

**UHCE OXFORD REPORT CR14
GENERAL SURGERY: HOSPITAL RE-ADMISSION RATES**

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EXECUTIVE SUMMARY

Purpose of study

The Department of Health and the Healthcare Commission commissioned NCHOD to work with the appropriate professional bodies to develop for surgical specialties a set of outcome indicators that could help clinicians and the Healthcare Commission. This report covers the work done on general surgery re-admission rates.

Outline of study

The study has been carried in the following phases:

- Professional bodies contacted to nominate clinicians to work with NCHOD.
- Agreement reached between NCHOD and nominated clinicians about:
 - aggregations of activity to be used for analysis
 - types of analysis to be done
 - specific operations to be studied
 - candidate indicators to be studied further.
- NCHOD produces national figures for each candidate indicator to provide data about the number of events and admissions nationally so that the suitability of the indicator as a comparative measure could be assessed.
- NCHOD produces trust-based comparative figures for each of the candidate indicators considered suitable, with respect to numbers of events and admissions, to identify whether the measure is a useful comparative indicator.
- Agreement is reached between NCHOD and nominated clinicians about a set of indicators to recommend to the Department of Health and the Healthcare Commission for implementation.

Recommendations

After discussions with collaborating clinicians, it is recommended that the following emergency re-admission indicators could be used for comparing trust general surgery performance:

- General indicators:
 - day cases
 - elective admissions with an operation
 - elective admissions without an operation
 - emergency admissions with an operation
 - emergency admissions without an operation.
- High volume upper gastro-intestinal operation:
 - cholecystectomy.

The vascular procedures indicators had a few outlier trusts when three years of data were analysed. They are unlikely to be useful as annual comparative measures if annual data are required.

Many factors influence these indicators and the results of comparative analyses have to be interpreted with care.

1. BACKGROUND

Purpose of study

The Department of Health and the Healthcare Commission commissioned the National Centre for Health Outcomes Development (NCHOD) at Oxford to work with the Royal College of Surgeons to develop for general surgery a set of outcome indicators that could help:

- Clinicians:
 - share information about prognosis with patients
 - assess outcomes in patients they have treated
 - compare outcomes of patients they have treated with colleagues.
- Healthcare Commission to screen trusts as to whether their clinical performance needs further investigation.

The detailed work of indicator specification was carried out with nominees from:

- Association of Coloproctology of GB and Ireland
- Association of Upper Gastro-intestinal Surgeons of GB and Ireland
- Vascular Surgical Society of GB and Ireland

Outcome indicators

For the purpose of studying outcomes, an indicator has been defined as an ‘aggregated statistical measure, describing a group or whole population, compiled from measures on individuals that provide insights into the functioning of services’. Well-chosen indicators provide pointers as to where further investigation may be worthwhile but they do not necessarily provide definitive answers on whether services are good or inadequate.

As well as direct indicators of outcome such as mortality or re-admission rates, consideration in this study will be given to the inclusion of proxy or indirect indicators of outcome such as the ‘inappropriate’ selection of cases.

Emergency re-admission rates

Emergency re-admission (ERA) after hospital care may be a consequence of a wide range of factors including:

- natural progression of a patient’s disease
- too early discharge from hospital
- sub-optimal care during the initial admission
- inadequate resources outside hospital.

However, indicators based on emergency re-admission rates are considered to be a potentially useful means of comparing hospital performance and have been recommended in seven of the ten reports on specific conditions published in 1999 by NCHOD, namely for:

- asthma
- acute myocardial infarction
- cataract
- fractured proximal femur
- incontinence
- severe mental illness
- stroke.

Re-admission rates are used as clinical indicators and in star ratings. Those produced have included indicators for emergency re-admission within 30 days of an admission:

- in which a hysterectomy was performed
- in which a hip replacement operation was performed
- for fractured hip
- for stroke
- of an older person (also 0-7 and 7-28 day re-admissions for this group of patients)

General surgery

General surgery is a specialty with a number of discrete sub-specialties and with an increasing number of surgeons working only in a sub-specialty. The specialty and sub-specialties can be described by the operations done or by the diagnoses of the admissions.

The operations usually done by general surgeons relate to:

- Endocrine glands.
- Breast.
- Upper and lower gastro-intestinal tract.
- Abdominal organs.
- Arteries/veins:
 - aorta, iliacs/femorals and other arteries
 - veins.
- Soft tissues:
 - abdominal wall and peritoneum
 - lymphatics.

The diagnoses related to general surgery are:

- malignant neoplasms
- benign neoplasms
- disease of arteries, arterioles and capillaries
- diseases of veins and lymphatic system
- diseases of oral cavity, salivary glands and jaws
- diseases of oesophagus, stomach and duodenum
- diseases of appendix
- hernia
- non-infective enteritis and colitis
- other disease of intestines
- diseases of peritoneum
- disease of liver
- disease of gall bladder, biliary tract and pancreas
- other disease of digestive system
- disorders of breast
- sign and symptoms relating to digestive system
- complications of surgical care.

For clinical organisation purposes, general surgery is now considered as four sub-specialties:

- breast surgery
- upper gastro-intestinal surgery
- colo-rectal surgery
- vascular surgery.

2. METHODS

Outline of the study

The study was carried in the following phases:

- Royal College of Surgeons was contacted to nominate surgical specialist societies to work with NCHOD.
- Specialist societies nominated clinicians to work with NCHOD.
- Agreement was reached between NCHOD and nominated clinicians about:
 - aggregations of activity to be used for analysis
 - types of analysis to be done
 - specific operations to be studied and candidate indicators to be studied further.
- NCHOD developed detailed specifications for each of the candidate indicators which were agreed with the clinicians.
- NCHOD produced national figures for each candidate indicator to provide:
 - data about the number of events and admissions nationally so that the suitability of the indicator as a comparative measure could be assessed.
- NCHOD produced trust-based comparative figures for each of the candidate indicators considered suitable, with respect to numbers of events and admissions, to identify whether the measure was a useful comparative indicator.
- Agreement was reached between NHOD and nominated clinicians about a set of indicators to recommend to the Department of Health and the Healthcare Commission .

Groups of general surgery activity used

With the assistance of the collaborating clinicians a model of general surgery has been developed, dividing the activity into different groups relating to:

- Suitability for measuring the performance of the specialty
- Appropriateness of using indicators derived from a linked file
- Relative risk of the occurrence of adverse events.

The finished consultant episode (FCE) is the measure for counting specialty activity. From routinely collected data, a FCE can be classified as:

- One which is:
 - first FCE in a continuous in-patient spell (CIPS), or
 - subsequent FCE when the patient is transferred from the original specialty of admission.
- One containing:
 - diagnostic code for cancer, or
 - no such codes.
- If a first FCE, one with mode of admission (if known) coded as:
 - emergency, or
 - elective, or
 - transfer from another hospital.
- If an elective admission, one coded as:
 - day case intended to be and discharged on the same day, or
 - overnight stay.
- One in which:
 - an operative procedure took place, or
 - no operative procedure took place.

The diagnostic codes used to identify cancer patients were those used for the specification of clinical indicator AS401 and are ICD-10 codes C00-97, D37-48 and Z51.1 (patient on chemotherapy for cancer).

In specifying the groups which had operations, FCEs which only had certain operative procedure codes were excluded and included in the non-operation group. A list of these codes, developed for clinical indicator AS401, is shown at Annex A.

