C04: Extending the Critical Path
Adele Groyer
Matthew Smith
Chris Reynolds

Agenda

• Background
• Heart Attack
• Aorta Graft Surgery
• Benign Brain Tumour
• Next Steps
Background

CI Working Parties
*formed October 2010 and recently merged*

Geographical Variations

- **Current Members**
  - Christine Fairall
  - Jennifer Loftus
  - Ketiwe Nhende
  - Christopher Reynolds
  - Daniel Ryan

Definitions

- **Current Members**
  - Phil Cleverley
  - Katarzyna Gilewicz
  - Adele Groyer
  - Matthew Smith
  - James Tait
  - Neelish Tiwari

Peter Banthorpe (WP chair and PEC Representative)
Hospital Episodes Statistics data set advantages

• Shows complete history for each life
  – Allows for overlap with other CIs
  – Useful to identify conditions that would have been underwritten out
• Identify socio-economic grouping
  – Location
  – Linkage with other socio-economic classification systems

Aims of Geographical Variations WP

Analysis of the impact on CI Rates of proxy rating factors:
Location, Socio-Economic Profile, interactions

Power of using these proxies for modelling mortality in the UK has already been proven
Can we use the same proxies for CI?

Results will be of interest to:
Actuaries, Underwriters, Marketing & Product Development Specialists, Healthcare professionals
History of Research to Date

**HES data request**
- February 2011

**HES data received**
- January 2012

**Initial Analysis**
- Health Poverty Index
- Cancer eAtlas
- Deprivation Scores

**Analysis of HES Data**
- **Conditions**: Cancer, Heart Attack & Stroke
- **Socio-Economic Profilers**:
  - Mosaic, Acorn, IMD

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**History of Research to Date: Initial Findings**

Results *largely as expected* based on 2011 preliminary analysis

- **Strong positive gradient***
  - Heart Attack
  - Stroke
  - Cancer of lung / stomach / cervix
  
  * Incidence rate increases as level of deprivation increases

- **Weak positive gradient**
  - All cancers combined

- **Negative gradient**
  - Breast cancer**
  - Melanoma

**IMD analysis suggested a fall in incidence at highest socio-economic class**
History of Research to Date: Initial Findings

- Top-Down and Bottom-Up approaches produced similar results

- Socio-economic profilers are useful indicators for CI Incidence Rates

Aims of Definitions Working Party

- “Playing the definitions game: What value in doing more?”
- Estimate current population incidence of ABI+ and non-ABI conditions
- Allow for overlaps and underwriting using new HES data
- Highlight any special risks associated with offering cover on this basis
Research to date

- Desk Based: Heart-related conditions
  - CABG (ABI+)
  - Angioplasty (non-ABI)
  - Heart valve replacement / repair (ABI+)
  - Heart attack (ABI+)
    - Explained underlying condition and risk factors
    - Described risk introduced by ABI+ versions
    - Quoted high-level figures from online HES data

- Seriatim data for Primary Pulmonary Hypertension

Updated aims for the combined CI WP

- Illness by illness review using detailed HES data for over 40 illnesses commonly covered under UK CI products:
  - Calculate standard definition “first ever” incidence rates
  - Adjust for pre-existing medical problems that would be underwritten out
  - Reflect socio-economic variations in incidence
  - Show ABI+ incidence variation

- Present full results of research at end of 2013
History of research to date – HES data set

- HES seriatim data used for **Primary Pulmonary Hypertension**
  - Identified coding issues, especially of secondary PPH
  - Explored effects of repeat episodes and allowing for “underwriting”

Insured definition is not an ABI standard but generally based around:

- Being at least class III on the NYHA scale of functional capacity
- Exclusion of secondary pulmonary hypertension

### Pulmonary Hypertension

- **Risk Factors** (Possible)
  1. Drugs & toxins
  2. Demographic
  3. Pregnancy
  4. Hypertension
  5. Disease
  6. HIV
  7. Liver disease
  8. Vascular disease
  9. Congenital disease

- **Pathology**
  - Syndromes
  - Restricted blood flow through the pulmonary artery
  - Increased pulmonary vascular resistance
  - Right heart failure

### Symptoms
- Shortness of breath
- Dizziness
- Fatigue
- Chest pain
- Swollen ankles

### Treatment
- No cure

Evidence based treatment algorithm

Ultimate Duration 11+ (2009)

“Duration 0” – all history excluded back to 1998
Hospital Episodes Statistics data set

- Seriatim data of all finished consultant episodes in NHS hospitals
  - Inpatient and outpatient data
- Data years 1989/90 to 2009/10 received
  - 1997/98 to 2009/10 are coded with unique patient identifiers
- 18 million records for 2009/10 alone!

