

NATIONAL BOWEL CANCER AUDIT

The validity of cancer-specific mortality as a performance indicator in patients having major surgery for bowel cancer

NBCA: Short report 4

Date of publication: Friday 13th October 2017

About HQIP, the National Clinical Audit and Patient Outcomes Programme and how it is funded:

The Healthcare Quality Improvement Partnership (HQIP) is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing and National Voices. Its aim is to promote quality improvement, and in particular, to increase the impact that clinical audit has on healthcare quality in England and Wales. HQIP holds the contract to manage and develop the National Clinical Audit and Patient Outcomes Programme (NCAPOP), comprising more around 40 programmes covering care provided to people with a wide range of medical, surgical and mental health conditions. The programme is funded by NHS England, the Welsh Government and, with some individual programmes, also funded by the Health Departments of the Scotland, Northern Ireland and the Channel Islands. www.hqip.org.uk.

Introduction

The National Bowel Cancer Audit (NBOCA) reports clinical outcomes of patients by hospital trust in order to compare the performance of providers. For a performance indicator to be valid it must make fair comparisons of an outcome that is within the control of the provider. One of the indicators currently reported is risk-adjusted all-cause 2-year mortality after major surgery, but there is wide variation between regions and hospital trusts on this outcome. [2016 AR] All-cause mortality includes deaths from causes other than the cancer itself or treatment for the cancer, and these will often be beyond the control of the hospital trust. Comparing cancer-specific mortality between hospital trusts offers the potential to make fairer comparisons of long-term mortality.

The Office for National Statistics uses death certificate information to generate an underlying cause of death for each patient, which is defined as “the disease or injury which initiated the train of morbid events leading directly to death...”. This could be used to estimate long-term cancer-specific mortality, but this outcome has not yet been validated.

Methods

19,888 patients undergoing major resection between 1 April 2012 and 31 March 2013 according to NBOCA were included. Patients were linked to ONS mortality data for date and cause of death, and to the Hospital Episode Statistics database (HES) for information on mode of admission and comorbidities. Comorbidities measured according to the Charlson Score. [ref] Cancer-specific death was defined as death from any cause within 90 days of surgery or death with bowel cancer or cancer of an unspecified site as the underlying cause in the 91 days to 2 years after surgery.

To assess the validity of cancer-specific 2-year mortality after major surgery as a performance indicator, four analyses were carried out:

1. Cause of death according to time from surgery to death
2. Cause of death according to patient comorbidity
3. Correlates of all-cause mortality and cancer-specific mortality with known risk factors
4. Variation in cancer-specific 2-year mortality versus all-cause 2-year mortality by hospital trust

