinghamshire Healthcare	4	0	0%	0%	18.7%	28.0%	36	0	0%	0%	20.0%	25.7%
Dartford and Gravesham	7	0	0%	0%	14.8%	21.8%	54	5	9.3%	6.9%	18.2%	22.9%
Dorset County Hospital	3	0	0%	0%	21.2%	31.9%	24	3	12.5%	15.3%	22.2%	29.2%
East Kent Hospitals University	31	1	3.2%	3.5%	8.5%	11.8%	100	8	8.0%	9.7%	16.1%	19.5%
East Sussex Healthcare	14	0	0%	0%	11.3%	16.2%	74	3	4.1%	4.1%	17.0%	21.0%
Frimley Health	4	0	0%	0%	18.7%	28.0%	58	6	10.3%	9.1%	17.9%	22.4%
Gloucestershire Hospitals	15	0	0%	0%	11.0%	15.8%	137	10	7.3%	7.7%	15.2%	18.1%
Great Western Hospitals	8	0	0%	0%	14.1%	20.6%	42	2	4.8%	4.7%	19.3%	24.6%
Hampshire Hospitals	2	0	0%	0%	25.4%	38.4%	29	3	10.3%	11.0%	21.1%	27.5%
Isle of Wight	4	0	0%	0%	18.7%	28.0%	35	5	14.3%	11.7%	20.2%	25.9%
Maidstone and Tunbridge Wells	24	1	4.2%	6.2%	9.3%	13.0%	74	7	9.5%	11.6%	17.0%	21.0%
Medway	7	0	0%	0%	14.8%	21.8%	36	1	2.8%	3.0%	20.0%	25.7%
Northern Devon Healthcare	7	0	0%	0%	14.8%	21.8%	17	2	11.8%	9.9%	24.5%	32.8%

30-day post-chemotherapy mortality for patients with NSCLC treated with curative or palliative intent in 2014, by NHS hospital trust in the South of England

	NSCLC, curative						NSCLC, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**1,961**	**53**	**2.7%**				**7,673**	**720**	**9.4%**			
Oxford University Hospitals	28	0	0%	0%	8.8%	12.3%	99	10	10.1%	12.5%	16.1%	19.5%
Plymouth Hospitals	4	0	0%	0%	18.7%	28.0%	73	10	13.7%	13.4%	17.1%	21.1%
Poole Hospital	22	0	0%	0%	9.6%	13.5%	36	2	5.6%	8.6%	20.0%	25.7%
Portsmouth Hospitals							31	0	0%	0%	20.8%	26.9%
Royal Berkshire	17	0	0%	0%	10.5%	15.0%	65	8	12.3%	11.8%	17.5%	21.7%
Royal Cornwall Hospitals	28	1	3.6%	4.0%	8.8%	12.3%	69	16	23.2%	**20.2%***	17.3%	21.4%
Royal Devon and Exeter	37	2	5.4%	7.6%	8.0%	11.0%	62	7	11.3%	13.0%	17.7%	22.0%
Royal Surrey County Hospital	38	1	2.6%	1.3%	7.9%	10.9%	96	2	2.1%	1.3%	16.2%	19.7%
Royal United Hospital Bath	7	0	0%	0%	14.8%	21.8%	59	6	10.2%	10.8%	17.9%	22.3%
Salisbury	1	0	0%	0%	34.7%	53.2%	19	1	5.3%	5.1%	23.7%	31.6%
Torbay and South Devon NHS Foundation Trust	26‡	3	11.5%	**10.7%***	9.0%	12.6%	43	4	9.3%	9.6%	19.2%	24.4%
Surrey and Sussex Healthcare	4‡	1	25.0%	**19.8%***	18.7%	28.0%	17	2	11.8%	10.9%	24.5%	32.8%
Taunton and Somerset	15	0	0%	0%	11.0%	15.8%	73	11	15.1%	15.3%	17.1%	21.1%
The Royal Bournemouth & Christchurch Hospitals	6‡	1	16.7%	**26.0%***	15.8%	23.3%	60	5	8.3%	7.9%	17.8%	22.2%
University Hospital Southampton	14	0	0%	0%	11.3%	16.2%	50	3	6.0%	6.4%	18.5%	23.4%

30-day post-chemotherapy mortality for patients with NSCLC treated with curative or palliative intent in 2014, by NHS hospital trust in the South of England

	NSCLC, curative						NSCLC, palliative					
Trust	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**	**Patients**	**Deaths within 30 days**	**Crude mortality (%)**	**Risk-adjusted mortality (%)**	**Upper limit (2SD)**	**Upper limit (3SD)**
England	**1,961**	**53**	**2.7%**				**7,673**	**720**	**9.4%**			
University Hospitals Bristol							15	0	0%	0%	25.4%	34.3%
Western Sussex Hospitals	14	1	7.1%	10.0%	11.3%	16.2%	50	7	14.0%	13.4%	18.5%	23.4%
Weston Area Health	3	0	0%	0%	21.2%	31.9%	14	2	14.3%	7.6%	26.0%	35.1%
Yeovil District Hospital	5	0	0%	0%	17.1%	25.3%	27	2	7.4%	6.6%	21.5%	28.1%

‡ Small numbers may contribute to statistical outliers.

