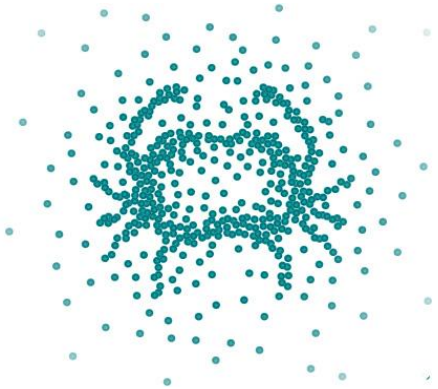

C-Ci

CRAB Clinical Informatics Ltd

Stephen Mackenney
Chief Executive

CRAB

See the whole picture.

The problem

Existing clinical performance information:

- A focus on management data
- Limited quality metrics:
  - single outcome measures: mortality & readmissions
  - mainly using national aggregate data sets
  - poor risk adjustment: no real case-mix
  - based on averages
  - snapshot analysis exaggerates small anomalies
  - benchmarking not robust
- Ownership of data…
- …doctors “policed” rather than supported?

CRAB

See the whole picture.

The solution

CRAB: What does it do?

- Calculation of individual patient risk
  - physiological and operative
  - mortality and morbidity
  - Predictive and retrospective
- Presentation as O/E ratio:
  - celebrate successes as well as alerting problems
  - international benchmarking
  - trend and snapshot
  - spectrum analysis by risk decile
  - critical care facilities analysis

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Background

- **POSSUM**
  - Recommended methodology:
    - Royal College of Surgeons (England, Scotland & Ireland)
    - National Confidential Enquiry into Perioperative Deaths (NCEPOD)
    - Vascular Society of Great Britain and Ireland
    - Association of Coloproctology of Great Britain and Ireland
    - Association of Upper Gastrointestinal Surgeons
  - In use:
    - 34 units in England
    - 47 countries worldwide
- **CRAB**
  - POSSUM now fully automated, updated, with state-of-the-art web technology and more detailed data capture.
  - International referential database of 800,000+ patients: largest of its kind in the world

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See the whole picture.

Scoring system

- Physiological assessment
  - 12 Variables
  - 4 Grade
  - Exponential increase in grading
- Operative severity assessment
  - 6 Variables (slight variation from general surgery)
  - 4 Grade
  - Exponential increase in grading
- Associated trigger tool for medical care

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Benefits

Simple, secure, web-based system for:

- Consultation support
- Audit aid for individual mortality or morbidity assessment
  - Appropriate outcome?
  - Appropriateness of surgery?
- Early intervention system
  - As an aid to resuscitation, planning care needs
- To assess surgeon/unit performance
  - robust, clinical evidence base for identifying outliers, and causes
  - training and appraisal
  - reliable benchmarking
  - protection for good performers
- Organisational assurance on Clinical Governance issues
- Real patient choice and public accountability

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See the whole picture.

Hello Charles Bigley!

Log Off | Account Details

HOME

About CRAB | EH Information | Get Help

General Reports

HOSPITAL OUTCOMES

Risk
Mortality ▸▸ | Morbidity ▸▸

By Consultant
Mortality ▸▸ | Morbidity ▸▸

By Speciality
Mortality ▸▸ | Morbidity ▸▸

Complications
Overview | Detailed

HOSPITAL TRENDS

General
Mortality ▸▸ | Morbidity ▸▸

Risk Adjusted Outcomes
Mortality ▸▸ | Morbidity ▸▸

Outcome Trend Assessment
Mortality ▸▸ | Morbidity ▸▸

Facilities Tools
Use of Facilities Prediction ▸▸

HOSPITAL REFERRAL TOOLS

Casemix Profile
Mortality | Morbidity

Commissioner Tools
Surgical Outlier ▸▸ | Referral Pattern ▸▸

Specific Reports

SUB-SPECIALITY ANALYSES

General
Surgical Casemix ▸▸ | Activity ▸▸

Casemix Profile
Mortality ▸▸ | Morbidity ▸▸

Trend Analyses
Mortality | Morbidity

Need Help?

Click on any Report Name to learn more
or
Click on the adjacent ▸▸ symbol to get straight to work.

What this means

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International results
Comparative data

Country	Number of patients	Type of unit/surgery	% Mortality	O/E ratio
Argentina	743	Peripheral Vascular	5.3%	0.98
Wales	2890	Teaching Hospital, Urology	1.3%	1.01
Turkey	3420	Military Hospital Mixed General	2.1%	0.99
Singapore	340	High dependency Mixed General and orthopaedics	8.2%	0.97
India	7567	Mixed general surgery Young age skew	1.7%	0.98