The collaborating clinicians have agreed that, when comparing performance between hospital trusts, only admissions with a general surgery first FCE should be used. The quality of care given in the originating FCE will greatly influence that delivered in subsequent FCEs and, indeed, the transfer may often occur because an adverse event has occurred in the initiating FCE.

Admissions with cancer diagnoses have been separately identified. The routine databases of HES and ONS mortality are not the best sources from which to derive comparative cancer outcome statistics in that:

- Cancer survival measures are more appropriate indicators for comparing performance than case fatality rates.
- Comparative cancer mortality performance needs to be based on cancer networks not individual hospitals or trusts.
- Cancer diagnoses are associated with a disproportionately high rate of deaths during or following admission, thus masking less common causes of death.

Previous NCHOD work has shown that FCEs with different modes of admission and with and without an operative procedure performed have varying risks of adverse events occurring after them. Day cases, discharged on the same day as admission, very rarely lead to significant adverse events and there is little purpose in producing linked file indicators for this group of patients. Any patient intended to be a day case but who died rather than being discharged should be the subject of an investigation.

Whether the remaining groups of activity can be used for producing comparative outcome indicators from a linked file is a matter of statistical power and will depend on the number of:

- adverse events being measured
- admissions in the group
- NHS trusts being compared.

For the calendar year 2000 there were on 1,438,351 general surgery FCEs, of which 1,332,799 (93%) were the first FCE in a continuous in-patient spell (CIPS). Of those FCEs which were not first in a spell, 62% were in a CIPS starting with a general surgery FCE. Exhibit 1 shows, for sub-groups of the first FCE general surgery admissions, the number admitted annually.

Exhibit 1: Annual number of first FCEs in a spell which were general surgery

Group	First FCEs	
	Number	%
With cancer diagnosis	133786	10.0
Elective without cancer:		
• day cases	467205	35.0
• overnight with operation	236615	17.8
• overnight no operation	44870	3.4
Emergency without cancer:		
• with operation	132078	9.9
• no operation	303820	22.8
Transfer without cancer	9057	0.7
Admission source not known	5368	0.4
Total	1332799	100.0

Database used

The database used was a linked file of English hospital episodes and ONS mortality data developed at Oxford. Index admissions were for the calendar years 1999-2001 and there was a further 90 days of data to allow the recording of the events of interest post-admission.

Analyses done

Analyses of trends over time require a means of dividing time into discrete periods. For most specifications, only the first recorded admission in the year for an individual has been included in the indicator denominator. However, it is recognised that that the first recorded event may not necessarily be the first relevant event.

For most analyses, continuous in-patient spells starting with a general surgery FCE were used as the index admissions rather than finished consultant episodes. CIPS, relating to the duration of stay in a hospital, have been used rather than FCEs because they:

- are a more clinically relevant measure than FCEs
- obviate having to handle transfers between FCEs in an analysis.

The issues that were considered, in specifying the indicators, were:

- Time interval from end of an index admission to start of first ERA.
- Inclusion of:
 - deaths occurring in specified time period after end of index admission
 - same day re-admissions
 - index admissions with disposals other than home.
- Inclusion of all first emergency re-admissions or only those with specific diagnostic codes.

For day case, elective admission and mode not known indicators, the time interval chosen was 0-29 days after start of index admission.

For emergency and transfer admission indicators, the time interval chosen was 0-89 days as the SMR for this period was markedly raised.

Admissions were excluded from the analyses if the patient died during the index admission or during the time over which the index was being derived (29 days elective and 89 days for emergency admissions).

Index admissions were specified to include only those with a discharge home and, in these circumstances, same day re-admissions were included in the denominator. When admissions with other methods of disposal are included, it is difficult to distinguish genuine same day re-admissions from coding errors.

Initial analyses included all first emergency re-admissions regardless of diagnostic code.

ERA rates were age/sex standardised. In common with the clinical indicator specifications, indirect standardisation was used and the indicators were standardised for age and sex.

Indirect standardisation is to be preferred because it is:

- More robust with small numbers and avoids the distortions caused by direct standardisation based on unstable age-specific rates.
- More flexible with respect to future requirements such as standardising for other factors such as deprivation.

Funnel plots

Results have been shown graphically as funnel plots which show standardised ERA rates on the y axis plotted against expected ERAs on the x axis in a scatter plot. The horizontal line in the middle of each plot shows the national overall ERA rate around which the standardised ERA rates cluster and this clustering is much more pronounced as the expected ERAs get larger leading to a funnel shape. Poisson confidence intervals (95 and 99%) for each value of the expected are superimposed on top of the standardised ERA rates. These confidence intervals are tabulated values for expected ERAs less than 100 and calculated from a formula giving approximate values for expected ERAs greater than 100 (from Bland).

3. RE-ADMISSION INDICATOR SPECIFICATIONS: GENERAL

General specifications

Specifications have been developed for the following general ERA indicators:

- 1A. 0-29 day ERA for day cases for all causes of re-admission
- 2A. 0-29 day ERA for overnight elective admissions which had an operation for all causes of re-admission
- 3A. 0-29 day ERA for overnight elective admissions which did not have an operation for all causes of re-admission
- 4A. 0-89 day ERA for emergency admissions which had an operation for all causes of re-admission
- 5A. 0-89 day ERA for emergency admissions which did not have an operation for all causes of re-admission
- 6A. 0-89 day ERA for transfer admissions for all causes of re-admission
- 7A. 0-29 day ERA for admissions with mode of admission unknown for all causes of re-admission

GENERAL INDICATOR SPECIFICATIONS

Indicator type/number: Re-admission 1A

Definition

Proportion of general surgery day cases (excluding those with a cancer diagnosis) that had a first emergency re-admission starting 0-29 days after discharge from the index admission.

Denominator

General surgery elective day case admission, occurring first in the calendar year for an individual:

- Day case defined as intended to be a day case and discharged same day as admission
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages
- Both sexes.

Numerator

Emergency re-admission starting 0-29 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

Indicator type/number: Re-admission 2A

Definition

Proportion of elective CIPS, starting with a general surgery FCE (excluding day cases and those with a cancer diagnosis) in which an operative procedure took place, that had a first emergency re-admission starting 0-29 days after discharge from the index admission.

Denominator

Elective CIPS starting with a general surgery FCE that had an operative procedure, occurring first in the calendar year for an individual:

- Day case admissions are excluded
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions which only have the operation codes listed in Annex A are excluded
- Admissions with disposals other than home are excluded
- Admissions ending in death or with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-29 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

Indicator type/number: Re-admission 3A

Definition

Proportion of elective CIPS, starting with a general surgery FCE (excluding those with a cancer diagnosis) in which no operative procedure took place, that had a first emergency re-admission starting 0-29 days after discharge from the index admission.

Denominator

Elective CIPS starting with a general surgery FCE in which no operative procedure took place, occurring first in the calendar year for an individual:

- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions which only have the operation codes listed in Annex A are included
- Admissions with disposals other than home are excluded
- Admissions ending in death or with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages
- Both sexes

Numerator

Emergency re-admission starting 0-29 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included.
- Same day re-admissions are included.

Indicator type/number: Re-admission 4A

Definition

Proportion of emergency CIPS, starting with a general surgery FCE (excluding those with a cancer diagnosis) in which an operative procedure took place, that had a first emergency re-admission starting 0-89 days after discharge from the index admission.