Appendix 3: Trust responses to their 30-day mortality data

Outlier Trust	Outlier category	Excerpts of responses received from outlier Trusts
Blackpool Teaching Hospitals NHS Foundation Trust	NSCLC, palliative	"14 cases were identified which included 2 patients who were receiving adjuvant chemotherapy. 12 of the cases have been discussed at the local SACT mortality meeting - 2 have not because they died in other hospitals and the notes were not available for our team. Of the two cases receiving adjuvant therapy - 1 died in hospital as a result of treatment related toxicity and 1 died at home with massive pulmonary embolism. Of the 10 palliative treatment patients who have been discussed: 1 patient was thought to have had treatment that may have contributed to early death. 2 patients died as a result of progressive disease. The 7 remaining patients were classified as "unknown" with respect to whether SACT had an involvement in their death. 7 of the 12 were recorded as having PS2 prior to treatment. The entry of 'treatment intent' was recommended but not mandatory for the time period analysed. This data is not available for 30% of the patients treated. The calculated crude mortality rate is 17.19% with the data submitted. With the additional data the 'worst case scenario' produces a crude mortality rate of 18.46%. However, a rapid review of the disease stage for the missing patient data (and therefore by inference: treatment intent) suggests that the rate will move strongly towards the 'best case scenario' crude mortality rate of 12.24%. Further detailed analysis would be required to determine the impact of the missing data on the risk-adjusted mortality rate."
Burton Hospitals NHS Foundation Trust	Breast, curative	"Further to your letter regarding the above, I can confirm that the data for Burton relates to a single patient. The data originally submitted was incorrect as the patient concerned was being treated with palliative intent. We are working with our clinical team to ensure that with our new system these errors do no occur in the future."
Cambridge University Hospitals NHS Foundation Trust	Breast, palliative	"We welcome the publication of the national chemotherapy dataset. Having the ability to compare outcomes between trusts and across the country is a huge step forward in improving outcome for patients. Many thanks for giving us the opportunity to comment on the results. The information that a relatively high proportion of our patients died within 30 days of chemotherapy prompted our breast cancer team to review their practice, and enabled us to look at each case in detail. We identified that of the 19 deaths observed in these figures, 16 patients died because their cancer had progressed. We were able to identify that one patient

Outlier Trust	Outlier category	Excerpts of responses received from outlier Trusts
		had died because of a rare complication, and on further review we identified several other cases of this infection, which may relate to the particularly chemotherapy schedules used here. Two other patients died because of infections which were not related to their chemotherapy. This has led to changing our practice to include preventative antibiotics for vulnerable patients. We also identified some patients where treatment may have continued beyond the time when patients were likely to gain most benefit. As a result we are increasing staffing in our palliative care team, so that we can involve specialist palliative care nurses at an earlier stage in the patient pathway, which has been shown to improve decision making in patients with terminal cancer. We have also taken the opportunity to review the long term outcomes from our unit. These will be published later in the year, and show that overall the survival times for our patients remain extremely good compared to national and international comparators. Overall this has been an excellent and useful process which we are confident will improve the care of our patients in the future."
Derby Teaching Hospitals NHS Foundation Trust	Breast, palliative	"Thank you for providing us with the data identifying Derby Teaching Hospitals NHS Foundation Trust as an outlier for 30-day mortality following systemic anti-cancer therapy treatment (SACT) with curative and palliative intent. We have taken a thorough review of the data of the patients identified as dying within 30 days of their last reported cycle of chemotherapy for breast cancer and identified a number of contributing factors relating to the quality of data that was available in 2014, as follows: 1. Treatment intent a. The original data identified 72 patients treated with palliative intent but also 95 patients whose treatment intent was not recorded in the dataset. b. Reviewing the treatment intent for 19 patients who were submitted as “not recorded”. Their intent should have been labelled as “palliative”. 2. Diagnosis a. 2 of the patients in the initial data identified as receiving SACT for breast cancer with palliative intent had a previous diagnosis of breast cancer but were not actively receiving SACT for breast cancer in that time period. 3. Date of last cycle of chemotherapy