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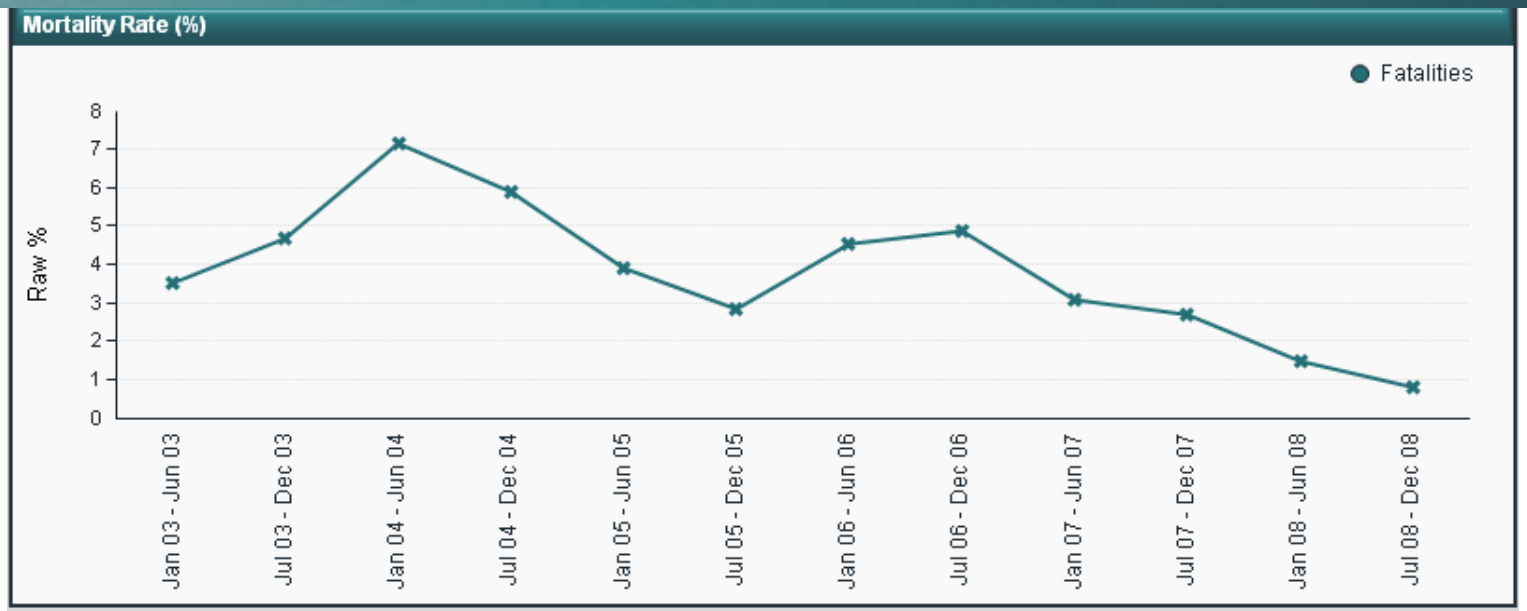
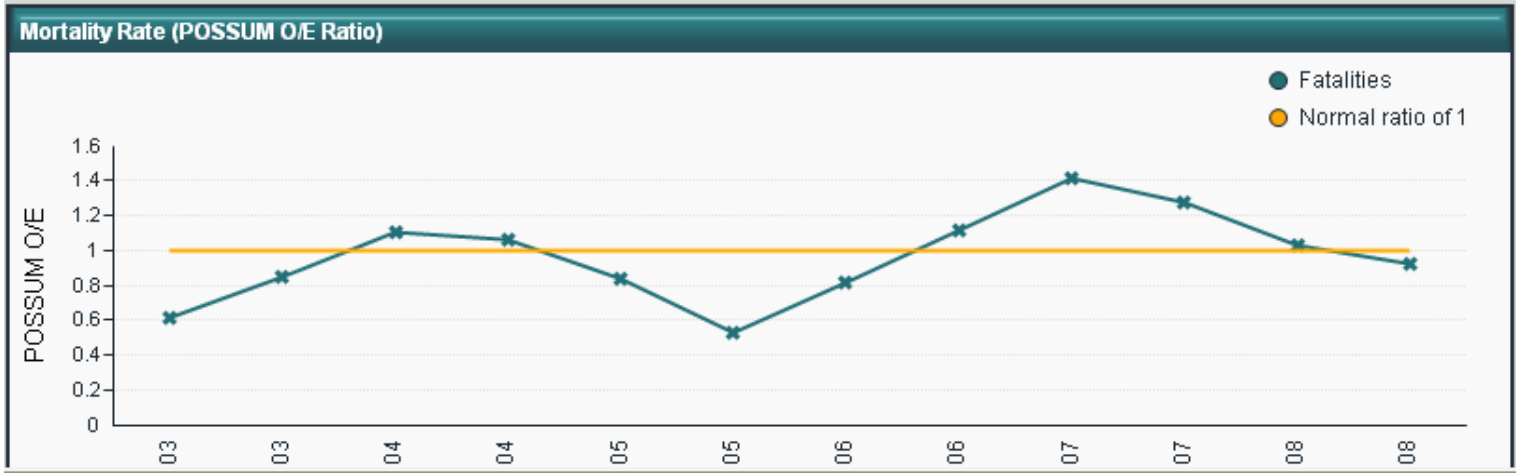
Organisational results

Case study





Individual performance
Case study

Orthopaedics research analysis

- 2326 consecutive non day case patients
  - 44% Elective
  - 56% Emergency
- 6 surgeons
- 2 years
- Overall mortality 2.2%
- Overall morbidity 10.8%

Morbidity
O/E ratio comparison

Individual Orthopaedic Surgeons

	Morbidity	O/E
A	12.9%	0.97
B	10.5%	1.04
C	11.0%	0.95
D	4.6%	1.00
E	9.6%	1.03
F	13.4%	0.98