Denominator

Emergency CIPS starting with a general surgery FCE in which an operative procedure took place, occurring first in the calendar year for an individual:

- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions which only have the operation codes listed in Annex A are excluded
- Admissions with disposals other than home are excluded
- Admissions ending in death or with death occurring within 89 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages
- Both sexes.

Numerator

Emergency re-admission starting 0-89 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included.
- Same day re-admissions are included.

Indicator type/number: Re-admission 5A

Definition

Proportion of emergency CIPS, starting with a general surgery FCE (excluding those with a cancer diagnosis) in which no operative procedure took place, that had a first emergency re-admission starting 0-89 days after discharge from the index admission.

Denominator

Emergency CIPS starting with a general surgery FCE in which no operative procedure took place, occurring first in the calendar year for an individual:

- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions which only have the operation codes listed in Annex A are included
- Admissions with disposals other than home are excluded
- Admissions ending in death or with death occurring within 89 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages
- Both sexes

Numerator

Emergency re-admission starting 0-89 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included.
- Same day re-admissions are included.

Indicator type/number: Re-admission 6A

Definition

Proportion of transfer CIPS starting with a general surgery FCE (excluding those with a cancer diagnosis) that had a first emergency re-admission starting 0-89 days after discharge from the index admission.

Denominator

CIPS starting with a transfer from another hospital and starting with a general surgery FCE, occurring first in the calendar year for an individual:

- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 89 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages
- Both sexes.

Numerator

Emergency re-admission starting 0-89 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

Indicator type/number: Re-admission 7A

Definition

Proportion of CIPS with mode of admission unknown and starting with a general surgery FCE (excluding those with a cancer diagnosis) that had a first emergency re-admission starting 0-29 days after discharge from the index admission.

Denominator

CIPS with mode of admission unknown and starting with a general surgery FCE, occurring first in the calendar year for an individual:

- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages
- Both sexes.

Numerator

Emergency re-admission starting 0-29 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

4. RE-ADMISSION INDICATOR SPECIFICATIONS: UPPER G-I SURGERY

Introduction

Two high volume upper gastro-intestinal procedures were considered to have adequate numbers to be a potentially useful re-admission indicator:

- elective cholecystectomy
- anti-reflux and hiatus hernia surgery.

However, upper gastro-intestinal surgeons consider that certain operations should only be done in specialist centres and that outcome measures should be calculated for clinically relevant groups of these procedures. The specialist operations relate to:

- oesophagus
- stomach
- pancreas
- liver.

Elective cholecystectomy

About 39,000 admissions with a cholecystectomy code (J18) occur per year of which 87% are elective admissions and:

- In 94 % of the FCEs in which the operation took place the code was recorded in the first position (the main operation).
- The commonest diagnostic codes were:
 - K80 cholelithiasis in 74.2% of admissions
 - K81 cholecystitis in 16.9%

About 28,200 laparoscopic cholecystectomies (recorded as J18.3 with Y50.8) occur each year and in 99.3% of the FCEs in which the operation took place the code was recorded in the first position (the main operation).

The specification used was elective admissions with cholecystectomy recorded as main operation.

Operations for hiatus hernias/anti-reflux surgery

Over 90% of operations for hiatus hernia and anti-reflux surgery occurred in elective admissions with the average annual numbers being:

- G23 repair of diaphragmatic hernia 254
- G24 anti-reflux procedures 1601.

The proportion of G23 and 24 procedures carried out as the main procedure in elective admissions was 91%.

The specification used was elective admissions with G23 or 24 recorded as the main operation.

UPPER G-I SURGERY INDICATOR SPECIFICATIONS

Indicator type/number: Re-admission 8A

Definition

Proportion of elective CIPS, starting with a general surgery FCE (excluding those with a cancer diagnosis) and having a cholecystectomy recorded as the main operation, that had a first emergency re-admission starting 0-29 days after discharge from the index admission.

Denominator

Elective CIPS starting with a general surgery FCE and having a cholecystectomy recorded as the main operation, occurring first in the calendar year for an individual:

- Operative code J18
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-29 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

Indicator type/number: Re-admission 9A

Definition

Proportion of elective CIPS, starting with a general surgery FCE (excluding those with a cancer diagnosis) and having hiatus hernia or anti-reflux surgery recorded as the main operation, that had a first emergency re-admission starting 0-29 days after discharge from the index admission.

Denominator

Elective CIPS starting with a general surgery FCE and having hiatus hernia or anti-reflux surgery recorded as the main operation, occurring first in the calendar year:

- Operative codes G23-24
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-29 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

5. RE-ADMISSION SPECIFICATIONS: VASCULAR SURGERY

Introduction

The following procedures were considered to be potentially useful ERA indicators:

- abdominal aneurysm surgery
- carotid endarterectomy
- leg arterial by-pass grafts.

Abdominal aneurysm surgery

The codes used for abdominal aneurysm surgery were L19.4-19.6, L49.1-49.6, L25.4 and L21.4-21.6.

The specifications used were, as for the case fatality indicators, abdominal aneurysm procedure recorded as main operation in:

- elective admissions
- emergency or transfer admissions.

Carotid endarterectomy

The codes used for carotid endarterectomy were L29.4 and 29.5.

The specification used was, as for the case fatality indicators, carotid endarterectomy recorded as main operation in an elective admission.

Leg arterial by-pass grafts

The codes used for leg by-pass grafts were L58.2-58.7 and 59.2-59.7.

The specifications used were, as for the case fatality indicators, leg arterial by-pass graft recorded as main operation in:

- elective admissions
- emergency or transfer admissions.

VASCULAR SURGERY INDICATOR SPECIFICATIONS

Indicator type/number: Re-admission 10A

Definition

Proportion of elective CIPS, starting with a general surgery FCE (excluding those with a cancer diagnosis) and having abdominal aneurysm surgery recorded as the main operation, that had a first emergency re-admission starting 0-29 days after discharge from the index admission.

Denominator

Elective CIPS starting with a general surgery FCE and having abdominal aneurysm surgery recorded as the main operation, occurring first in the calendar year:

- Operative codes L19.4-19.6, L21.4-21.6, L25.4 and L49.1-49.6
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-29 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

Indicator type/number: Re-admission 11A

Definition

Proportion of emergency and transfer CIPS, starting with a general surgery FCE (excluding those with a cancer diagnosis) and having abdominal aneurysm surgery recorded as the main operation, that had a first emergency re-admission starting 0-89 days after discharge from the index admission.

Denominator

Emergency and transfer CIPS starting with a general surgery FCE with abdominal aneurysm surgery recorded as the main operation, occurring first in the calendar year:

- Operative codes L19.4-19.6, L21.4-21.6, L25.4 and L49.1-49.6
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-89 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

Indicator type/number: Re-admission 12A

Definition

Proportion of elective CIPS, starting with a general surgery FCE (excluding those with a cancer diagnosis) and having carotid endarterectomy recorded as the main operation, that had a first emergency re-admission starting 0-29 days after discharge from the index admission.

Denominator

Elective CIPS starting with a general surgery FCE and having carotid endarterectomy recorded as the main operation, occurring first in the calendar year for an individual:

- Operative codes L29.4-29.5
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-29 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

Indicator type/number: Re-admission 13A

Definition

Proportion of elective CIPS, starting with a general surgery FCE (excluding those with a cancer diagnosis) and having leg arterial by-pass grafting recorded as the main operation, that had a first emergency re-admission starting 0-29 days after discharge from the index admission.