Outlier Trust	Outlier category	Excerpts of responses received from outlier Trusts
		a. Data submitted related to prescriptions generated rather than treatments administered. 3 patients had data submitted relating to a cycle of chemotherapy for breast cancer with palliative intent. In fact this was not administered and as a consequence the actual interval between their last cycle of chemotherapy and date of death was over 30 days The net effect of these changes is to reduce the apparent 30-day mortality rate from 15.3% to 9.9%."
Dorset County Hospital NHS Foundation Trust	Breast, curative	"Upon receipt of the patient level data it was my intention to validate those patients where no intent had been recorded against the patients' record on SCR and the MDT intent, as obviously this could impact on the mortality percentage, this piece of work was conducted and has been updated on the spreadsheets sent to you. The same piece of work has been conducted for the lung patients. I had expected that these would be the only changes we would be making, and then would be adding some clinical commentary following review of the patient notes. However, this is when we found a fundamental error, the curative patient with the 30 day flag is still alive. [PHE] explained to me that the patient had been recorded as deceased since our February 2015 upload and would have been in a patient level data set sent to us in January 2016. We will investigating how we used this data and look to improve our processes going forward. At the time the date of death was uploaded, we had a very manual process which has since been improved and I am confident that this type of error will not re-occur. We also discussed the number of patient records where 'intent' had not been recorded and the difference this would have made to our overall position. We have corrected historical data for re-submission and will be working with clinicians to ensure this is included as standard in future."
East Lancashire Hospitals NHS Trust	NSCLC, palliative	"We did some work with the CIU around November 2015 when our lead Cancer Clinician liaised with the data manager at the CIU. The communication was via email and verbal telephone calls. We then undertook a clinically lead audit on this group of patients. When this was resubmitted, our revised upload showed the mortality dropped from 16.79% to 16.19% which is a slight improvement. However we remain an outlier for this particular data period (30-day post chemotherapy lung mortality 2014 – for patients

Outlier Trust	Outlier category	Excerpts of responses received from outlier Trusts
		recorded as 'palliative intent' – for patients recorded 'curative intent' we are not an outlier). It is already recognised that in our locality, a higher than the national average of patients are diagnosed with advanced lung cancer, resulting in a high mortality. The Trust has taken these results very seriously and will now produce an action plan which will be monitored by our Lead Cancer Clinician, our Lung MDT lead and the oncologists providing lung oncology services within our Trust. The action plan will include working with the oncologists at our local cancer centre (Lancashire Teaching Hospitals NHS Trust). The plan will focus on (1) clinical appropriateness of giving chemotherapy to lung cancer palliative patients (2) working with our CCGs on the work already ongoing around patients presenting earlier and implementation of the NICE 2015 revised GP referral for suspected cancer (3) increasing the resources available for collection and validating the data submitted to the CIU."
Gloucestershire Hospitals NHS Foundation Trust	Breast, curative	"Thank you for alerting us to our outlier status within the SACT 30-day mortality data. We have looked at this in detail, whilst being in open communication with CIU. We can confirm that the 4 patients labelled as dying within 30 days of curative chemotherapy, were in fact receiving palliative treatment; i.e. this is a data error around the labelling of treatment intention, rather than a reflection of clinical care. Our information team are confirming details of this data shift directly to the SACT data team. The issue first came to light when the SACT 30 day mortality data for lung cancer patients was published in 2015. The error occurs due to a mismatch between the selectable treatment intentions in our electronic chemotherapy prescribing system and the SACT definitions of treatment intent. We would like to assure you we have taken action to correct this; modifying the definitions in our system, such that prospectively from June 2016, intent will map correctly to the definitions in SACT. This will unfortunately mean that for all reports analysing data submitted up to that date, we will continue to have the same problem. We would welcome the continued opportunity, pre-publication of reports, to review and re-validate our data to confirm this is the only reason for us being an outlier and there is nothing else we should also be concerned about."