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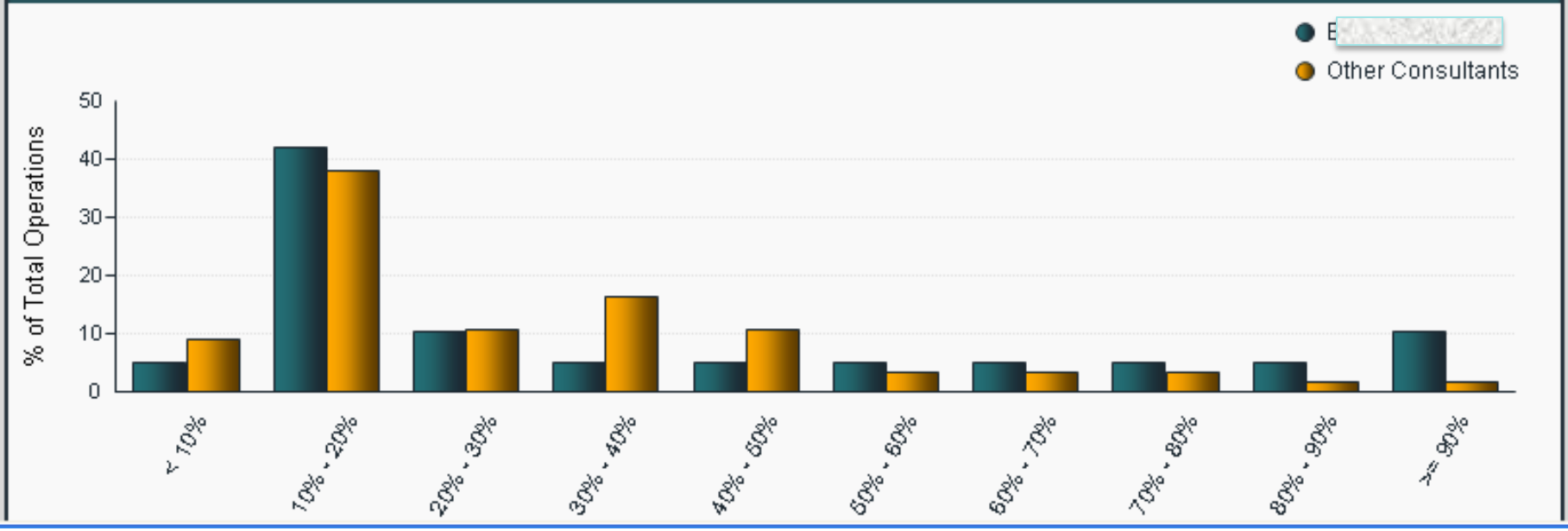
Case study: UK
London

	< 10%	10% - 20%	20% - 30%	30% - 40%	40% - 50%	50% - 60%	60% - 70%	70% - 80%	80% - 90%	>= 90%
Total	6	29	8	10	7	3	3	3	2	3
Consultant	1	8	2	1	1	1	1	1	1	2
Consultant %	5.3	42.1	10.5	5.3	5.3	5.3	5.3	5.3	5.3	10.5
Other Consultants	5	21	6	9	6	2	2	2	1	1
Other Consultants %	9.1	38.2	10.9	16.4	10.9	3.6	3.6	3.6	1.8	1.8

Complications Casemix



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Case study: Sweden
Karolinska Hospital

Complications Casemix Profile

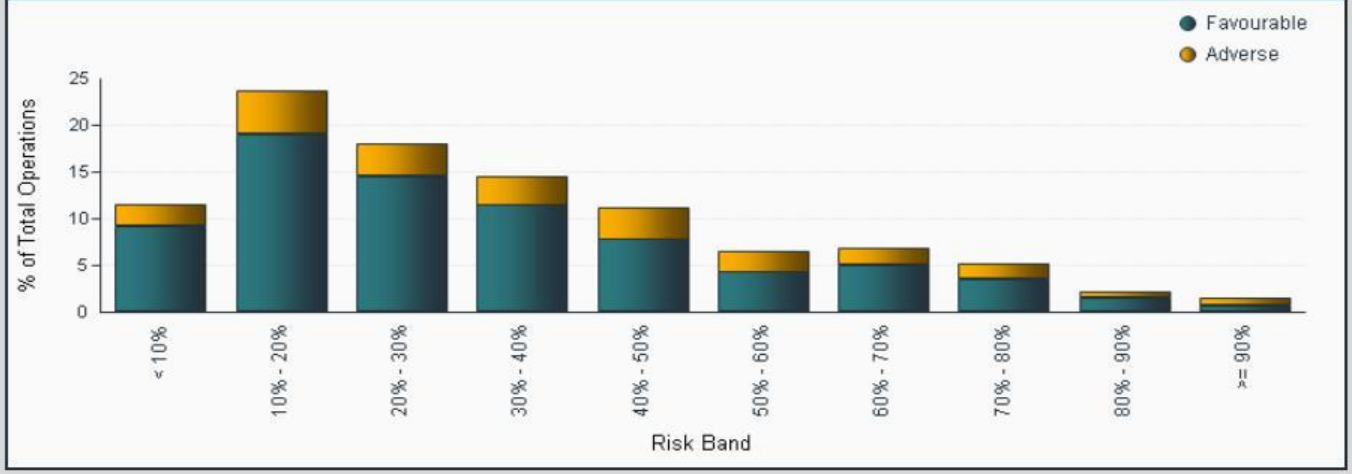
REPORT

Create New Report

Karolinska Orthopaedic Centre, 01/01/2009 to 31/12/2009.