What the HES data looks like

<table>
<thead>
<tr>
<th>Patient Identifier</th>
<th>Unique identifier by patient – 47m of these</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Patient Information</td>
<td>Age, gender</td>
</tr>
<tr>
<td>Basic Episode Information</td>
<td>Date started, date finished, admission method, current status etc</td>
</tr>
<tr>
<td>Diagnosis Information</td>
<td>Up to 20 different diagnoses</td>
</tr>
<tr>
<td>Procedure Information</td>
<td>Up to 20 different operations, with date of operation</td>
</tr>
<tr>
<td>Geographical Information</td>
<td>Postal district, Lower Super Output Area, IMD Rank, Mosaic Type, ACORN Type, Health ACORN type</td>
</tr>
</tbody>
</table>
Example data

Each record is an individual episode

Each ICD code could appear multiple times as a primary diagnosis (DIAG_01) or in secondary diagnosis fields

Analysing the Data - a SQL algorithm

Single Life (HES_ID) → Derive complete episode history

20 diagnoses/operations for each episode → Define the "order"

Choose the first event of interest → Simply a sum of all episode counts that match the ICD/OPCS coding

All Data

First Ever

Duration

Simply a sum of all episode counts that match the ICD/OPCS coding

A sum of all episode counts that match the ICD/OPCS coding where only 1 is permitted per life

A sum of all episode counts that match the ICD/OPCS coding assuming there is no relevant medical history or other CI claim. Only 1 count is permitted per life
Results available today

- Updated heart attack results
- Aorta graft surgery
- Benign brain tumour

Sample Conditions
Heart Attack
Heart Attack

Overview

• The death of a portion of heart muscle due to inadequate blood supply;
• The resulting restriction in blood supply (ischemia) can cause damage (infarction) of heart muscle tissue (myocardium)
• Risk factors for Myocardial Infarction include smoking, obesity, excessive alcohol consumption, high blood pressure, stress and lack of physical activity.

Heart Attack

Causes and Symptoms

• Risk factors for Myocardial Infarction include smoking, obesity, excessive alcohol consumption, high blood pressure, stress and lack of physical activity.
• Age, gender and family history are also relevant risk factors.
• Symptoms include chest pain, often radiating to the left arm, shortness of breath, weakness, nausea, vomiting and palpitations.
• Loss of consciousness and sudden death can also occur with MI.
• The diagnosis of MI can be made after assessing the patient’s complaints and physical status. ECG changes, coronary angiogram and levels of cardiac markers help to confirm the diagnosis.
Heart Attack

Treatment

- Depends on type and severity and include:
  - Thrombolysis - a combination of medication to dissolve the blood clot and restore the flow of blood to the heart
  - Coronary Angioplasty - surgery to widen the coronary artery. A stent may be inserted to ensure the vessel remains open.
  - Coronary Artery Bypass Graft (CABG) – involves taking a blood vessel from another part of the body, usually chest or leg, to act as a graft. The graft replaces any hardened or narrowed arteries in the heart.

ABI Definition

Heart Attack – of specified severity
- The death of a portion of the heart muscle, due to an inadequate blood supply, that has resulted in all of the following evidence of acute myocardial infarction;
  - typical clinical symptoms (for example, characteristic chest pain),
  - new characteristic electrocardiograph changes,
  - the characteristic rise of cardiac enzymes or Troponins recorded at the following levels or higher;
    - Troponin >1.0 ng/ml
    - AccuTnl >0.5 ng/ml or equivalent threshold with other Troponin I methods.