Outlier Trust	Outlier category	Excerpts of responses received from outlier Trusts
Ipswich Hospital NHS Trust	Breast, curative	"Following your publication of the Systemic Anti-Cancer Therapy 30-day post chemotherapy mortality data which showed us an outlier, we have reviewed our clinical records to establish the reasons for this. We are sorry to advise you that one of our patients was miscoded as being treated with curative intent when in fact they were treated palliatively and died with massive disease progression. We believe that this is the most likely explanation for our Trust being identified as an outlier in terms of 30 day mortality following systemic anti-cancer treatment for curative breast cancer. Of the second and this now only case of death within thirty days whilst on curative treatment, our review has identified that they died with a massive pulmonary embolus in the community. Co-morbidity factors are likely to have contributed to this outcome. We are sorry that this data error was not identified sooner and are pleased that this will be accounted for in follow up publications on this matter. We have committed to review any other data inconsistencies and populate as required from our clinical records. We will review our data control processes and adapt accordingly. Our electronic medical oncology management system that is now in place will also assist in those assurances."
James Paget University Hospitals NHS Foundation Trust	Breast, palliative	"I believe there are 9 patients with breast cancer who were deceased within 30 days of SACT. We have had a look at accuracy of the results and apart from one patient (who is still alive) the others were deceased within 30 days of SACT. We will be investigating the others although all have been through the Haematology/Oncology mortality meeting. What I will propose is an extraordinary mortality review of these patients only; I think we need to know if there were any factors which need addressing. A Preliminary look doesn't point to any but a more detailed investigation is required. I think the time span could only allow us to look at data accuracy so once we have investigated more thoroughly we would be able to provide a comprehensive response-though I recognise that this would be outside the deadline provided."
Kettering General Hospital NHS	Breast, curative	"In the recent analysis due for publication of 30/7 mortality following systemic anti-cancer treatment KGH was identified as an outlier.

Outlier Trust	Outlier category	Excerpts of responses received from outlier Trusts
Foundation Trust		We have carried out analysis of this patient group and the two patient deaths. Patient 1: The initial treatment intent was curative and the patient underwent appropriate therapy. However the decision around subsequent chemotherapy was revised to palliative intent, but this action was never amended and reflected in subsequent data extracts. Causation: This was due to an incomplete dataset proforma being uploaded and defaulting to curative intent rather than palliative intent. Action: Remedial safety nets have been put in place. All incomplete datasets will be escalated for data clarification and completion prior to initial upload. Patient 2: Patient receiving chemotherapy with curative intent. At the 3rd cycle the patient became unwell and was admitted to neighbouring trust (cancer centre) for specialist oncology input. The patient was transferred to ITU where they subsequently died. Cause of death from the coroner's report attributes this to bowel ischemia/infarction which could be related to chemotherapy. Causation: vascular ischemia of bowel Action: Nil specific. It is not clear that chemotherapy contributed to the outcome, however equally it may have been a causative factor. Comment: One death (with curative intent) within 30 days- it brings the crude mortality to 0.93%."
Lancashire Teaching Hospitals NHS Foundation Trust	NSCLC, palliative	"Many thanks for giving us the opportunity to respond to the 30 day M and M data. We are disappointed to learn that we remain a negative outlier for 30 day mortality for NSCLC. We have reviewed all our data - we have checked that those patients flagged as having died with 30 days of SACT received the least dose of chemotherapy within 30 days and we have previously updated the fields for intent of treatment which I understand was sent back to you in 2015. Your letter states 'We have particular concerns over patient deaths that are recorded to have occurred following chemotherapy given with curative intent, as this raises the possibility that these were iatrogenic deaths in a group of patients with potentially curable malignancy'. I can confirm we have 1 NSCLC patient that falls into this category - a patient who was receiving radical chemo-radiotherapy for NSCLC. Following the first dose of treatment our chemotherapy helpline attempted to contact the patient for review. Death certificate states cause of death was lung cancer and his case was