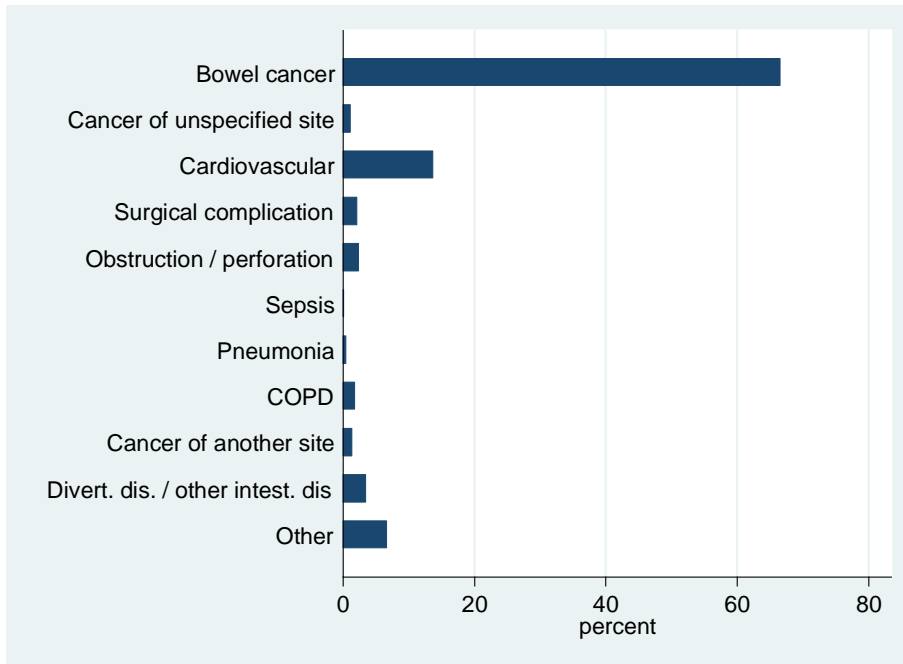
Results

3,639 of the 19,888 patients died of any cause within 2 years. The all-cause 2-year mortality rate per person-year was 20.8% (95% CI 20.1% to 21.5%). The total number of cancer-specific deaths was 2,849. The cancer-specific 2-year mortality rate per person-year was 16.0% (95% CI 15.4% to 16.6%).

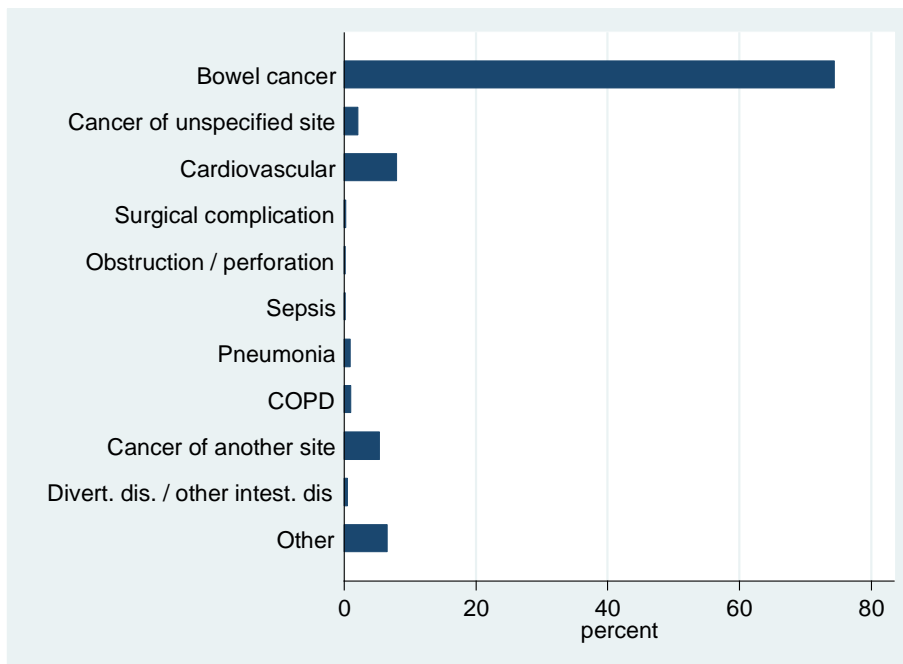
1. Cause of death according to time from surgery to death

Cardiovascular diseases, surgical complication and obstruction/perforation as the underlying cause of death feature much more in deaths within the first 90 days after surgery compared to in the 91 days to 2 years after surgery, as shown in the graphs below. Surgical complication and obstruction/perforation were rarely recorded as the underlying cause of death in the later follow-up period.

Cause of death within 90 days of surgery



Cause of death 90 days to 2 years after surgery



2. Cause of death according to patient comorbidity

Amongst all 3,639 patients who died within 2 years of surgery, the main causes of death were bowel cancer/ cancer of an unspecified site (77%), cardiovascular disease (10%), other causes (5%), and cancer of another site (4%).