The evidence must show a definite acute myocardial infarction.
- For the above definition, the following are not covered: Other acute coronary syndromes including but not limited to angina

SoBP Feb 2011
**ABI+ Definition**

**Heart Attack – of specified severity**

- The death of a portion of the heart muscle, due to an inadequate blood supply, that has resulted in all of the following evidence of acute myocardial infarction;
  - **typical clinical symptoms** (for example, characteristic chest pain),
  - new characteristic electrocardiograph changes,
  - the characteristic rise of cardiac enzymes or Troponins recorded at the following levels or higher;
    - Troponin >1.0 ng/ml
    - AccuTnl >0.5 ng/ml or equivalent threshold with other Troponin I methods.

The evidence must show a definite acute myocardial infarction.

- For the above definition, the following are not covered: Other acute coronary syndromes including but not limited to angina

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**Exploring the Critical Path**

**Definition**

- ABI SoBP April 2006 (same as Feb 2011)

**Data**

- HES/ONS 2002/GAD/ISD Scotland
  - Population Estimates; England
  - Mortality Statistics: Cause; England & Wales
  - Interim Life Tables; England

**ICD Codes**

- ICD-10: I21 and I22
Myocardial Infarction
GeoDemographic Analysis

Myocardial Infarction - ACORN Profiler

Bottom Up Working Party Grouping

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Myocardial Infarction GeoDemographic Analysis

Myocardial Infarction - ACORN Profiler

Rates by Age Group

Percentage of Deaths
Myocardial Infarction
GeoDemographic Analysis

Myocardial Infarction - IMD

Myocardial Infarction - IMD Rates by Age Group

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## Sample Conditions
### Aorta Graft Surgery

#### Overview

<table>
<thead>
<tr>
<th>What can go wrong?</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aneurysm</td>
<td>Aneurysm is defined as a permanent localised dilation of the artery and is classified by shape; location along the aorta; and how it is formed.</td>
</tr>
<tr>
<td>Dissection</td>
<td>Dissection is the tearing of the inner layer of the aortic wall, allowing blood to leak into the wall itself and cause the separation of the inner and outer layers.</td>
</tr>
<tr>
<td>Coarctation</td>
<td>Coarctation is a narrowing of a section of the aorta, just beyond the aortic arch as it bends down to descend to the lower body.</td>
</tr>
</tbody>
</table>
Aorta Graft Surgery
Causes and Symptoms

Causes
- Hypertension
- Atherosclerosis
- Smoking
- Trauma
- Congenital weaknesses
- Age
- Genetic Factors

Symptoms & Diagnosis
- Severe Pain
- Echocardiography
- CT or MRI Scan
- Internal Bleeding

Aorta Graft Surgery - Treatment

Treatment Options

Medical Treatment
- Major/Common Treatments
- Interposition Tube Graft
- Aorta patch graft
- Composite Valve Graft
- Interposition Tube Graft with Aortic Root Replacement

Less Common Treatments
- Composite Aortic Root Replacement
- Homograft root replacement
- Reduction aortoplasty
- Blood Pressure Optimisation
- Diet
- Smoking Cessation
- Patient Care Programme
ABI Definition

Aorta Graft Surgery – for disease
The undergoing of surgery for disease to the aorta with excision and surgical replacement of a portion of the diseased aorta with a graft.
The term aorta includes the thoracic and abdominal aorta but not its branches.
For the above definition, the following are not covered:
• Any other surgical procedure, for example the insertion of stents or endovascular repair.
• Surgery following traumatic injury to the aorta.

Evolving Definitions

Aorta Graft Surgery – for disease
The undergoing of surgery for disease to the aorta with excision and surgical replacement of a portion of the diseased aorta with a graft.
The term aorta includes the thoracic and abdominal aorta but not its branches.

The undergoing of surgery for traumatic injury to the aorta needing excision and surgical replacement of a portion of the aorta with a graft is also covered.

For the above definition, the following are not covered:
• Any other surgical procedure, for example the insertion of stents or endovascular repair.
Exploring the Critical Path

Definition

- ABI SoBP April 2006 (same as Feb 2011)

Data

- HES/ONS 2002
  - Hospital Episode Statistics; England
  - Population Estimates; England

OPCS Codes

L183-185, L192-195
L202-205, L212-215
L231, L233, L451-L452

Aorta Graft Surgery

Derived Incidence Rates

- Extra codes compared to Exploring the Critical Path ...

