

**Disease Pathways**  
**Which conditions are most likely to cause**  
**blockages within emergency hospital care?**

**Dr Rod Jones**  
**Statistical Advisor**  
**hcaf\_rod@yahoo.co.uk**

**Executive Summary**

- Conditions scoring high across various dimensions of complexity include Fractured neck of femur, Mental health conditions, Vascular and Respiratory conditions
- Mental health conditions typically score high on average age, length of stay and consequently bed usage.
- For acute care the diagnosis 'Unknown and unspecified causes of morbidity' features prominently – this may indicate the poor quality of diagnosis such as 'patient unwell' or 'off legs'. Whatever the reason it points to the need for excellent diagnostic processes at the front end of acute care.
- On the same basis the two most frequent diagnoses are unspecific, namely, 'Pain in throat and chest' and 'Abdominal and pelvic pain'. Such non-specific diagnoses once again point to the need for excellent diagnostic processes at the front end of acute care.
- The complexity and uncertainty associated with current patterns of acute care is highlighted.

**Introduction**

Many healthcare systems are seeking to identify those disease pathways where particular focus should be placed in terms of 'unblocking' the delivery of emergency care.

The concept of a blockage to care is probably multi-factorial and hence this work attempts to use various indicators of complexity

This analysis uses the primary diagnosis rather than HRG on the basis that primary diagnosis is more focussed and gives a better indication of how the conditions are reported. HRGs are derived from groups of diagnoses.

**Source of the Data**

Data covering the whole of England for the 2002/03 financial year was extracted from the DOH HES database. Various scores were obtained by ranking the data in different ways and assigning a score from 0 to 100.

### Dimensions of Complexity

The following tables list the primary diagnosis (ICD) for patients admitted to the NHS. A number of dimensions have been chosen to reflect the various components of complexity.

Each dimension is then ranked from 0 to 100 with a score of 100 being highest.

Dimension	Highest Value (Score 100)	Comments
Volume of admissions	Highest volume diagnosis accounts for 4.1% of all NHS emergency admissions including Maternity and Mental Health	Sheer volume of admissions implies a need for rapid high-volume diagnosis, treatment and discharge. High volume may not necessarily consume beds but means necessary organisational; processes and procedures.
Beds	The diagnosis consuming the most beds accounts for 5.1% of all NHS bed days (elective and emergency) including mental Health and Maternity	Certain conditions consume a greater share of the overall bed pool than others. The bed intensive procedures can be targeted to save overall cost of nursing
Average Age	Highest average age is 88 years!	Increasing age has greater implications to the integration between primary and secondary care. A very high average age could even question whether the patient has been admitted due to age rather than the condition.
Ratio of consultant episodes per admission	Highest average is 2 FCE per admission. Average for all conditions is only 1.12:1	Associated co-morbidity is often not reflected in the primary diagnosis. This indicator attempts to reflect co-morbidity and the need for multi-team involvement
Median Length of Stay	Highest median LOS is 38 days which occurs in mental health	The median LOS is the middle ranked LOS. It tends to be lower than average LOS and is a better reflection of the most common LOS
Skew in the LOS distribution (average LOS/median LOS)	Highest measure of skew is 14 (average LOS divided by median LOS)	Some conditions are characterised by groups of patients who stay much longer than the average. These patients can become institutionalised.
Gender	100% of one gender is given a rank of 50 while an equal split has a rank of 0.	Some conditions have a disposition to a particular gender. This implies that a 50:50 split in terms of available beds, etc is no longer appropriate.
Combined Score	Adds up all separate scores	No particular dimension of complexity has been weighted more than any other (except for gender where the maximum is only 50). Conditions with a high aggregate score are however more likely to cause blockages.

## 1. Volume of emergency admissions

Sheer volume of admissions is a likely indicator for pathways which require high volume or rapid diagnosis to support the high volume.