There was an increased proportion of deaths recorded as due to cardiovascular disease in patients identified as having MI or congestive cardiac failure (61/251 = 24%), peripheral vascular disease (32/171 = 9%), chronic renal disease (40/243 = 16%), dementia (10/67 = 15%), and COPD (69/542 = 13%). In addition, patients with underlying dementia were more likely to have dementia recorded as their underlying cause of death (7/67 = 10% vs 0.4% of all deaths). And in patients identified as having COPD, a higher proportion of deaths were recorded as begin from COPD (32/542 = 6%) compared to the proportion in all deaths (41/3442 = 1%).

3. Correlates of all-cause mortality and cancer-specific mortality with known risk factors

Cancer stage, emergency admission, and to a lesser degree patient sex, were more strongly associated with cancer-specific mortality than with all-cause mortality, as follows:

	Crude HR (95% CI) for cancer-specific mortality	Crude HR (95% CI) for all-cause mortality
TNM T4 vs T1	12.45 (9.40,16.51)	7.88 (6.39,9.72)
TNM N2 vs N0	5.86 (5.35,6.42)	4.47 (4.13,4.84)
TNM M1 vs M0	5.40 (5.00,5.83)	4.54 (4.23,4.87)
Emergency admission	3.96 (3.65,4.30)	3.34 (3.11,3.60)
Sex female vs male	1.18 (1.10,1.29)	1.06 (0.99,1.13)

The impact of age and comorbidities was slightly stronger for all-cause mortality than for cancer-specific mortality, as follows:

	Crude HR (95% CI) for cancer-specific mortality	Crude HR (95% CI) for all-cause mortality
Age 85+ vs <65	3.28 (2.90,3.71)	3.55 (3.18,4.00)
Comorbidities 2+ vs 0	1.63 (1.45,1.83)	1.88 (1.70,2.08)

ASA grade had a similar strength of association with all-cause mortality and with cancer-specific mortality, as follows:

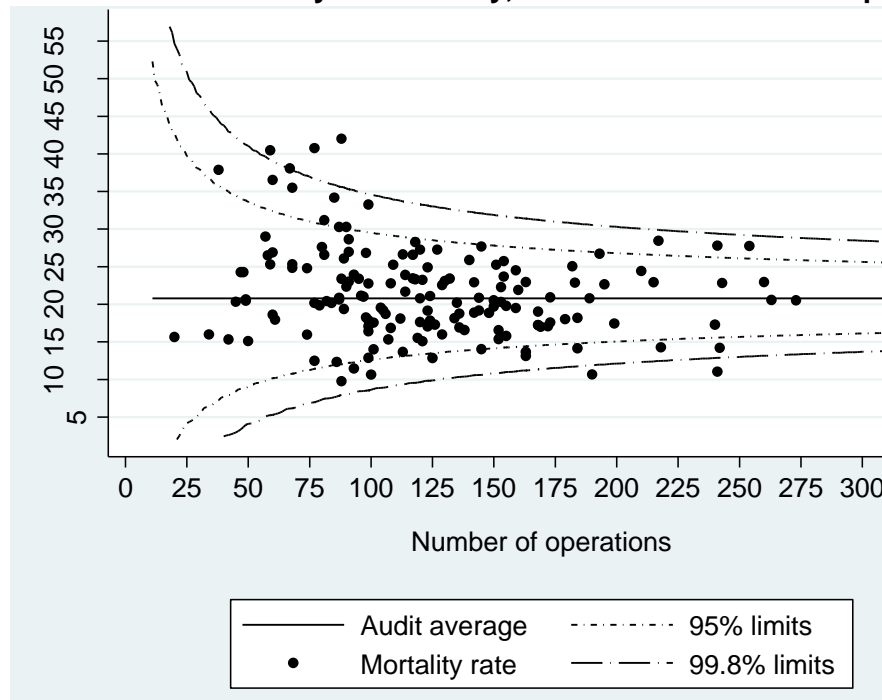
	Crude HR (95% CI) for cancer-specific mortality	Crude HR (95% CI) for all-cause mortality
ASA 4/5 vs 1	9.29 (7.59,11.36)	9.38 (7.82,11.24)