Outlier Trust	Outlier category	Excerpts of responses received from outlier Trusts
		discussed in our local M and M meeting. There was insufficient information to attribute the death directly to SACT. Unfortunately having reviewed our data we are unable to recommend any changes that might suggest that our status is due to data errors. We have been holding monthly local M and M meetings since mid-2012 and had noticed that in 2012 there were numerically a higher number of deaths within our NSCLC patient population than in previous years. This was discussed at length in both the M and M meetings and in our consultant meetings. The consultants treating lung cancer were all asked to reflect on their practices and this was discussed at their appraisals. The deaths were discussed at our M and M meeting and on review of the deaths, there doesn't appear to be one overarching issue to explain the spike in deaths in 2014. There were a number of patients that were having symptomatic benefit from Erlotinib who continued on treatment beyond disease progression in 2014 and this may have contributed. There certainly isn't anything to suggest that there is a significant number of treatment related deaths and the majority of patients died from their disease. I'm pleased to say that in 2015 there were less NSCLC deaths and so we hope that 2014 was due to random variation. However we continue to monitor the situation very closely. Furthermore we are due to start an enhanced supportive care CQUIN this year in which we are prioritising patients with lung cancer due to our concerns about the 2014 30 day mortality data. A major aim of enhanced supportive care is to reduce the 30 day post SACT mortality rate."
Milton Keynes Hospital NHS Foundation Trust	NSCLC, curative	"Colleagues have identified that the patient who died within 30 days was miscategorised as curative intent when the treated was intended to be palliative. We would like to confirm that we have resubmitted our data. MKUH has a small number of patients for non-small cell lung cancer treatment with curative intent. In the original data submitted, MJUH was identified as an outlier where 1 patient died within 30 days of chemotherapy who was treated as curative intent; with the total population of curative intent being 6 patients. This represented 16.67% of the population and a risk adjusted mortality rate of 50.9%. However on further validation, it was identified the patient who died was miscategorised and therefore the treatment intended was palliative as opposed to curative. In summary, MKUH treated 5 patients with curative intent and none of these patients died within 30 days of chemotherapy treatment."
Royal Cornwall	NSCLC, palliative	"Figures reported to the Chemotherapy Intelligence Unit show that RCHT appears to be an outlier for death within 30 days of chemotherapy given with palliative intent for lung cancer. I reviewed these figures with our cancer pathway manager,

Outlier Trust	Outlier category	Excerpts of responses received from outlier Trusts
Hospitals NHS Trust		the oncologists represented on the lung cancer multidisciplinary team and the clinical MDT Lead for lung cancer in October 2015. Initially 29 deaths were recorded by CIU occurring within 30 days of chemotherapy given with palliative intent (including 1 on day 30). Following data cleansing and risk adjustment by CIU there are now 16 cases (from 69) for review. One of these cases never received the chemotherapy prescribed, leaving 15. None of the cases have performance status recorded on the CIU database which suggests the risk adjustment may be incomplete. I have carried out a review of all these cases using case notes where available (13/15), correspondence (15/15) and all the chemotherapy prescribing and administration system (15/15). In all cases the palliative intent of treatment was clearly documented following discussion with patient and family. In all cases the treatment given was within NICE guidance. All deaths are attributed in notes or death certificate to lung cancer or to a direct consequence of this. In no cases was the treated given implicated in death. When considering the time from commencement of palliative treatment to death I found 8/15 cases were death occurred within 28 days of starting palliative chemotherapy. In 2 of these, death occurred within 7 days of starting palliative chemotherapy, both of whom died in hospital. In summary, after data cleansing, 15 cases of death within 30 days of palliative chemotherapy for lung cancer have been identified. In none of these cases was treatment thought to be a cause of death. Two cases were identified who survived less than 7 days after starting palliative treatment and it could be argued that these patients did not gain from that treatment. The lung MDT notes that NICE guidance on the use of some drugs in the palliative setting has changed which should alter our position favourably. It is agreed that recording of performance status on the information return to CIU may make data analysis more complete. If our outlier status persists the MDT may need to review their criteria for starting palliative treatment in patients with poor performance status."

Outlier Trust	Outlier category	Excerpts of responses received from outlier Trusts
South Tyneside NHS Foundation Trust	NSCLC, curative	“Thank you for your letter dated 15th August, informing us that that mortality for lung cancer with a curative intent at our Trust falls outside the 95% confidence limits in your analyses and that our Trust will be named as an outlier in the report. 4 patients were treated at our Trust for lung cancer with a curative intent. There was 1 death in this group of contributing to our crude and adjusted mortality rate. This data has been reviewed by our Lung Cancer Operational Group on 8th August 2016, and I agree with their conclusion that it appears that our negative outlier status is down to cohort size. The 1 death that occurred had already been reviewed as part of our Trust’s mortality review process. This case was reviewed again by the Lung Cancer Operational Group and they confirmed the conclusion of the initial review that this death was unrelated to chemotherapy and occurred in a patient who died at home due to a myocardial infarction. I am hence assured that our Trust’s outlier status in your report is the result of the small cohort size in our lung cancer patients where there was a curative intent and more importantly the 1 death contributing to the outlier status was unrelated to treatment for the lung cancer.”
South Warwickshire NHS Foundation Trust	Breast, curative	"A full review by the consultant clinical oncologist and the lead cancer clinician was undertaken on the reported breast cancer patient. The medical notes were reviewed and a timeline of events including blood results interventions and theatre findings were recorded. Using this information a root cause analysis was undertaken. The findings were that the patient presented acutely unwell four days after cycle 2 FEC 75. The Trust's conclusion was that there was no evidence that chemotherapy administration resulted in death."
Surrey and Sussex Healthcare NHS Trust	NSCLC, curative	"The relevant senior clinical team within the Trust have reviewed the patient information and all relevant information and data. This is as a result of one patient dying out of four treated. This was a patient with significant co-morbidities and the cause of death was unrelated to the chemotherapy regime. The patient had a significant myocardial infarction at home, not related to the chemotherapy. Their pre-treatment stage was T3N3M0 and performance status was 2, and the treatment