<b>ICD Primary Diagnosis</b>	<b>Volume</b>
R07 Pain in throat and chest	100
R10 Abdominal and pelvic pain	95
R69 Unknown and unspecified causes of morbidity	62
I20 Angina pectoris	55
J44 Other chronic obstructive pulmonary disease	54
J18 Pneumonia organism unspecified	47
J22 Unspecified acute lower respiratory infection	42
I21 Acute myocardial infarction	40
I50 Heart failure	39
S72 Fracture of femur	38
N39 Other disorders of urinary system	37
R55 Syncope and collapse	34
K52 Other non-infective gastroenteritis and colitis	31
J45 Asthma	31
S52 Fracture of forearm	30

Of interest to note is the fact that the top three by volume are all non-specific diagnosis, i.e. the NHS admits high volumes of patients about whom we are unsure exactly what is wrong with the patient. These point to the need for rapid diagnosis in A&E and medical assessment units.

## 2. Size of Bed Pool

The next indicator is the relative size of the bed pool which is employed to accommodate the various groups of diagnosis.

<b>ICD Primary Diagnosis</b>	<b>Beds</b>
R69 Unknown and unspecified causes of morbidity	100
S72 Fracture of femur	67
F20 Schizophrenia	54
I63 Cerebral infarction	45
J18 Pneumonia organism unspecified	39
I50 Heart failure	37
J44 Other chronic obstructive pulmonary disease	35
I64 Stroke not specified as haemorrhage or infarction	32
N39 Other disorders of urinary system	31
F32 Depressive episode	30
Z38 Live born infants	27
J22 Unspecified acute lower respiratory infection	26
I21 Acute myocardial infarction	25
F31 Bipolar affective disorder	23
I20 Angina pectoris	20

Once again the diagnosis consuming the most beds is one of 'Unknown and unspecified causes of morbidity'. Heart and lung conditions are also prominent.

### 3. Average Age of patient

Age of the patient is included as an indicator to reflect the difficulties of dealing with the very elderly including discharge to nursing homes, etc..

ICD Primary Diagnosis	Age
R54 Senility	100
F03 Unspecified dementia	96
F01 Vascular dementia	95
G30 Alzheimer's disease	95
Z74 Problems related to care-provider dependency	95
F00 Dementia in Alzheimer's disease	94
Z73 Problems related to life-management difficulty	94
I69 Sequelae of cerebrovascular disease	93
S72 Fracture of femur	92
I50 Heart failure	92
I64 Stroke not specified as haemorrhage or infarction	92
M80 Osteoporosis with pathological fracture	92
F05 Delirium not induced by alcohol and other psychoactive	92
I95 Hypotension	90
I44 Atrioventricular and left bundle-branch block	90

As can be see the top 7 are to do with mental health where one could question whether an NHS institution is the best place for such elderly people. Indeed one could argue that the patients are in hospital because of their age rather than their condition per se. Conditions of the heart also feature in this group.

### 4. Ratio of FCE per admission

Ratio of consultant episodes per admission has been chosen as an indicator to reflect those conditions requiring the input from multiple teams.

ICD Primary Diagnosis	FCE to FFCE
J80 Adult respiratory distress syndrome	100
I33 Acute and subacute endocarditis	97
I63 Cerebral infarction	95
Z39 Postpartum care and examination	93
K26 Duodenal ulcer	90
A19 Miliary tuberculosis	86
J69 Pneumonitis due to solids and liquids	83
Z76 Persons encountering health services in other circumstances	78
N17 Acute renal failure	76
K70 Alcoholic liver disease	73
I22 Subsequent myocardial infarction	70
J14 Pneumonia due to Haemophilus influenzae	69
J85 Abscess of lung and mediastinum	69
J61 Pneumoconiosis due to asbestos and other mineral fibres	68
I64 Stroke not specified as haemorrhage or infarction	68

As can be seen vascular and respiratory conditions feature prominently.

## 5. Length of Stay

LOS has been included to reflect those diagnoses requiring extended periods of care which could be curtailed with the availability of suitable community support.