	< 10%	10% - 20%	20% - 30%	30% - 40%	40% - 50%	50% - 60%	60% - 70%	70% - 80%	80% - 90%	>= 90%
Total	56	116	88	71	55	32	33	25	10	7
Favourable	45	93	71	56	38	21	24	17	7	3
Favourable %	9.1	18.9	14.4	11.4	7.7	4.3	4.9	3.4	1.4	0.6
Adverse	11	23	17	15	17	11	9	8	3	4
Adverse %	2.2	4.7	3.4	3.0	3.4	2.2	1.8	1.6	0.6	0.8
Raw %	19.6	19.8	19.3	21.1	30.9	34.4	27.3	32.0	30.0	57.1

Complications Casemix



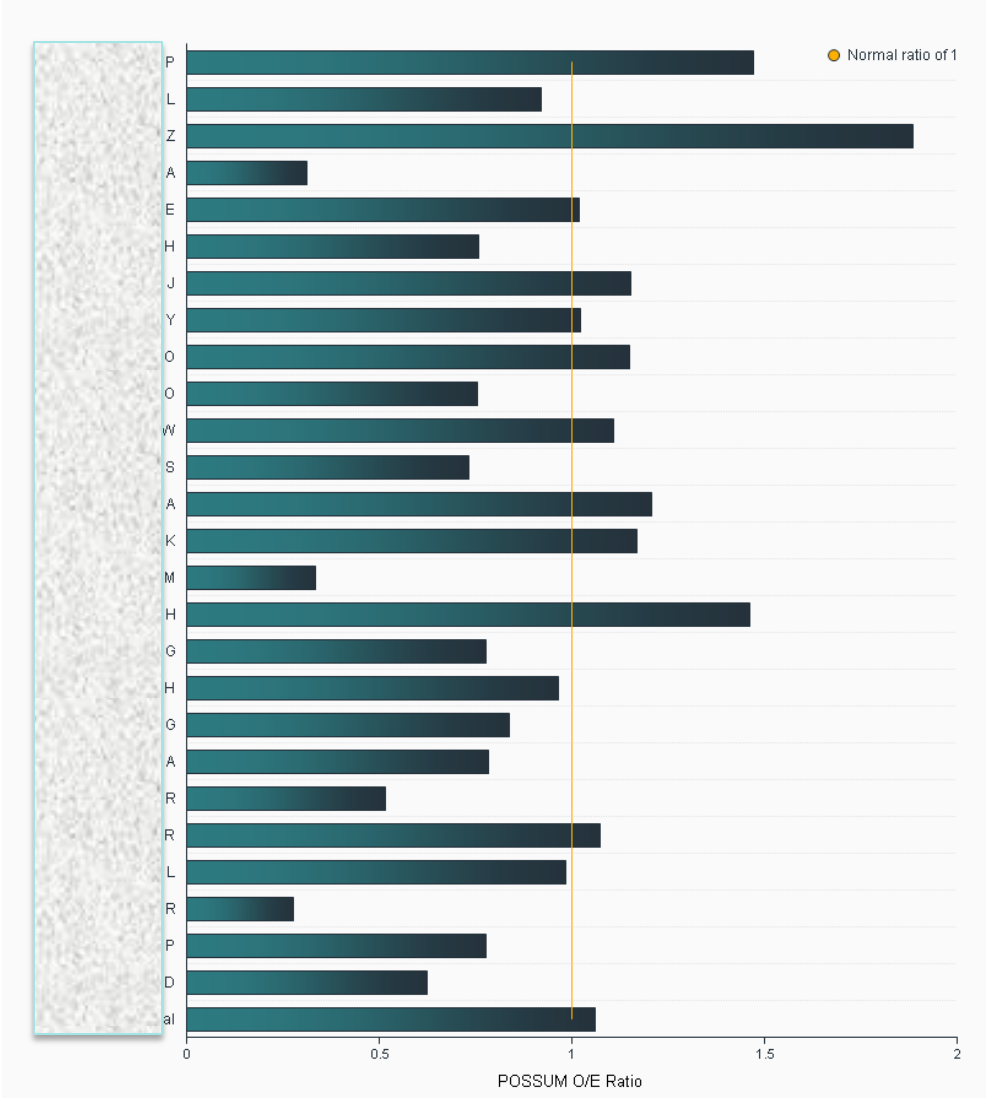
Create New Report

< BACK to DATES

CRAB

See the whole picture.

Case study: Sweden (Karolinska Hospital)



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Mortality review

Mortality Risk

REPORT

Create New Report

Denver, 01/01/2006 to 31/12/2008.

Date of Op.	Case	Consultant	D.O.B.	D.O.D.	Risk
13/01/2006	17070	Pi, Mr P	16/01/1936	17/01/2006	2.8%
14/01/2006	17119	Gamma, Mr C	07/02/1917	30/01/2006	48.5%
01/02/2006	17598	Pi, Mr P	15/03/1930	10/02/2006	20.8%
07/02/2006	17122	Gamma, Mr C	06/01/1945	08/02/2006	19.3%
20/02/2006	17095	Tau, Mr T	10/01/1928		99.9%
02/03/2006	17134	Tau, Mr T	19/06/1925		88.3%
02/03/2006	17184	Tau, Mr T	05/05/1922		74.3%
04/03/2006	17139	Pi, Mr P	14/01/1924	05/03/2006	14.6%
04/03/2006	17592	Pi, Mr P	17/12/1959	14/03/2006	90.3%
05/03/2006	17593	Pi, Mr P	17/12/1959	14/03/2006	76.9%

Change page: < Prev 1 2 3 4 5 6 7 8 9 10 ... Next > | Displaying page 1 of 43; items 1 to 10 of 427

Show Patient Names | Show All

Create New Report

CRAB

See the whole picture.