Denominator

Elective CIPS starting with a general surgery FCE and having leg by-pass grafting recorded as the main operation, occurring first in the calendar year for an individual:

- Operative codes L58.2-58.7 and L59.2-59.7
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-29 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

Indicator type/number: Re-admission 14A

Definition

Proportion of emergency and transfer CIPS, starting with a general surgery FCE (excluding those with a cancer diagnosis) and having leg arterial by-pass grafting recorded as the main operation, that had a first emergency re-admission starting 0-89 days after discharge from the index admission.

Denominator

Emergency and transfer CIPS starting with a general surgery FCE and having leg by-pass grafting recorded as the main operation, occurring first in the calendar year for an individual:

- Operative codes L58.2-58.7 and L59.2-59.7
- Admissions with cancer diagnoses C00-97, D37-48 and Z51.1 are excluded
- Admissions with disposals other than home are excluded
- Admissions with death occurring within 29 days of discharge from the index admission, without an earlier emergency re-admission, are excluded
- All ages and both sexes.

Numerator

Emergency re-admission starting 0-89 days after discharge from index admission:

- Only first re-admissions after discharge are included
- Re-admissions for all causes are included
- Same day re-admissions are included.

6. RE-ADMISSION INDICATOR PLOTS

Funnel plots

Exhibits 2 and 3 show for each indicator the number of:

- trusts that had consistent codes across the three years that were analysed
- admissions
- emergency re-admissions
- ERA rates.

The figures in Exhibit 2 are obtained from a file of general surgery FCEs occurring first in a CIPS in 2000 and those in Exhibit 3 are CIPS starting with a general surgery FCE in 1999-2001.

Exhibit 4 shows for the years 1999-2001 for indicators selected to proceed to plots:

- ERA rate
- number and proportion of trusts that had ERA rates which were outside the funnel plot 95% confidence limits.

For the analyses relating to the components of surgical activity, indicators 1A-5A had adequate numbers of admissions and ERAs to be worthwhile proceeding to producing plots. Only one operation-specific indicator 8A had adequate numbers. Funnel plots for these indicators are shown in Exhibits 5-10.

Funnel plots are a type of control chart which are useful when the sample size of plot data points vary. Control charts attempt to compare the degree of variation in some performance measure which was observed, compared to what would statistically be expected. The funnel plots we have presented show how standardised ERA rates vary with expected ERAs around the national average ERA rate. The Poisson confidence intervals represent the variation in standardised ERA rate we expect statistically. If only random variation is present for any given condition we would see 95% (for example), of the data points to be within these limits (for that level of confidence). In only presenting one set of confidence limits (for the expected deaths) the charts are clear and allow an idea of how much variation is present in the data to be ascertained quickly.

Thus the comparison of standardised ERA rates (with confidence limits) to a national average to determine statistical significance means that the number of trusts appearing in Exhibit 4 will not correspond entirely to the number of trusts appearing outside the funnel limits, since they are calculated by two different methods.

Exhibit 2: Number of trusts, admissions and re-admissions and ERA rates for year 2000 using FCE file

Indicator (days)	Number of trusts	Number of admissions	Number of re-admissions	ERA %
1A Day cases 0-29	165	370497	5945	2
2A Overnight elective with operation 0-29	162	192392	8934	5
3A Overnight elective with no operation 0-29	133	30688	1701	6
4A Emergency admissions with operation 0-89	156	113861	14576	13
5A Emergency admissions with no operation 0-89	156	200314	31413	16
6A Transfer admissions 0-89	108	3835	764	20
7A Unknown mode of admission 0-29	86	1373	82	6

Exhibit 3: Number of trusts, admissions and re-admissions and ERA rates for 1999-2001 using CIPS file

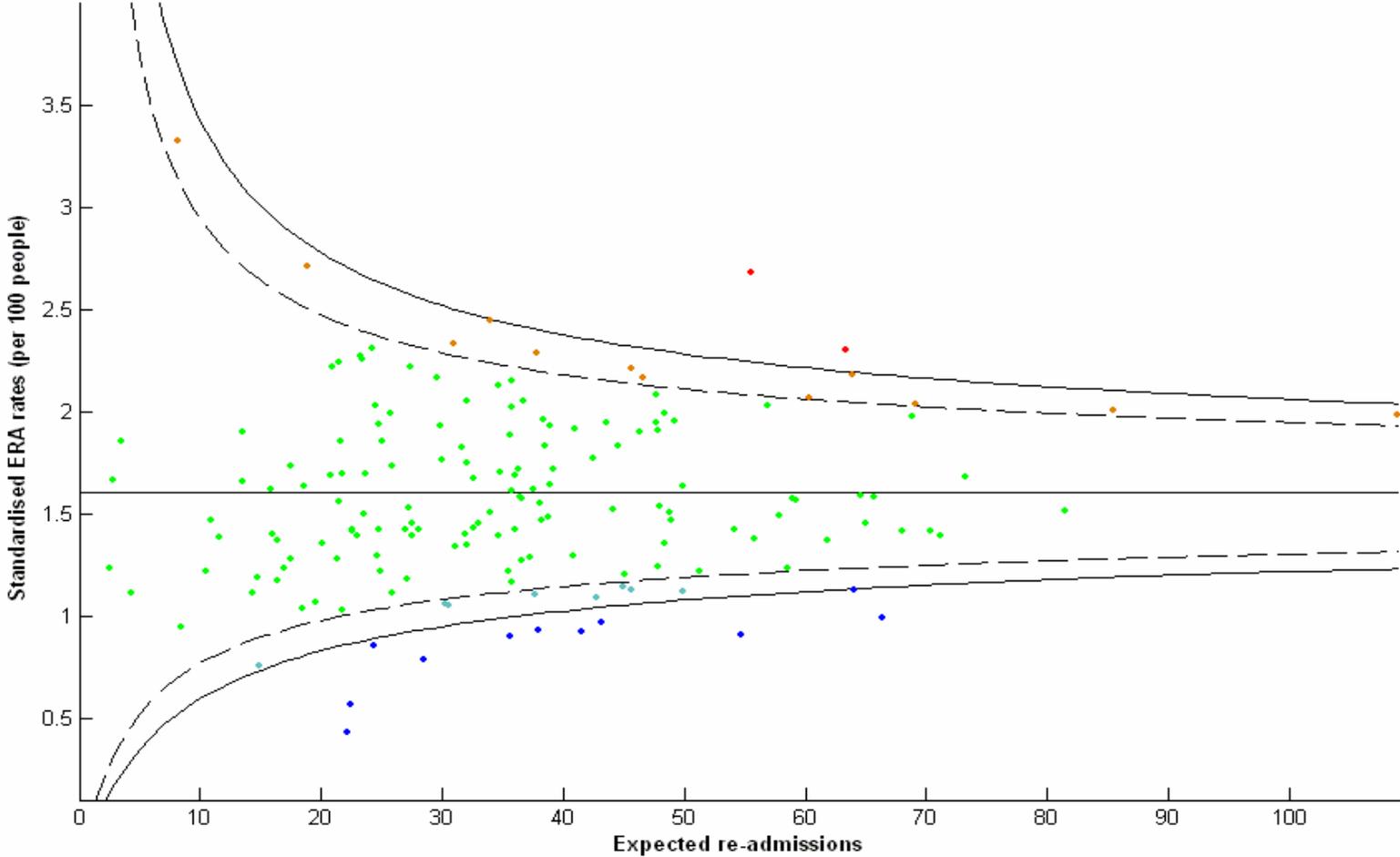
Indicator (days)	Number of trusts	Number of admissions	Number of re-admissions	ERA %
8A Elective cholecystectomy 0-29	157	84130	4103	5
9A Elective hiatus/hernia/anti-reflux 0-29	97	3942	260	7
10A Elective abdominal aneurysm 0-29	123	5381	436	8
11A Emergency and transfer abdominal aneurysm 0-89	128	857	143	17
12A Elective carotid endarterectomy 0-29	100	6517	295	5
13A Elective leg arterial by-pass 0-29	132	5887	771	13
14A Emergency leg arterial by-pass 0-89	136	2112	664	31