<b>ICD Primary Diagnosis</b>	<b>LOS</b>
F00 Dementia in Alzheimer's disease	100
F20 Schizophrenia	97
F25 Schizoaffective disorders	97
F02 Dementia in other diseases classified elsewhere	97
F31 Bipolar affective disorder	87
F22 Persistent delusional disorders	87
F01 Vascular dementia	82
F33 Recurrent depressive disorder	74
G30 Alzheimer's disease	68
F06 Other mental disorders brain damage and dysfunction	68
F30 Manic episode	68
I33 Acute and subacute endocarditis	66
F29 Unspecified nonorganic psychosis	61
Z50 Care involving use of rehabilitation procedures	58
L89 Decubitus ulcer	55

As can be seen this group is almost exclusively mental health and indicates a need for stronger community support for these conditions if a substantial reduction in bed days is to be achieved.

## 6. Skew in LOS, i.e. tail in the distribution with very high LOS

Skew in the LOS distribution has been added to highlight those conditions where there are a minority of very long stay patients relative to the average stay.

<b>ICD Primary Diagnosis</b>	<b>Skew in LOS</b>
F73 Profound mental retardation	100
F71 Moderate mental retardation	66
F72 Severe mental retardation	58
I99 Other and unspecified disorders of circulatory system	38
F91 Conduct disorders	37
F70 Mild mental retardation	35
F84 Pervasive developmental disorders	33
H54 Blindness and low vision	30
F81 Specific developmental disorders of scholastic skills	30
F79 Unspecified mental retardation	30
F68 Other disorders of adult personality and behaviour	28
Z59 Problems related to housing and economic circumstances	26
Z00 General exam & investig persons no complaint or rep d	25
F45 Somatoform disorders	25
F80 Specific developmental disorders of speech and language	25

Once again mental health is highlighted by this dimension indicating that certain patients tend to become institutionalised (due to the lack of community support structures or perhaps due to the very high average age).

### 7. Gender

Gender has been included to reflect conditions which are more prone in one sex or the other. This indicator points to the need for single gender wards, etc. Conditions which are exclusively male or female have been excluded. A score of 49 indicates that 99% of admissions are for a single sex.

ICD Primary Diagnosis	Gender
C50 Malignant neoplasm of breast	49
N60 Benign mammary dysplasia	48
J61 Pneumoconiosis due to asbestos and other mineral fibres	48
N64 Other disorders of breast	48
N63 Unspecified lump in breast	48
D66 Hereditary factor VIII deficiency	47
N61 Inflammatory disorders of breast	46
A56 Other sexually transmitted chlamydial diseases	44
Z10 Routine general health check-up of defined subpopulatio	43
A60 Ano-genital herpes viral [herpes simplex] infection	42
K40 Inguinal hernia	42
F50 Eating disorders	41
M32 Systemic lupus erythematosus	39
S21 Open wound of thorax	39
I86 Varicose veins of other sites	38
R33 Retention of urine	36
J92 Pleural plaque	36
C45 Mesothelioma	34
E04 Other non-toxic goitre	34
R79 Other abnormal findings of blood chemistry	33
S76 Injury of muscle and tendon at hip and thigh level	33

### 8. Combined Score

The combined score adds all the individual scores in an attempt to highlight those conditions with greatest overall complexity. The top 20 rather than top 15 conditions have been listed.

ICD Primary Diagnosis	Score
S72 Fracture of femur	305
I63 Cerebral infarction	304
R69 Unknown and unspecified causes of morbidity	269
I50 Heart failure	262
J44 Other chronic obstructive pulmonary disease	261
I33 Acute and sub-acute endocarditis	258
I64 Stroke not specified as haemorrhage or infarction	257
F20 Schizophrenia	257
R54 Senility	246
J18 Pneumonia organism unspecified	243
I21 Acute myocardial infarction	243
F01 Vascular dementia	236
F00 Dementia in Alzheimer's disease	230
J61 Pneumoconiosis due to asbestos and other mineral fibres	230
F03 Unspecified dementia	229
G30 Alzheimer's disease	227
R07 Pain in throat and chest	225
I20 Angina pectoris	223
J69 Pneumonitis due to solids and liquids	221
Z50 Care involving use of rehabilitation procedures	221