<table>
<thead>
<tr>
<th>OPCS Codes</th>
<th>Type of surgery</th>
<th>FCE’s 2011/12 ages 15 - 59</th>
</tr>
</thead>
<tbody>
<tr>
<td>L16</td>
<td>Interposition tube graft</td>
<td>59</td>
</tr>
<tr>
<td>L18</td>
<td>(mostly) Composite aortic valve replacement</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>EMERGENCY REPLACEMENT</td>
<td></td>
</tr>
<tr>
<td>L19</td>
<td>(mostly) Composite aortic valve replacement</td>
<td>253</td>
</tr>
<tr>
<td></td>
<td>NON-EMERGENCY REPLACEMENT</td>
<td></td>
</tr>
<tr>
<td>L20</td>
<td>(mostly) Composite aortic valve replacement</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>EMERGENCY BYPASS</td>
<td></td>
</tr>
<tr>
<td>L21</td>
<td>(mostly) Composite aortic valve replacement</td>
<td>113</td>
</tr>
<tr>
<td></td>
<td>NON-EMERGENCY BYPASS</td>
<td></td>
</tr>
<tr>
<td>L23</td>
<td>PLASTIC REPAIR</td>
<td>16</td>
</tr>
</tbody>
</table>
Aorta Graft Surgery
Derived Incidence Rates (2009)

<table>
<thead>
<tr>
<th>Age</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of ACL04 (NS)</td>
<td>% of ACL04 (SM)</td>
</tr>
<tr>
<td>First Ever</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-39</td>
<td>1.2%</td>
<td>0.9%</td>
</tr>
<tr>
<td>40-59</td>
<td>1.1%</td>
<td>0.6%</td>
</tr>
<tr>
<td>60-79</td>
<td>2.2%</td>
<td>1.2%</td>
</tr>
<tr>
<td>First Ever CI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-39</td>
<td>0.9%</td>
<td>0.7%</td>
</tr>
<tr>
<td>40-59</td>
<td>0.8%</td>
<td>0.4%</td>
</tr>
<tr>
<td>60-79</td>
<td>0.9%</td>
<td>0.5%</td>
</tr>
<tr>
<td>First Ever (Trauma Only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-39</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>40-59</td>
<td>0.1%</td>
<td>0.1%</td>
</tr>
<tr>
<td>60-79</td>
<td>0.1%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
Sample Conditions
Benign Brain Tumour
Brain Tumours
Causes and Symptoms

Don’t ever sleep with mobile under the pillow. Most mobiles emit harmful radiation due to transmission of signal around 900MHz. Radiation may damage your brain. It may also cause headache and muscle pain. “Better safe than sorry” Spread this message if you really care for others & create awareness.

Brain Tumours
Diagnosis and Treatment
ABI Definition

**Benign Brain Tumour – resulting in permanent symptoms**

A non-malignant tumour or cyst in the brain, cranial nerves or meninges within the skull, resulting in permanent neurological deficit with persisting clinical symptoms.

For the above definition, the following are not covered:

- Tumours in the pituitary gland.
- Angiomas

SoBP Feb 2011

Evolving Definitions

**Benign Brain Tumour – resulting in permanent symptoms**

A non-malignant tumour or cyst in the brain, cranial nerves or meninges within the skull, resulting in **either surgical removal or** permanent neurological deficit with persisting clinical symptoms.

For the above definition, the following are not covered:

- Tumours in the pituitary gland.
- Angiomas
Evolving Definitions

Benign Brain Tumour – resulting in permanent symptoms
A non-malignant tumour or cyst in the brain, cranial nerves or meninges within the skull, resulting in permanent neurological deficit with persisting clinical symptoms or requiring invasive surgery.
For the above definition, the following are not covered:
- Tumours in the pituitary gland.
- Angiomas.