Exhibit 4: 0-29 and 0-89 ERA rates and the number and proportion of trusts with ERA values outside 95% observed confidence intervals for 1999-2001 using CIPS file

Indicator (days)	ERA %	Number and (%) trusts outside CIs
1A Day cases 0-29	2	30 (18)
2A Overnight elective with operation 0-29	5	40 (25)
3A Overnight elective with no operation 0-29	6	19 (14)
4A Emergency admissions with operation 0-89	13	37 (24)
5A Emergency admissions with no operation 0-89	16	34 (22)
6A Transfer admissions 0-89	20	8 (7)
7A Unknown mode of admission 0-29	6	4 (5)
8A Elective cholecystectomy 0-29	5	17 (11)
9A Elective hiatus/hernia/anti-reflux 0-29	7	2 (2)
10A Elective abdominal aneurysm 0-29	8	2 (2)
11A Emergency/transfer abdominal aneurysm 0-89	17	0 (0)
12A Elective carotid endarterectomy 0-29	5	2 (2)
13A Elective leg arterial by-pass 0-29	13	3 (2)
14A Emergency/transfer leg arterial by-pass 0-89	31	0 (0)

Exhibit 5: Indicator 1A day case admissions

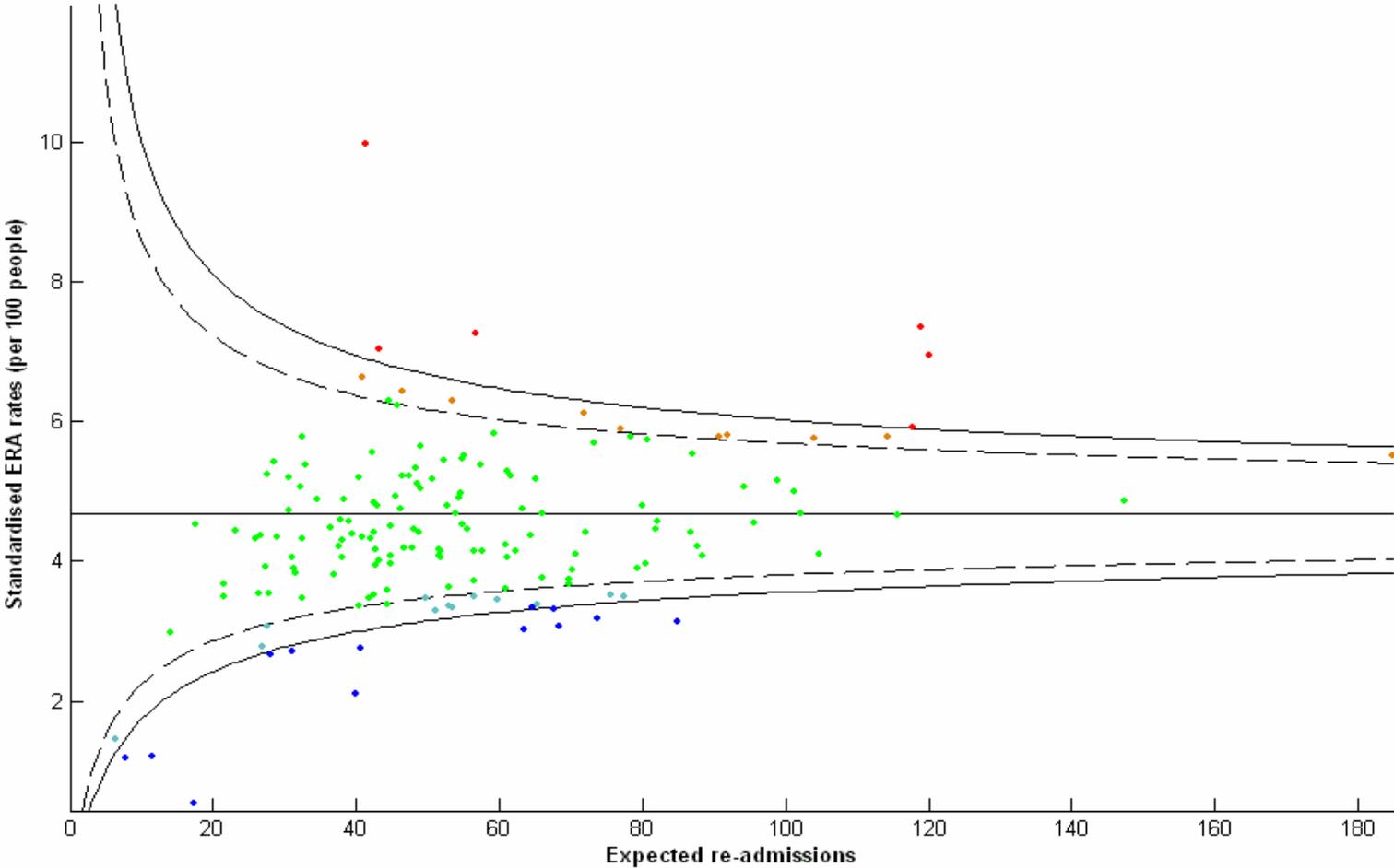
1A 0-29 day ERA for day cases for all causes of re-admissions