Outlier Trust	Outlier category	Excerpts of responses received from outlier Trusts
		was entirely appropriate."
The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust	NSCLC, curative	"We noted your observation that the Royal Bournemouth Hospital is an outlier for mortality for those patients who had received chemotherapy given with curative intent for lung cancer. This group is limited to those small number of patients receiving post op adjuvant chemotherapy (without radiotherapy) given their high risk of occurrence. The data lists 6 patients that are said to have received curative chemotherapy in RBH. One patient is incorrectly labelled as receiving curative treatment so actually the denominator should be 5. Looking at the spreadsheet a number of these information fields are not filled in. We will update this data as best as we can and correct the intent of the mislabelled patient, but, given that the patient who died was fit, from a non-deprived postcode and that death is being compared to the whole national cohort, I do not think this is likely to influence the risk adjusted mortality. We reviewed the individual circumstances surrounding the patient who died. The patient was a 65, fit for treatment, and was performance status 1, their only co-morbidity was a history of hypertension. A post mortem performed on the patient confirmed the cause of death to be Bilateral pulmonary embolus, venous thrombosis and adenocarcinoma of the lung. In short we appear as an outlier in analysis due to a single, unexpected, unforeseen death in a very small cohort of patients. On the basis of this review and the available evidence we do not feel that in retrospect, treatment should have been managed differently. As you state in your email of 8.8.16, the low volume denominator is probably the most important consideration here and this should be clearly acknowledged in any published report. As Oncologists, we provide a Dorset wide service according to network protocols. We have a single inpatient service in Poole. All surgery is performed in Southampton. It is worth noting that if you look at the three trusts across the whole of Dorset there were 0/3 curative deaths in Dorset County Hospital, 0/22 in Poole and 1/5 in Bournemouth giving a crude mortality of 3.3% for the county, which is at or just below the national median."
Torbay and South Devon NHS	NSCLC, curative	"We have identified a 2% error rate in the recording of treatment intent. This is due largely to the SACT [e-prescribing] system placing patients treated with 1st line (in the palliative setting) into the curative treatment intent group. However, it is

Outlier Trust	Outlier category	Excerpts of responses received from outlier Trusts
Foundation Trust		also due to patients having palliative chemotherapy following relapse remaining in the curative intent group; inaccurate staging and incorrect diagnosis. Patients having '1st or 2nd line' chemotherapy (with palliative intent were also allocated to treatment intent not recorded. Having corrected our data for staging and treatment intent our 30-day chemotherapy mortality in the curative setting for lung cancer falls from negative outlier status to 0%."
University Hospitals Coventry and Warwickshire NHS Trust	Breast, curative and palliative NSCLC, palliative	"After a review of the data for Breast Cancer (curative/radical chemotherapy), the data was found to be accurate. All of these patients have been individually reviewed by consultants through the Trustwide Mortality Review process which provides a comprehensive mortality review for all adult inpatients who die within the Trust. All cases are graded according to the NCEPOD classification of care. Of the 3 deaths included above, all of them were graded NCEPOD A for 'good care' at primary review. In addition, they have all had a further mortality review within the department during a multidisciplinary mortality meeting to provide additional assurance of a high standard of care. Although the Trust remains a mortality outlier for this group using the risk-adjusted mortality calculations, we are satisfied that the provision of chemotherapy was justified in all 3 patients, and appropriate medical reviews had taken place prior to the last cycle of chemotherapy - each death was unpreventable and the care was of a high standard."
		"During 2014 the UHCW SACT database was not routinely edited and checked for accuracy prior to submission. Since February 2016, there has been a change in process regarding the data recorded in the SACT and all data is now reviewed prior to submission by our Cancer Lead Chemotherapy Nurse, and will continue to be reviewed in a timely manner for accuracy when our new Chemotherapy Nurse manager is appointed. This, we believe, will ensure that accurate data is submitted for future patients. Our Cancer and Chemotherapy Teams have reviewed the data submitted to SACT for the time period January 2014 - December 2014 to better understand UHCW's 30 day mortality risk for breast cancer (palliative chemotherapy and curative/radical chemotherapy) and lung cancer (palliative chemotherapy). The teams have reviewed a total of 27 patients on the SACT database who died within 30 days of chemotherapy in that time period. Of the 27 patients, 4 patients were treated at different Trusts (3 patients at George Eliot Hospital NHS Trust, 1 patient at Alexandra Hospital NHS Trust). They were wrongly recorded as being treated at UHCW and should not have been