Case-mix analysis

PHYSIOLOGICAL SCORE:		**65**
Age	61 - 70 years	2
Cardiac; CXR	Anti-coagulants, peripheral oedema; borderline cardiomegaly	4
Resp.; CXR	Short of breath at rest; pulmonary fibrosis, consolidation	8
Blood pressure	90 - 99 or 171 or more mmHg	4
Pulse	39 or less, or 121 or more bpm	8
Glasgow coma score	GCS 8 or less	8
Urea	10.1 - 15.0 mmol/litre	4
Sodium	125 or less mmol/litre	8
Potassium	3.5 - 5.0 mmol/l	1
Haemoglobin	9.9 or less, or 18.1 or more g/100ml	8
White cell count	3.1 - 4.0 or 10.1 - 20.0 x10^12/l	2
ECG	91 or more bpm, arrhythmia, >4/min ectopics, ST/T wave changes	8
OPERATIVE SCORE:		**23**
Severity	Moderate operation	2
No. of ops	Two operations within 28 days	4
Blood loss	501 - 999 ml	4
Peritoneal soiling	Local pus only	4
Malignancy	No malignancy present	1
Time of op.	6 or less hrs after admission; immediate with resus.	8

Show Patient Details

CRAB

See the whole picture.

Root cause analysis

Detailed Complications - by Complication Category / Type

REPORT

Create New Report

Denver, 01/01/2006 to 31/12/2008.

Drill Down: By Consultant

Complication Category / Type	Complications	% of Total	% of Operations
Anastomotic leak / Major	20	0.7	0.1
Anastomotic leak / Minor	55	2.0	0.3
Cardio-respiratory / Arrythmia	47	1.7	0.3
Cardio-respiratory / Cardiac failure	297	11.0	1.8
Cardio-respiratory / Hypotension	17	0.6	0.1
Cardio-respiratory / Other cardiac	1	0.0	0.0
Cardio-respiratory / Other respiratory	6	0.2	0.0
Cardio-respiratory / Pulm collapse	37	1.4	0.2
Cardio-respiratory / Respiratory failure	54	2.0	0.3
Death / Death in hospital	263	9.8	1.6
Total	2693	100.0	16.2

Change page: < Prev 1 2 3 4 5 6 Next > | Displaying page 1 of 6; items 1 to 10 of 55

Show All

Create New Report

CRAB

See the whole picture.

Quality = positive performance

Mortality Surgical Outlier

WHAT OUTLIERS WOULD YOU LIKE TO IDENTIFY?

Denver, 01/01/2006 to 31/12/2008.

1. Choose Outlier Type

◉	Unexpected **Favourable** Outcomes (Above Outlier Threshold)
○	Unexpected **Adverse** Outcomes (Below Outlier Threshold)

2. Set Outlier Threshold

80 %

CREATE REPORT >

Need Help?

Click the on-screen button to choose the report you would like. (Clicking on one button automatically deselects the other.) Then, set the value of the Outlier Threshold.

Click CREATE REPORT to display the report.

The threshold is the risk of an unfavourable outcome calculated using POSSUM and expressed as a percentage. The higher the number, the greater the risk of an unfavourable outcome.

The report shows all cases that meet the selected criteria.

< BACK to DATES

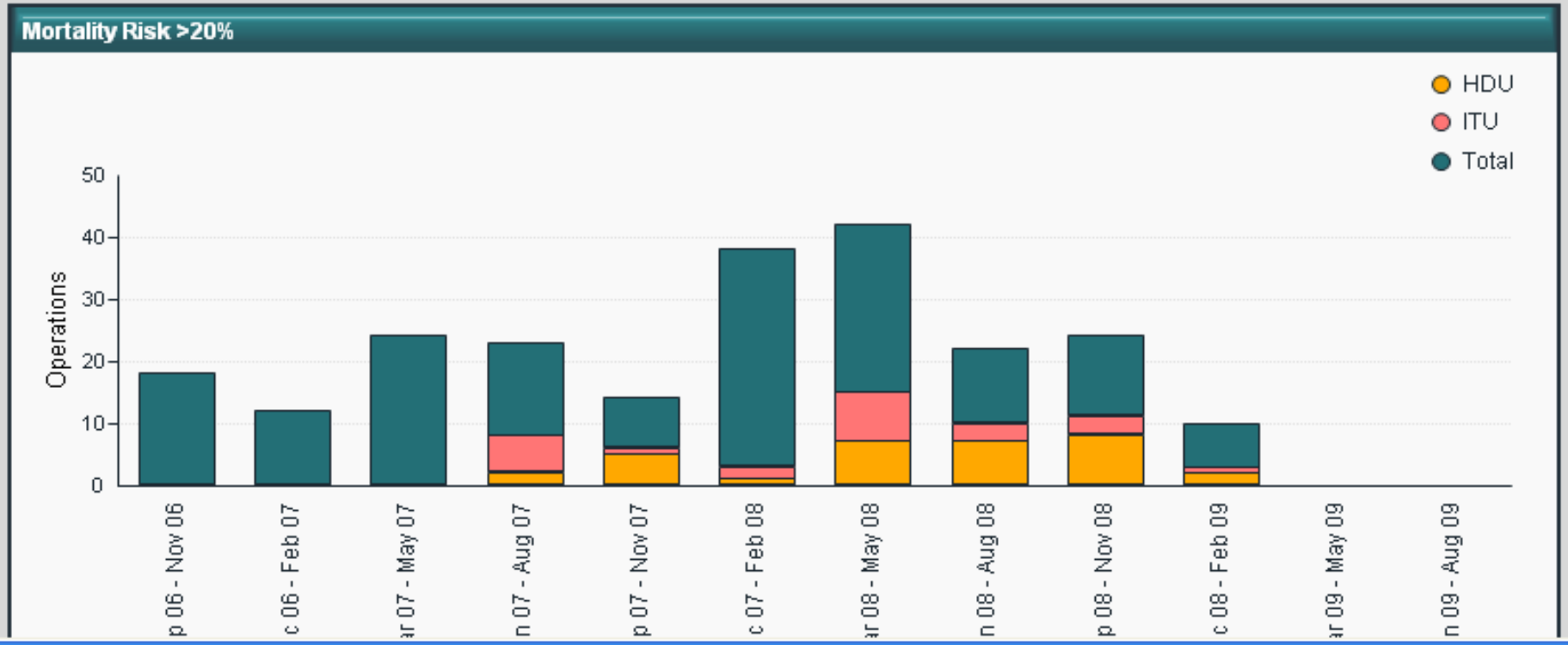
CRAB

See the whole picture.