Broken and solid lines show 95% and 99% confidence intervals respectively

Exhibit 6: Indicator 2A elective admissions with an operation

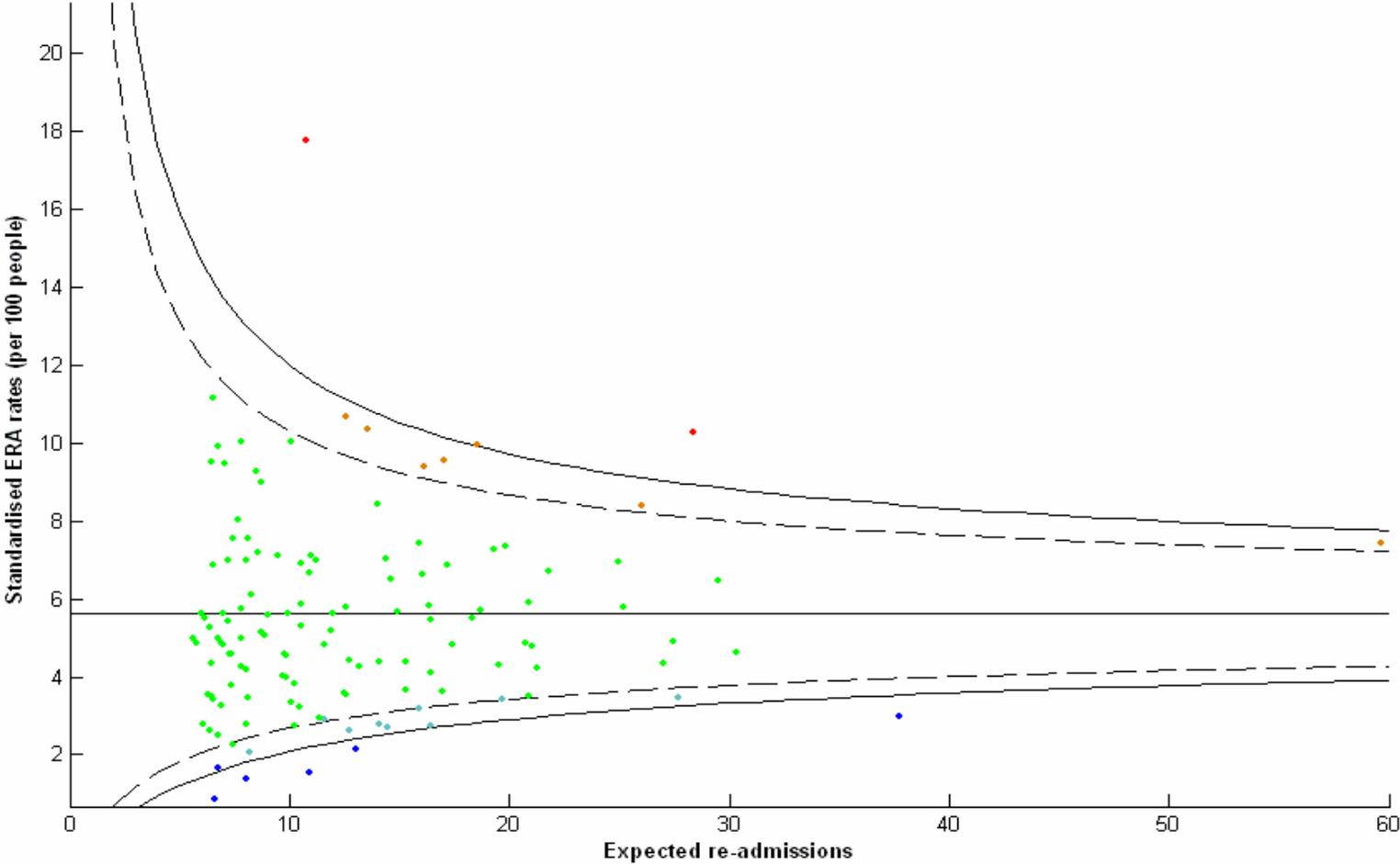
2A 0-29 day ERA for overnight elective admissions which had an operation for all causes of re-admission



Broken and solid lines show 95% and 99% confidence intervals respectively

Exhibit 7: Indicator 3A elective admissions without an operation

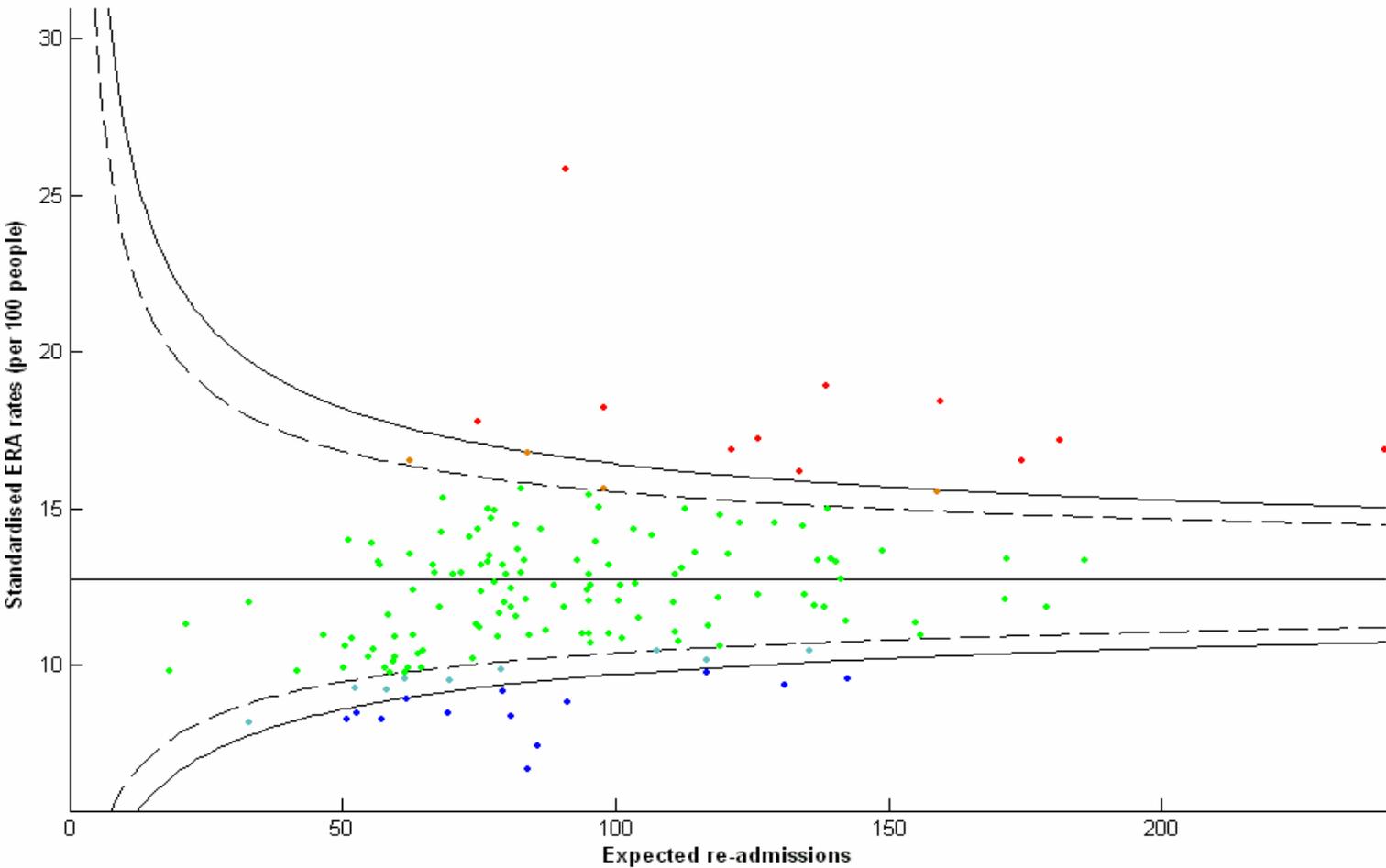
3A 0-29 day ERA for overnight elective admissions which did not have an operation for all causes of re-admission