4. Variation in cancer-specific 2-year mortality versus all-cause 2-year mortality by hospital trust

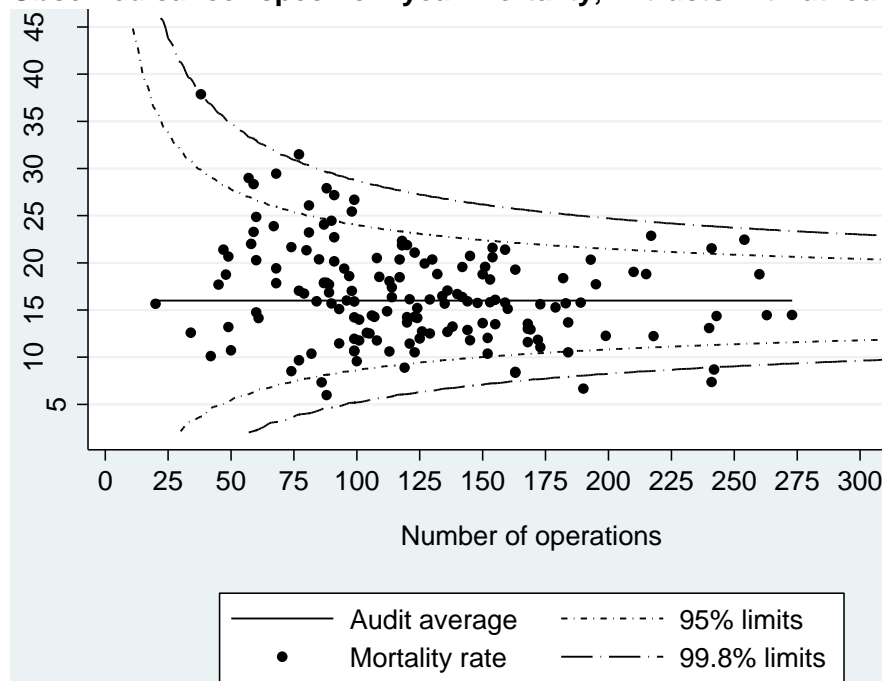
There seemed to be less variation between hospital trusts in observed cancer-specific 2-year mortality than in observed all-cause 2-year mortality, as shown in the funnel plots below. Note however that these outcomes are not adjusted for differences in patient and tumour characteristics at each trust. On observed all-cause 2-year mortality, 26 trusts fell outside the inner limits (8 would be expected by chance alone), of which 6 fell outside outer limits (0.3 would be expected by chance alone). On observed cancer-specific 2-year

mortality, 21 trusts fell outside the inner limits (8 would be expected by chance alone), of which 4 fell outside the outer limits (0.3 would be expected by chance alone).

Observed all-cause 2-year mortality, in trusts with at least 10 patients



Observed cancer-specific 2-year mortality, in trusts with at least 10 patients



Summary and conclusions

As expected, the ONS underlying cause of death was dependent on the time from surgery to death, with cardiovascular deaths, deaths due to surgical complications and obstruction/perforation more common in the immediate postoperative period. The ONS underlying cause of death was found to correlate with underlying comorbidities, in particular

cardiovascular disease, COPD and dementia. And cancer-specific mortality was found to correlate more strongly with characteristics of the tumour and mode of presentation of the patient, whilst as expected, all-cause mortality correlated more strongly with patient age and comorbidity. Finally, there was less variation by hospital trust in observed cancer-specific mortality than in all-cause mortality. This is as expected, because cancer-specific mortality should include fewer deaths which are beyond the control of the provider, such as deaths due to lifestyle factors and other underlying diseases.

This assessment of cancer-specific 2-year mortality after major surgery provides evidence that the outcome, defined according to ONS underlying cause of death, is a valid measure to make comparisons between healthcare providers on cancer mortality. Further work is needed on ensuring long-term cancer-specific mortality rates are adequately risk adjusted, with deaths from other causes appropriately modelled as competing events.