Case study: UK
Critical care

Denver, 3 month intervals over a 3 year period, 01/09/2006 to 31/08/2009.

Period	Sep 06 - Nov 06	Dec 06 - Feb 07	Mar 07 - May 07	Jun 07 - Aug 07	Sep 07 - Nov 07	Dec 07 - Feb 08	Mar 08 - May 08	Jun 08 - Aug 08	Sep 08 - Nov 08	Dec 08 - Feb 09	Mar 09 - May 09	Jun 09 - Aug 09
Total	18	12	24	23	14	38	42	22	24	10	0	0
HDU	0	0	0	2 ▼	5 ▼	1 ▼	7 ▼	7 ▼	8 ▼	2 ▼	0	0
ITU	0	0	0	6 ▼	1 ▼	2 ▼	8 ▼	3 ▼	3 ▼	1 ▼	0	0



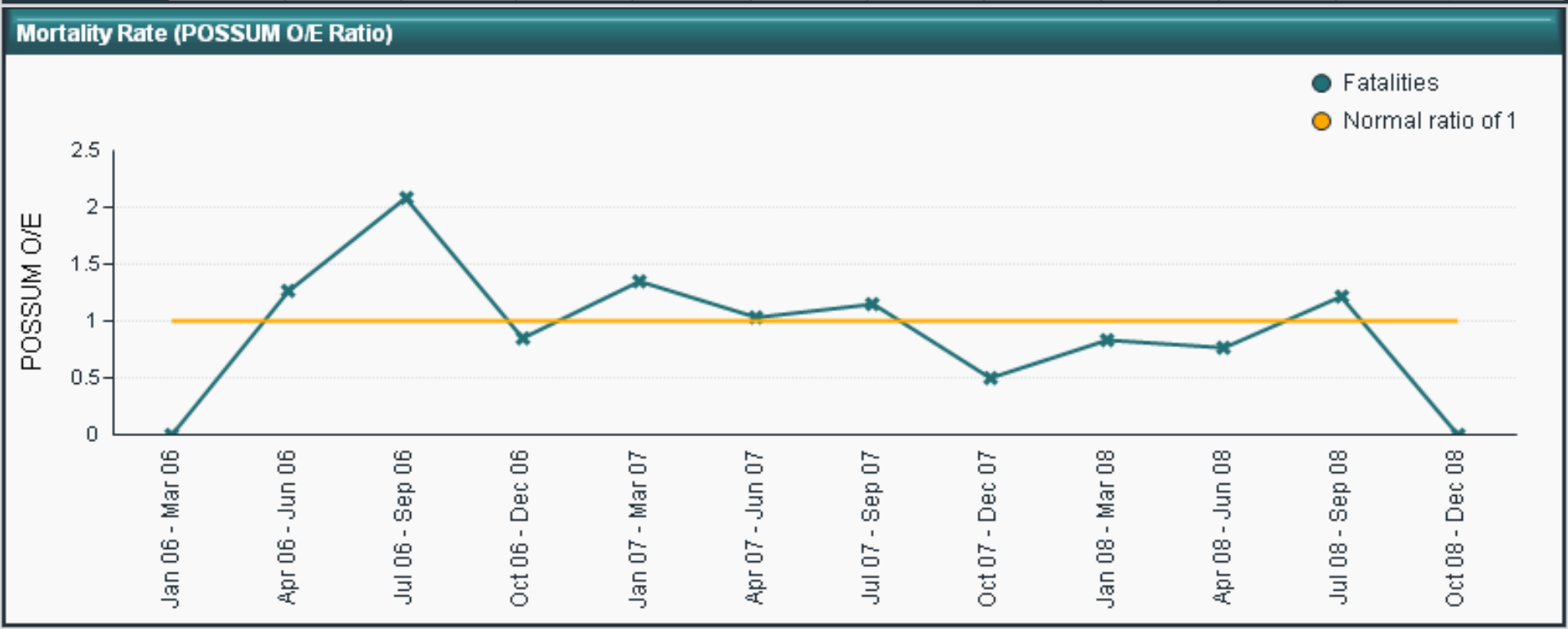
CRAB

See the whole picture.