The combined score gives a breakdown into:

- Fractured femur
- Mental health conditions
- Vascular
- Respiratory

## Health Resource Group (HRG)

The next table uses HRGs rather than ICD diagnosis in an attempt to group conditions. In this instance the size of the bed pool has been used as the ranking method. As can be seen the following are prominent features:

- COPD, Asthma and respiratory
- Conditions of the heart
- Fractured neck of femur

Several points emerge from this table:

- The high level of poor clinical coding, i.e. HRG consuming the most bed days is an Invalid Primary Diagnosis
- Fractured femur
- Vascular
- Respiratory

## Local Situation

The following two tables show the actual bed days for a sample of HRG's admitted to local acute hospitals in 2002/03. The first table gives the actual bed days while the second table gives each category as a percentage of the total. On the second table those trusts with the highest and lowest values in each category have been flagged.

It is unclear what these differences are measuring

- Different patterns of conditions in different areas
- Differences in clinical coding
- Differences in the surrounding support via community care

## Conclusions

The issue of patient complexity can be characterised using multiple dimensions and as a result several common themes emerge.

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HRG	FCE	% EM	Mean LOS	Median LOS	Mean Age	Bed Days
U01 Invalid Primary Diag.	239,485	41%	19.3	3	49	2,575,724
A22 Non-Transient Stroke or Cerebrovascular Accident >69	42,653	90%	29.3	14	78	1,184,488
A99 Complex Elderly with a Nervous System Primary Diag.	23,806	84%	41.8	23	82	962,891
H33 Neck of Femur Fracture >69	38,494	88%	24.1	17	82	889,585
D99 Complex Elderly with a Respiratory System Primary Diag.	43,166	93%	19.1	11	81	814,357
D20 Chronic Obstructive Pulmonary Disease or Bronchitis	83,123	94%	8.9	6	70	732,262
H99 Complex Elderly with a Musculoskeletal System Primary Diag.	21,597	87%	33.3	21	84	703,342
D21 Asthma >49	61,975	95%	10.7	6	72	625,190
L09 Kidney or Urinary Tract Infections >69	38,619	94%	15.4	8	78	593,899
E99 Complex Elderly with a Cardiac Primary Diag.	29,938	92%	19.1	11	82	561,932
E18 Heart Failure or Shock >69	43,554	92%	13.3	8	80	557,447
F36 Large Intestinal Disorders >69	48,896	62%	11.5	6	75	447,724
E12 Acute Myocardial Infarction	57,174	97%	7.8	6	68	435,905
H36 Closed Pelvis or Lower Limb Fractures >69	19,916	88%	22.6	13	77	429,674
A16 Cerebral Degenerations >69	12,923	59%	43.4	17	77	428,981
D13 Lobar, Atypical or Viral Pneumonia >69	29,752	95%	14.2	8	77	422,863
U07 Poorly Coded Primary Diag.	18,774	40%	42.3	7	58	407,030
F46 General Abdominal Disorders >69	59,904	90%	7.1	4	65	381,445
E29 Arrhythmia or Conduction Disorders >69	51,036	81%	8.1	5	78	359,355
E33 Angina >69	58,711	97%	6	3	77	352,540
D25 Respiratory Neoplasms	32,491	64%	12.4	8	68	349,613
A19 Haemorrhagic Cerebrovascular Disorders	15,961	81%	21.9	7	67	325,057
E31 Syncope or Collapse >69	41,208	96%	8.3	3	79	305,792
F17 Stomach or Duodenum Disorders >69	29,413	83%	10.4	6	71	291,604
J41 Major Skin Infections >69	22,728	94%	12.3	7	73	271,023
A34 Miscellaneous Disorders of Nervous System	17,208	59%	20.4	5	50	248,168
F47 General Abdominal Disorders <70 w/o cc	102,179	87%	2.5	1	37	242,355
S05 Red Blood Cell Disorders >69	23,992	72%	10.8	6	76	241,564
Q15 Amputations	5,752	54%	36.2	25	66	238,196
H37 Closed Pelvis or Lower Limb Fractures <70 w/o cc	36,544	93%	6.2	4	34	222,687
S99 Complex Elderly Haematology, Infectious Disease, Poisoning, or Non-specific Primary Diag.	9,192	72%	25	14	82	221,739