Outlier Trust	Outlier category	Excerpts of responses received from outlier Trusts
		included in the dataset. In addition to this, 9 patients were incorrectly recorded as having chemotherapy within the last 30 days of life. These patient's electronic prescriptions had not been cancelled prior to death - accounting for the incorrect data. The Trust can confirm that the chemotherapy had not been dispensed to them and should therefore be excluded from the analysis.”
University Hospitals Coventry and Warwickshire NHS Trust		“Further review shows that the number of Lung Cancer patients receiving palliative chemotherapy has dropped from 84 to 81 patients following our internal review of the data. With regards to 30 day mortality, there have only been 6 deaths from patients in this cohort, compared to the 12 deaths reported through SACT. This reduces the crude mortality rate by 50%, highlighting that UHCW is no longer a mortality risk for this group (outside the 95% confidence interval). Likewise, following further review the revised figures for Breast Cancer (palliative chemotherapy) show a decrease in 1 patient from the cohort, and a reduction of 7 deaths. There were 12 deaths originally submitted and UHCW's revised figures highlight there were only 5 deaths from this cohort meeting the criteria. This reduces the crude mortality rate from 12.37% to 5.21%. The data for January 2015 - December 2015 is also currently being reviewed for accuracy and resubmission of data if required. From this activity and the actions put into place to ensure the data is routinely reviewed, we are anticipating that future SACT data will give a better representation of the chemotherapy service delivered at UHCW. In addition to this, all inpatient deaths will continue to be reviewed as part of the Trustwide Mortality Review process, and all mortality outcomes within 30 days of chemotherapy will continue to be discussed at multidisciplinary mortality meetings which are held monthly to provide assurance of care and identify learning where appropriate."
University Hospitals of North Midlands NHS Trust	NSCLC, palliative	“University Hospitals of North Midlands NHS Trust (UHNM) was created on 1 November 2014 following the integration of Stafford Hospital (part of the former Mid Staffordshire NHS Foundation Trust) with the University Hospital of North Staffordshire. SACT data analysis for 2014 includes records from both organisations. However, Stafford Hospital had no electronic prescribing system in place in 2014 and only submitted SACT records for a small proportion of patients treated. The former University Hospital of North Staffordshire Trust was in the process of converting pre-printed paper prescriptions for chemotherapy to electronic prescribing during 2014. By the end of May 2014 there was complete

Outlier Trust	Outlier category	Excerpts of responses received from outlier Trusts
		electronic prescribing for all lung patients. This means the total patient number included in the analysis does not reflect the true patient volume treated in 2014. In addition patient data had been corrected with the CIU for the treatment intent in 2015. However, not all corrections have been taken into account on the current presented data. A major factor influencing the risk adjustment is the performance status (PS) which has been found to be incorrectly reported. Compliance with PS recording was low in 2014 and a technical fault seems to have converted blank data fields to performance status '0'. The data analysis by the CIU included 91 patients with PS 0 (63%), 27 patients with PS 1 (19%) and 6 patients with PS2-4 (4%). For 20 patients the PS was recorded as not known. The current data has been checked against the medical notes and PS at start of the regimen has been corrected and updated in the CIU database. Corrected PS data show 28 patients with PS 0 (19%), 54 patients with PS 1 (38%), 32 patients with PS2-4 (22%) and for the remaining 30 patients the PS is not known. The corrected PS clearly demonstrates a larger number of higher risk patients compared to the data presented in the analysis and therefore it is expected to affect subsequent analysis."

Appendix 4: Proposed 30-Day Systemic Anticancer Therapy (SACT) Mortality Proforma – National chemotherapy board

Sections 1-5 to be completed by treating consultant

Section 1. Patient & Disease Details

Patient ID Patient Initials Age Gender M/F *(Delete 1)*	Oncology Consultant Treating hospital/unit Known to palliative care *(Delete 2 choices)* Yes No Unknown	Form completed by Date completed
Primary Tumour *ie lung* Histopathology *ie adenocarcinoma* Stage at Death: *ie TNM and stage*	Treatment Intent *(Delete 3 choices)* Neo-adjuvant Adjuvant Palliative-please state line Curative	Co-morbidities *(Delete 2 choices)* YES NO Unknown List: Clinical Trial patient? YES NO *(Delete 1)*