Benign Brain Tumour means a non-malignant tumour located in the cranial vault and limited to the brain, meninges, cranial nerves or pituitary gland.
The tumour must require surgery or radiation treatment or cause irreversible objective neurological deficits.
Exploring the Critical Path

Definition
- ABI SoBP April 2006 (same as Feb 2011)

Data
- ONS 2002
  - Cancer Statistics - Registration; England
  - Population Estimates; England
  - Mortality Statistics: Cause; England & Wales
  - Population Estimates; England & Wales

ICD Codes
- ICD-10: D33 and D43

Benign Brain Tumour
Derived Incidence Rates
- Extra codes compared to Exploring the Critical Path ...

<table>
<thead>
<tr>
<th>ICD 10 Codes</th>
<th>D32.0</th>
<th>D42.0</th>
<th>G93.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>D32.9</td>
<td>D42.9</td>
<td>G95.0</td>
<td></td>
</tr>
<tr>
<td>D33.0</td>
<td>D43.0</td>
<td>Q85.0</td>
<td></td>
</tr>
<tr>
<td>D33.1</td>
<td>D43.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D33.2</td>
<td>D43.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D33.3</td>
<td>D43.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D35.4</td>
<td>D44.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Benign Brain Tumour

### Derived Incidence Rates (2009)

<table>
<thead>
<tr>
<th>Age</th>
<th>% of ACL04 (NS)</th>
<th>% of ACL04 (SM)</th>
<th>% of CIBT02 (Core)</th>
<th>% of ACL04 (NS)</th>
<th>% of ACL04 (SM)</th>
<th>% of CIBT02 (Core)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-39</td>
<td>8.6%</td>
<td>6.7%</td>
<td>7.1%</td>
<td>10.5%</td>
<td>9.4%</td>
<td>6.6%</td>
</tr>
<tr>
<td>40-59</td>
<td>4.9%</td>
<td>2.6%</td>
<td>2.5%</td>
<td>5.7%</td>
<td>3.8%</td>
<td>2.8%</td>
</tr>
<tr>
<td>60-79</td>
<td>1.7%</td>
<td>1.0%</td>
<td>1.0%</td>
<td>2.9%</td>
<td>1.8%</td>
<td>1.6%</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Age</th>
<th>% of ACL04 (NS)</th>
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<th>% of CIBT02 (Core)</th>
<th>% of ACL04 (NS)</th>
<th>% of ACL04 (SM)</th>
<th>% of CIBT02 (Core)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-39</td>
<td>7.3%</td>
<td>5.7%</td>
<td>6.1%</td>
<td>9.0%</td>
<td>8.1%</td>
<td>5.7%</td>
</tr>
<tr>
<td>40-59</td>
<td>4.0%</td>
<td>2.2%</td>
<td>2.0%</td>
<td>4.6%</td>
<td>3.1%</td>
<td>2.3%</td>
</tr>
<tr>
<td>60-79</td>
<td>1.2%</td>
<td>0.7%</td>
<td>0.7%</td>
<td>2.0%</td>
<td>1.2%</td>
<td>1.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
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<th>Age</th>
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<th>% of ACL04 (SM)</th>
<th>% of CIBT02 (Core)</th>
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<th>% of ACL04 (SM)</th>
<th>% of CIBT02 (Core)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-39</td>
<td>3.0%</td>
<td>2.3%</td>
<td>2.5%</td>
<td>3.8%</td>
<td>3.4%</td>
<td>2.4%</td>
</tr>
<tr>
<td>40-59</td>
<td>1.9%</td>
<td>1.0%</td>
<td>1.0%</td>
<td>2.9%</td>
<td>1.9%</td>
<td>1.4%</td>
</tr>
<tr>
<td>60-79</td>
<td>0.7%</td>
<td>0.4%</td>
<td>0.4%</td>
<td>1.3%</td>
<td>0.8%</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

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### Benign Brain Tumour

#### GeoDemographic Analysis

![Benign Brain Tumour - ACORN Profiler](image_url)
Benign Brain Tumour
GeoDemographic Analysis

Benign Brain Tumour - ACORN Profiler
Rates by Age Group

Benign Brain Tumour - ACORN Profiler
Incidence Rate per 100,000

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Benign Brain Tumour
GeoDemographic Analysis

Benign Brain Tumour - ACORN Profiler
Rates by Age Group

Benign Brain Tumour - IMD

Institute and Faculty of Actuaries
Benign Brain Tumour
GeoDemographic Analysis

![Chart showing Benign Brain Tumour - IMD Rates by Age Group]

Next Steps
Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

The views expressed in this presentation are those of the presenter.
What is social-economic gradient in health?