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A23 Non-Transient Stroke or Cerebrovascular Accident <70 w/o cc	12,373	88%	19.3	8	58	221,443
H39 Closed Upper Limb Fractures or Dislocations >69	18,413	88%	12.6	4	78	221,256
H27 Non-Inflammatory Back, Bone, or Joint Disorders >69	17,702	43%	16.3	9	76	219,828
F07 Disorders of the Oesophagus >69	18,109	73%	12	6	74	214,034
F55 Inflammatory Bowel Disease >69	23,019	92%	9.8	5	70	209,558
H41 Sprains, Strains, or Minor Open Wounds >69	28,293	96%	7.8	2	71	205,689
F64 Gastrointestinal Bleed >69	23,703	95%	9.6	5	74	198,920
E34 Angina <70 w/o cc	50,548	96%	3.8	2	57	195,620
L99 Complex Elderly with a Urinary Tract or Male Reproductive System Primary Diag.	8,115	89%	23.6	14	83	194,398

## IP Beddays Emergency Inpatient by HRG - showing Actual

HRG	A	B	C	D	E
A99: Comp Eld w a Nervous Sys PDx	7,542	10,894	4,745	13,025	2,844
D15: Bronchopneumonia	962	1,402	487	2,128	3,586
D99: Comp Eld w a Respiratory Sys PDx	9,667	8,946	4,706	7,628	7,090
E18: Heart Fail / Shock >69 or wcc	6,627	4,383	2,337	4,706	5,326
E99: Comp Eld w a Cardiac PDx	6,218	5,276	2,343	4,845	3,196
F99: Comp Eld w Digestive Sys PDx	1,397	1,772	597	388	662
H33: Nk of Femur Fracture >69 or wcc	14,965	12,849	3,681	15,100	7,723
H99: Comp Eld w a Musculoskel Sys PDx	8,878	12,752	4,126	8,131	3,434
L99: Comp Eld w a Urin Tract /Male Reprod Sys PDx	1,866	2,211	734	2,357	1,209
S21: Convalescent / Other Relief Care	758	711	364	218	407
S99: Cmp Eld-Haem Inf Dis Poiss / Non-spec PDx	2,442	2,736	1,151	1,281	1,613
T01: Senile Dementia	13,242	16,718	2,341	14,875	3,535
<b>Totals</b>	<b>74,564</b>	<b>80,650</b>	<b>27,612</b>	<b>74,682</b>	<b>40,625</b>

HRG	A	B	C	D	E
A99: Comp Eld w a Nervous Sys PDx	10%	14%	17%	17%	7%
D15: Bronchopneumonia	1%	2%	2%	3%	9%
D99: Comp Eld w a Respiratory Sys PDx	13%	11%	17%	10%	17%
E18: Heart Fail / Shock >69 or wcc	9%	5%	8%	6%	13%
E99: Comp Eld w a Cardiac PDx	8%	7%	8%	6%	8%
F99: Comp Eld w Digestive Sys PDx	2%	2%	2%	1%	2%
H33: Nk of Femur Fracture >69 or wcc	20%	16%	13%	20%	19%
H99: Comp Eld w a Musculoskel Sys PDx	12%	16%	15%	11%	8%
L99: Comp Eld w a Urin Tract /Male Reprod Sys PDx	3%	3%	3%	3%	3%
S21: Convalescent / Other Relief Care	1%	1%	1%	0%	1%
S99: Cmp Eld-Haem Inf Dis Poiss / Non-spec PDx	3%	3%	4%	2%	4%
T01: Senile Dementia	18%	21%	8%	20%	9%