Section 2. Assessment of SACT Use

Date of decision to treat	*Enter date/ not documented* *DD/MM/YY /Not doc*	SACT Regimen and Interval	*i.e Gem/carbo q3/52ly*
Cycle (inc. number planned) Regimen listed in the site-specific algorithm	*Cycle X of Y* YES NO *(Delete 1)*	Did death occur within 30 days of final SACT cycle	*Please write how many days* YES NO
Written informed patient consent obtained (Review consent form and documented toxicities) *(Delete as required)*	YES NO Consent- Good Average Poor	Grade of person consenting *(Delete as required)*	Consultant ST3+ Nurse Other-
ECOG pre cycle 1 (at consent)	PS= *x/Not doc*	ECOG at final cycle	PS= *x/Not doc*
Last SACT cycle prescribed by whom? *(Delete 3 choices)*	Consultant ST3+ Nurse Other-	SACT prescription signed by: *(Delete as required)*	Approved doctor Approved pharmacist Other
Written protocol available for this regimen?	*(Delete 1 choice)* Yes No	Was there an appropriate response assessment to SACT documented	YES NO Comment -
Was there a deviation from	*(Delete 1 choice)*		

protocol?	Yes No *Comment-*			*(Delete 1)*		
Was dose appropriate for: *(state yes/no)*	BSA/weight accounting for any dose reduction	FBC	Renal function	Hepatic function	Cardiac function	Other?
Please give detail if answer no above						
Where there any Grade 3/4 toxicities prior to final SACT cycle *(Delete as required)*	Not applicable (1st cycle) None documented Yes -			In your opinion was the appropriate dose administered i.e. dose reduction if required		
In retrospect was the decision to treat with this regimen appropriate: *(Delete 1)* YES NO Comments -				In retrospect was the last SACT administration appropriate: *(Delete 1)* YES NO Comments -		

Section 3. Assessment of final hospital admission (if applicable) and cause of death

Date of death	DD/MM/YY	Place of Death *(Delete 3 choices)*	Hospital Home Hospice Other -

Emergency admission prior to death *(Delete 1)* YES NO	Date: DD/MM/YY Length of admission Days	Comment on communication with chemotherapy helpline/acute oncology/on-call onc/haem teams	
Cause of death as per your assessment		Cause of death as per death certificate	
Death likely related to recent SACT *(Delete 3 choices)*	Definitely Probably Possibly No Comment -	Death reported to coroner if SACT contributory to death *(Delete 3 choices)*	Yes No Unknown Not required
Neutropenic Sepsis (prior to death) *Delete 1* YES NO	Review neutropenic sepsis management Timely appropriate first line ABXs given?	VTE Venous Thromboembolism (prior to death) *Delete 1* YES NO	Any concerns regarding management -

		On *(Delete 1)* -VTE prophylaxis -Therapeutic anticoagualtion	

Section 4. Other information

Any other deficiencies in care noted/lessons to be learnt:

Section 5. Overall Standard of Care

Please tick	**Description**	**Review process**
A Good Practice □	A standard that you accept for yourself, your trainees and your institution	No further review required, written summary as part of M&M minutes only
B Room for improvement □	Aspects of **clinical** care that could have been better	Second in depth review to be conducted by Consultant who was not directly involved in care of the patient. Requires presentation at local M&M meeting and outcome/learning shared in minutes and through relevant Trust governance process.
C Room for improvement □	Aspects of **organisational** care that could have been better	
D Room for improvement □	Aspects of **clinical and/or organisational** care that could have been better	
E Less than satisfactory □	Several aspects of **clinical and/or organisational** care that were well below satisfactory	Please report a clinical adverse incident. Second in depth review to be conducted by Consultant who was not directly involved in care of the patient. Requires presentation at local M&M

		meeting and outcome/learning shared in minutes, through relevant Trust governance process and report to Medical Director & relevant manager.

Section 6. Independent Consultant Review

(To be completed by consultant reviewer if overall standard of care assessed as B-E in Section 5).

Form completed by:	Date completed
Are you in agreement with the answers provided in Sections 1-5. If not please list any discrepancies, any other deficiencies in care or learning issues.	

Highlight areas of good practice:
Recommendations:

Section 7. Mortality Meeting Review

Summary of discussion:		
In retrospect was the last SACT administration appropriate? *(Delete 1)* YES NO	Were complications managed appropriately? *(Delete 1)* YES NO	Did SACT cause or hasten patient's death? *(Delete 3)* Definitely Probably Possibly

		No
Recommendations and actions:		