Case study: UK

Safety early warning system

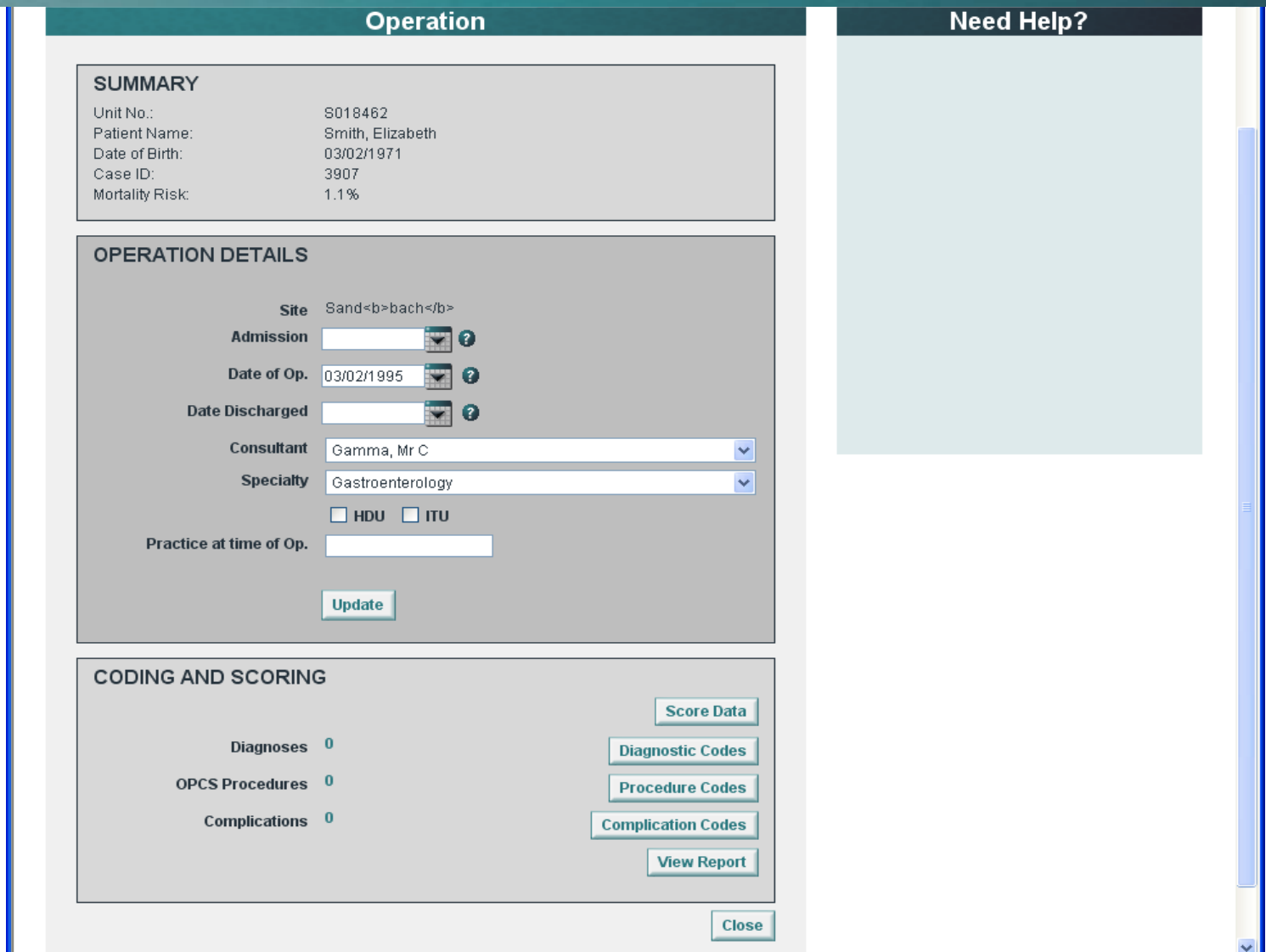
Period	Jan 06 - Mar 06	Apr 06 - Jun 06	Jul 06 - Sep 06	Oct 06 - Dec 06	Jan 07 - Mar 07	Apr 07 - Jun 07	Jul 07 - Sep 07	Oct 07 - Dec 07	Jan 08 - Mar 08	Apr 08 - Jun 08	Jul 08 - Sep 08	Oct 08 - Dec 08
Total	45	37	21	31	188	175	172	179	168	168	45	0
Fatalities	0	4 ▼	4 ▼	1 ▼	10 ▼	9 ▼	10 ▼	4 ▼	8 ▼	4 ▼	1 ▼	0
Raw %		10.8	19.0	3.2	5.3	5.1	5.8	2.2	4.8	2.4	2.2	
POSSUM O/E Ratio		1.25	2.08	0.84	1.34	1.03	1.15	0.49	0.83	0.76	1.21	



CRAB

See the whole picture.

Manual data capture



CRAB

See the whole picture.

Case-mix scoring

SUMMARY

Unit No.:	S018462
Patient Name:	Smith, Elizabeth
Date of Birth:	03/02/1971
Case ID:	3907
Mortality Risk:	1.1%

PHYSIOLOGICAL

Cardiac; CXR	No cardiac failure; normal chest X Ray
Resp.; CXR	No shortage of breath; no chronic obstructive airways dis
Blood pressure	Systolic blood pressure between 110 and 130 mmHg
Pulse	Pulse between 50 and 80 beats/min
Glasgow coma score	15 on the scale
Urea	7.5 mmol/litre or less
Sodium	136 mmol/litre or more
Potassium	Between 3.5 and 5 mmol/litre
Haemoglobin	Between 13 and 16 g/100ml
White cell count	White cell count between 4.1 and 10 x 10**12
ECG	Normal electrocardiogram

OPERATIVE

Operation	Moderate operation
Blood loss	100 ml or less of blood lost
Peritoneal soiling	Serous fluid only, or blood less than 250 ml
Malignancy	No malignancy present
Time of op.	Surgery <24 hrs after admission

Update Cancel

If a Physiological value is not available/applicable then select '(Not Known)' from the appropriate list.