Broken and solid lines show 95% and 99% confidence intervals respectively

Exhibit 8: Indicator 4A emergency admissions with an operation

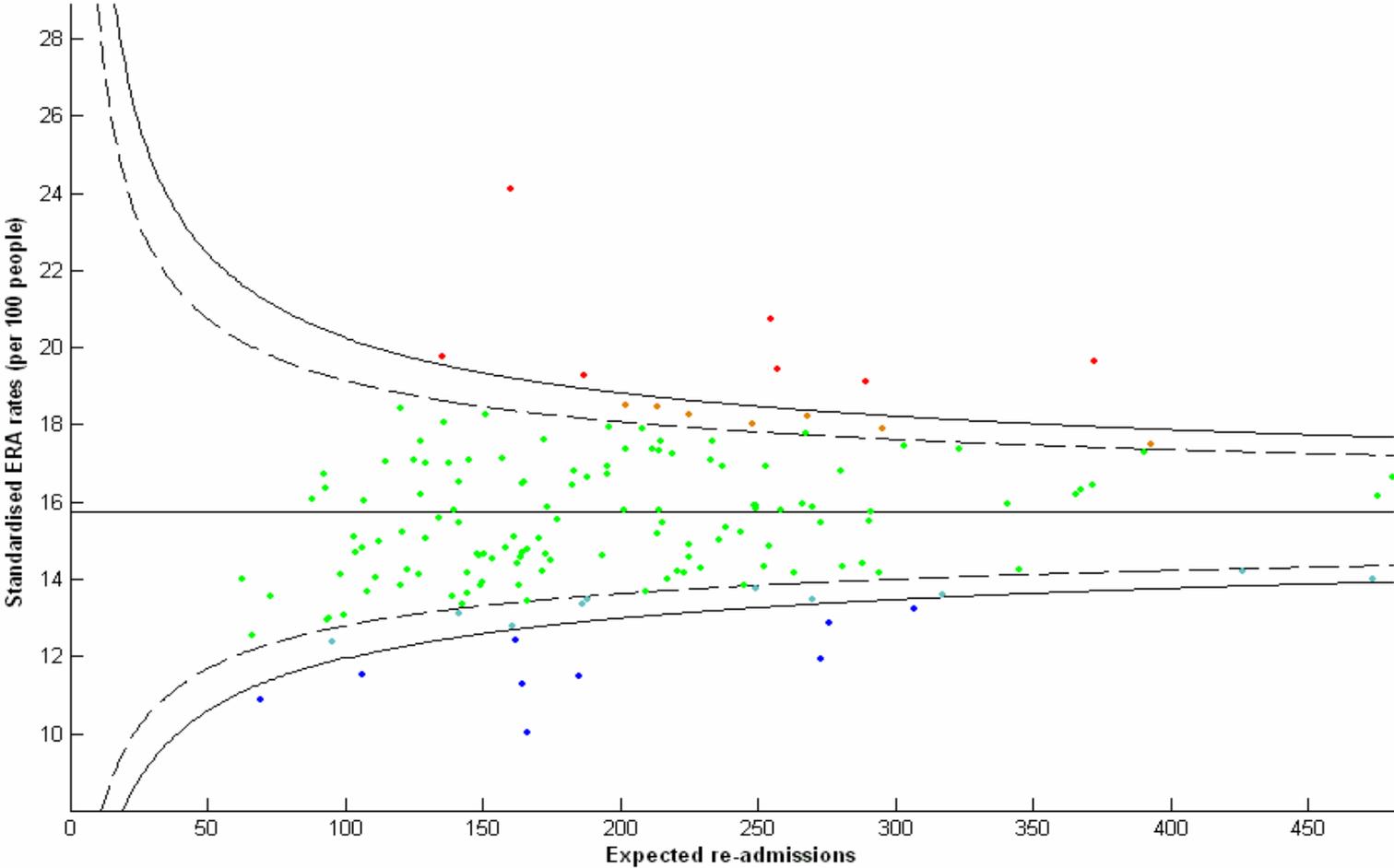
4A 0-89 day ERA for emergency admissions which had an operation for all causes of re-admission



Broken and solid lines show 95% and 99% confidence intervals respectively

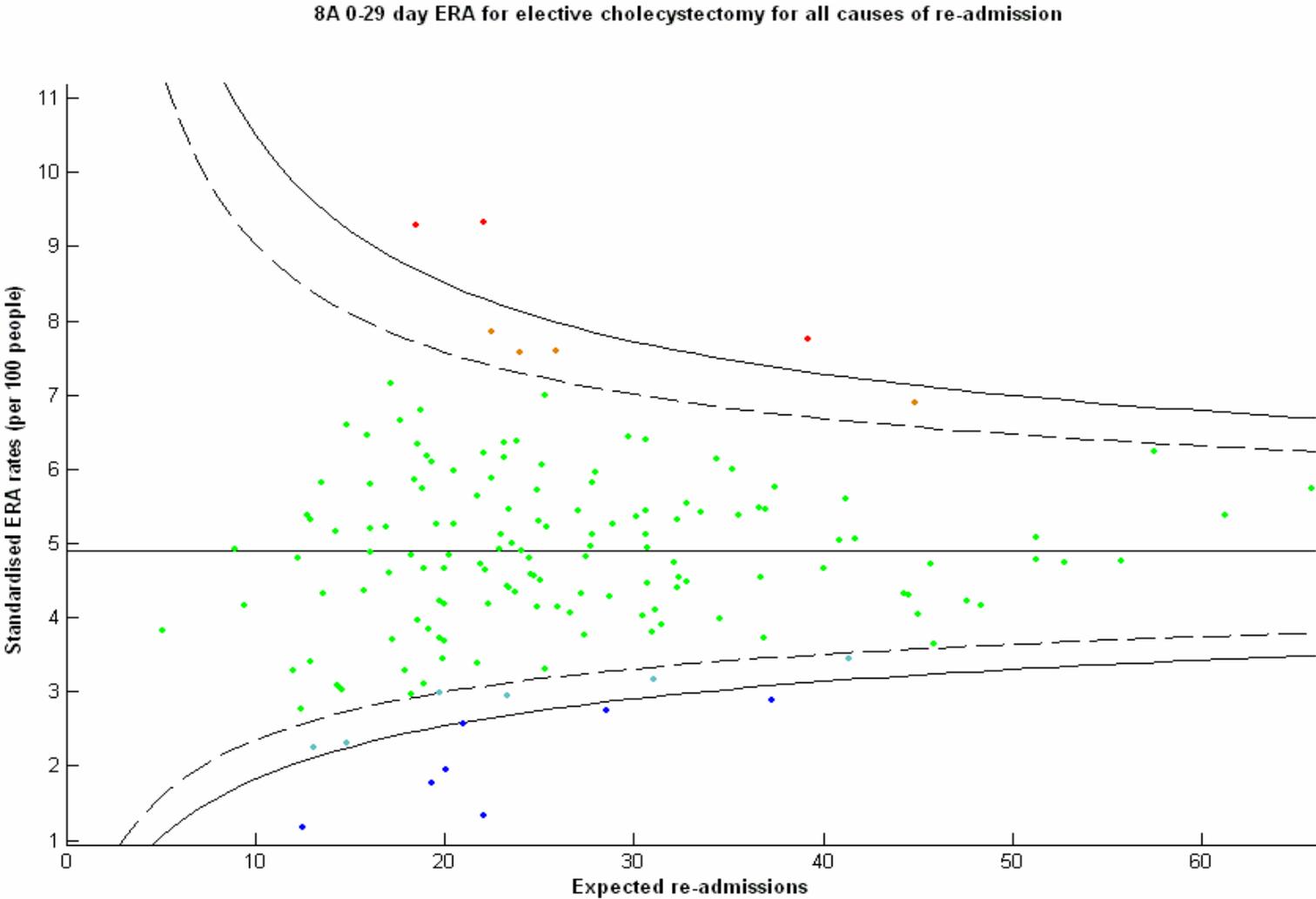
Exhibit 9: Indicator 5A emergency admissions without an operation

5A 0-89 day ERA for emergency admissions which did not have an operation for all causes of re-admission



Broken and solid lines show 95% and 99% confidence intervals respectively

Exhibit 10: Indicator 8A elective cholecystectomy admissions



Broken and solid lines show 95% and 99% confidence intervals respectively

7. OUTLIER TRUSTS AND RECOMMENDATIONS

Outlier trusts

Exhibit 11 shows for the elective admission indicators 1A-3A and 8A all those trusts which have two or more CFR values higher (marked H) than the 95% CI.