- The poorest of the poor have the worst health!
- In general, within countries, the evidence shows that the lower an individual’s socio-economic position the worse it is their health. There is a social gradient in health that runs from top to bottom of the socio-economic spectrum.
- The social gradient in health leads to health inequities which affect everyone.

For example, if you look at under-5 mortality rates by levels of household wealth you see that within counties the relation between socioeconomic level and health is graded. The poorest have the highest under-5 mortality rates, and people in the second highest quintile of household wealth have higher mortality in their offspring than those in the highest quintile.

Source: World Health Organisation (WHO)
Other socio-economic variations in incidence rates

- Environmental factors:
  - Access to education
  - Work environment
  - Access to healthcare
  - Social support / exclusion

- Lifestyle factors:
  - Health seeking behaviour / activities e.g. regular exercise, sport
  - Food
  - Occupation / employment status
  - Quality of early life and childhood
  - Addiction e.g. alcohol, drug

Socioeconomic Variations

- We have looked at socioeconomic gradients using geographical variation as proxy
- Age, gender and family medical history / biological effects are main variations too
- Other socio-economic variations such as environmental and lifestyle factors also play a part
- These variations can be wide-ranging for different illnesses
Appendix 2
Additional Socio Economic Gradients

Myocardial Infarction
GeoDemographic Analysis
Myocardial Infarction
GeoDemographic Analysis

Aorta Graft Surgery
GeoDemographic Analysis
Aorta Graft Surgery
GeoDemographic Analysis

Benign Brain Tumour
GeoDemographic Analysis
Benign Brain Tumour
GeoDemographic Analysis

Appendix 3
ICD and OPCS Codes
| Date: 15 July 2013 |

<table>
<thead>
<tr>
<th>Disease Diagnosis or procedure priority?</th>
<th>Subtype</th>
<th>ICD-10 codes</th>
<th>OPCS-4 codes</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary pulmonary hypertension</td>
<td>Diagnosis</td>
<td>E73</td>
<td>-</td>
<td>Consider overlap with other C1 surgeries. Probable vascular congenital cases are largely underestimated in UK.</td>
</tr>
<tr>
<td>Open heart surgery</td>
<td>Procedures</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>Diagnosis</td>
<td>Q25, Q26, Q28.2</td>
<td>-</td>
<td>Consider length of hospitalisation for severity.</td>
</tr>
<tr>
<td>Congenital heart disease</td>
<td>Diagnosis</td>
<td>Q21, Q22, Q23, Q24, Q25, Q26</td>
<td>-</td>
<td>Consider length of hospitalisation for severity.</td>
</tr>
<tr>
<td>Acute respiratory failure</td>
<td>Diagnosis</td>
<td>J95, J96</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Chronic respiratory failure</td>
<td>Diagnosis</td>
<td>J44, J45, J46, J47, J84</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>Diagnosis</td>
<td>J44, J45, J46, J47, J84</td>
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<td>Asthma</td>
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<td>J40, J41</td>
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<td>Upper respiratory tract infection</td>
<td>Diagnosis</td>
<td>J00-J18, J20-J27</td>
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<td>Lower respiratory tract infection</td>
<td>Diagnosis</td>
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<td>OPCS-4 codes are for PolyPheinMax Rubix and EMG Ultimate Thromboelastography.</td>
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<td>Polypectomy diagnosis Code 91.</td>
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<td>Angiogram Procedure Code 15.15.15.15, E46.0, E46.1, E46.2, E46.3, E46.4, E46.5, E46.6, E46.7.</td>
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<td>Major Organ Transplant Procedure Code N17, N18.</td>
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<td>Parkinson's Disease</td>
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<td>Multiple Systematral Apoplexy</td>
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