Exhibit 12 shows for the emergency admission indicators 4A and 5A those trusts which have one or more CFR values higher (marked H) than the 95% CI.

It should be noted that two trusts, Newcastle and Nottingham City had high values for five of the six indicators.

Recommendations

After discussions with collaborating clinicians, it is recommended that the following indicators could be used for comparing trust performance:

- General indicators:
 - day cases
 - elective admissions with an operation
 - elective admissions without an operation
 - emergency admissions with an operation
 - emergency admissions without an operation.
- High volume upper gastro-intestinal operation:
 - cholecystectomy.

The vascular procedures indicators had a few outlier trusts when three years of data were analysed. They are unlikely to be useful as annual comparative measures if annual data are required.

Great care is required in interpreting the results of comparative ERA rate analyses. The emergency indicators, for example, show a large number of teaching hospitals with high ERA rates suggesting that case-mix may be an important confounder as these hospital treat more complex cases.

The more clinically specific an indicator, the less case-mix and disease severity are likely to be confounders. The most specific measures of this set of indicators are ERA rates for day cases and elective cholecystectomy.

Exhibit 11: Trusts with standardised ERA rates significantly higher (H) than the national ERA rate for elective admission indicators 1A-3A and 8A. Statistical significance was assessed using 95% confidence intervals which were based on a Poisson distribution on the observed number of ERAs.

Trust	ELECTIVE ADMISSION INDICATORS				No Hs
	1A	2A	8A	3A	
NEWCASTLE UPON TYNE	H	H		H	3
NOTTINGHAM CITY	H	H		H	3
UNIVERSITY BIRMINGHAM		H		H	2
ROYAL WOLVERHAMPTON		H		H	2
SCUNTHORPE & GOOLE	H		H		2
ROYAL LIVERPOOL AND BROADGREEN	H	H			2
ROYAL BERKSHIRE & BATTLE	H	H			2
PORTSMOUTH	H	H			2
POOLE	H			H	2
OXFORD RADCLIFFE	H	H			2
NORTHUMBRIA	H	H			2
NORTH DURHAM		H	H		2
LEEDS TEACHING		H		H	2
CENTRAL MANCHESTER		H		H	2

Exhibit 12: Trusts with standardised ERA rates significantly higher (H) than the national ERA rate for emergency admission indicators 4A and 5A. Statistical significance was assessed using 95% confidence intervals which were based on a Poisson distribution on the observed number of ERAs.

Trust	EMERGENCY INDICATORS		
	4A	5A	No Hs
CENTRAL MANCHESTER	H	H	2
LEEDS TEACHING	H	H	2
NOTTINGHAM CITY	H	H	2
ROYAL LIVERPOOL AND BROADGREEN	H	H	2
SOUTH DURHAM	H	H	2
NEWCASTLE UPON TYNE	H	H	2
UNIVERSITY HOSPITAL BIRMINGHAM	H	H	2
ADDENBROOKE'S	H		1
BRADFORD	H		1
CITY SUNDERLAND		H	1
GATESHEAD		H	1
GUY'S & ST THOMAS'	H		1
NORTH TEES & HARTLEPOOL	H		1
NORTHERN GENERAL	H		1
OXFORD RADCLIFFE	H		1
PINDERFIELDS & PONTEFRACT		H	1
PRESTON ACUTE	H		1
SOUTH TEES ACUTE	H		1
SOUTH TYNESIDE	H		1
KINGS MILL CENTRE		H	1
PRINCESS ROYAL		H	1
UNIVERSITY COVENTRY & WARWICKS		H	1
WARRINGTON		H	1
WESTON		H	1

ANNEX A: OPCS4 CODES EXCLUDED FROM GROUPS WITH OPERATIONS

A18	Diagnostic endoscopic exam of ventricle of brain	M47	Urethral catheterisation of bladder
A52	Therapeutic epidural injection	M77	Diagnostic endoscopic exam of urethra
ASS	Diagnostic spinal puncture	Q12	Intrauterine contraceptive device
A84	Neurophysiological operations	Q55	Exam of female genital tract
B32	Biopsy of breast	R02	Diagnostic endoscopic exam of foetus
B37	Other operations on breast	R05	Diagnostic percut exam of foetus
E25	Diagnostic endoscopic exam of pharynx	R14	Surgical induction of labour
E36	Diagnostic endoscopic exam of larynx	R15	Other induction of labour
E42.3	Exteriorisation of trachea - temporary tracheostomy	R24	Normal delivery
E49	Diagnostic fiberoptic endoscopic exam of lower resp tract	R27	Other operations to facilitate delivery
E51	Diagnostic endoscopic exam of lower resp tract using rigid bronchoscope	S13	Punch biopsy of skin
E63	Diagnostic endoscopic exam of mediastinum	S14	Shave biopsy of skin
G16	Diagnostic fiberoptic endoscopic exam of oesophagus	S15	Other biopsy of skin
G19	Diagnostic endoscopic exam of oesophagus using rigid oesophagoscope	S50	Introduction of other inert substance into subcutaneous tissue
G45	Diagnostic fiberoptic endoscopic exam of UGI tract	S51	Introduction of destructive substance into subcutaneous tissue
G55	Diagnostic endoscopic exam of duodenum	S52	Introduction of therapeutic substance into subcutaneous tissue
G65	Diagnostic endoscopic exam of jejunum	S53	Introduction of substance into skin
G80	Diagnostic endoscopic exam of ileum	T11	Diagnostic endoscopic exam of pleura
H22	Diagnostic endoscopic exam of colon	T12	Puncture of pleura
H25	Diagnostic endoscopic exam of lower bowel using fiberoptic sigmoidoscope	T43	Diagnostic endoscopic exam of peritoneum
H28	Diagnostic endoscopic exam of colon using rigid sigmoidoscope	T46	Other drainage of peritoneal cavity
J09	Diagnostic endoscopic exam of liver using laparoscope	T81	Biopsy of muscle
J13	Diagnostic percut liver operation	T86	Lymph node sampling
J25	Diagnostic percut gall bladder operation	T90	Lymphangiography
J43	Diagnostic endoscopic retro exam of bile & pancreatic duct	V47	Biopsy of spine
J44	Diagnostic endoscopic retro exam of bile duct	V49	Exploration of spine
J45	Diagnostic endoscopic retro exam of pancreatic duct	W36	Diagnostic bone puncture
J67	Diagnostic percut pancreatic operation	W87	Diagnostic endoscopic exam of knee joint
K58	Diagnostic transluminal heart operation	W88	Diagnostic endoscopic exam of other joint
L71.4	Therapeutic transluminal artery operation	X29	Cont infusion of therapeutic substance
L72	Diagnostic transluminal artery operation (not femoral/iliac)	X30- X39	Injection/transfusion
L91	Other vein related operations	X40- X49	Dialysis/donation
L95	Diagnostic transluminal vein operation	X50	External resuscitation
M11	Diagnostic endoscopic exam of kidney	X51	Body temperature change
M30	Diagnostic endoscopic exam of ureter	X55.8	Other operations on unspecified organ other specified
M45	Diagnostic endoscopic exam of bladder	X55.9	Other operations on unspecified organ other unspecified

Z and Y codes (sites and methods) are also excluded from these indicators.