CRAB

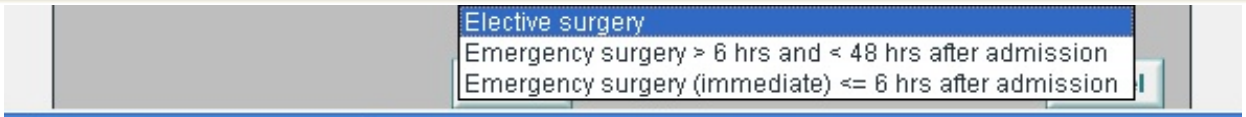
See the whole picture.

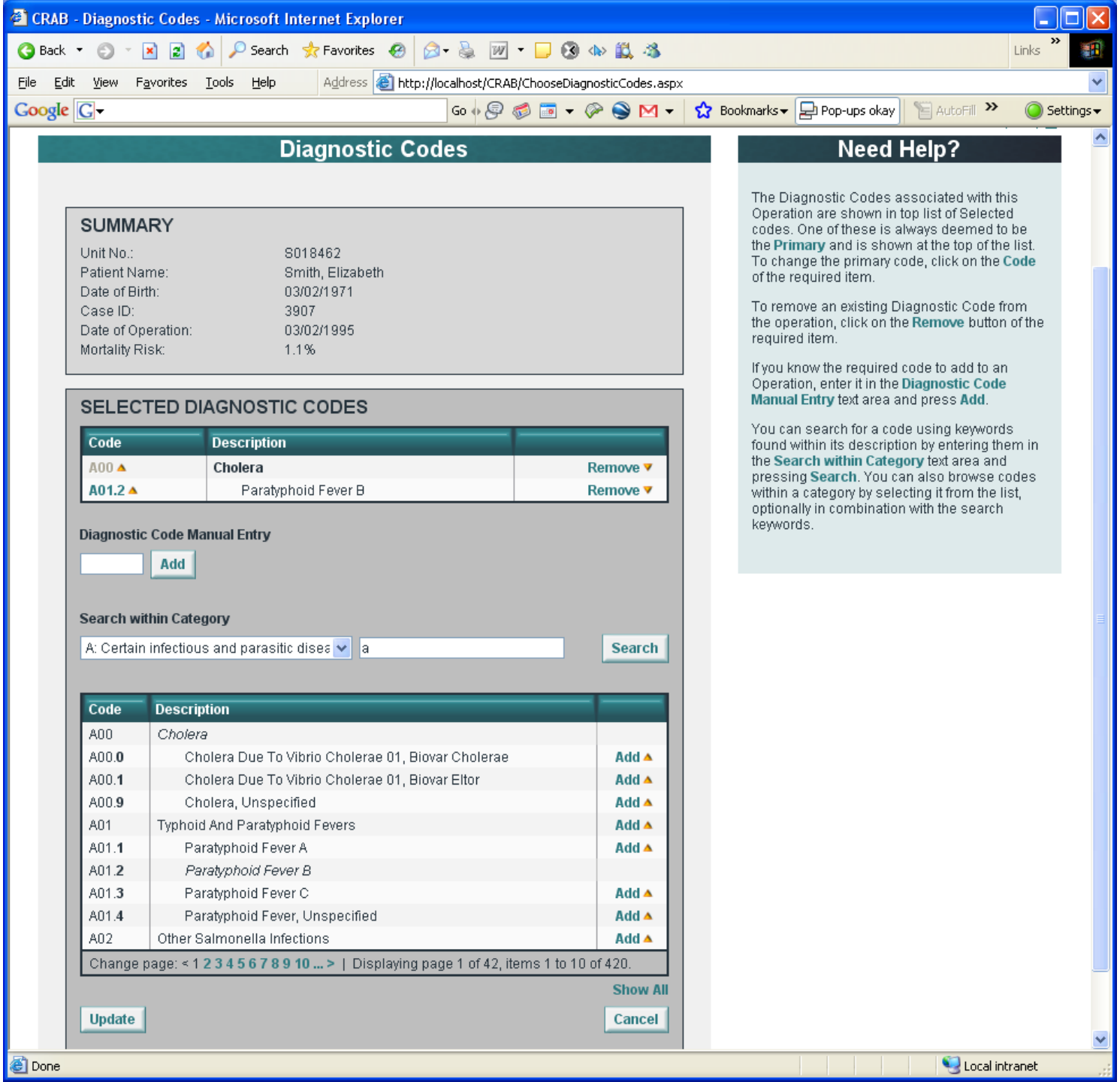
Predictive risk analysis

PHYSIOLOGICAL SCORE:		65
Age	61 - 70 years	2
Cardiac; CXR	Anti-coagulants, peripheral oedema; borderline cardiomegaly	4
Resp.; CXR	Short of breath at rest; pulmonary fibrosis, consolidation	8
Blood pressure	90 - 99 or 171 or more mmHg	4
Pulse	39 or less, or 121 or more bpm	8
Glasgow coma score	GCS 8 or less	8
Urea	10.1 - 15.0 mmol/litre	4
Sodium	125 or less mmol/litre	8
Potassium	3.5 - 5.0 mmol/l	1
Haemoglobin	9.9 or less, or 18.1 or more g/100ml	8
White cell count	3.1 - 4.0 or 10.1 - 20.0 x10^12/l	2
ECG	91 or more bpm, arrhythmia, >4/min ectopics, ST/T wave changes	8

OPERATIVE SCORE:		23
Severity	Moderate operation	2
No. of ops	Two operations within 28 days	4
Blood loss	501 - 999 ml	4
Peritoneal soiling	Local pus only	4
Malignancy	No malignancy present	1
Time of op.	6 or less hrs after admission; immediate with resus.	8

Show Patient Details




CRAB - Diagnostic Codes - Microsoft Internet Explorer
Back
Search
Favorites
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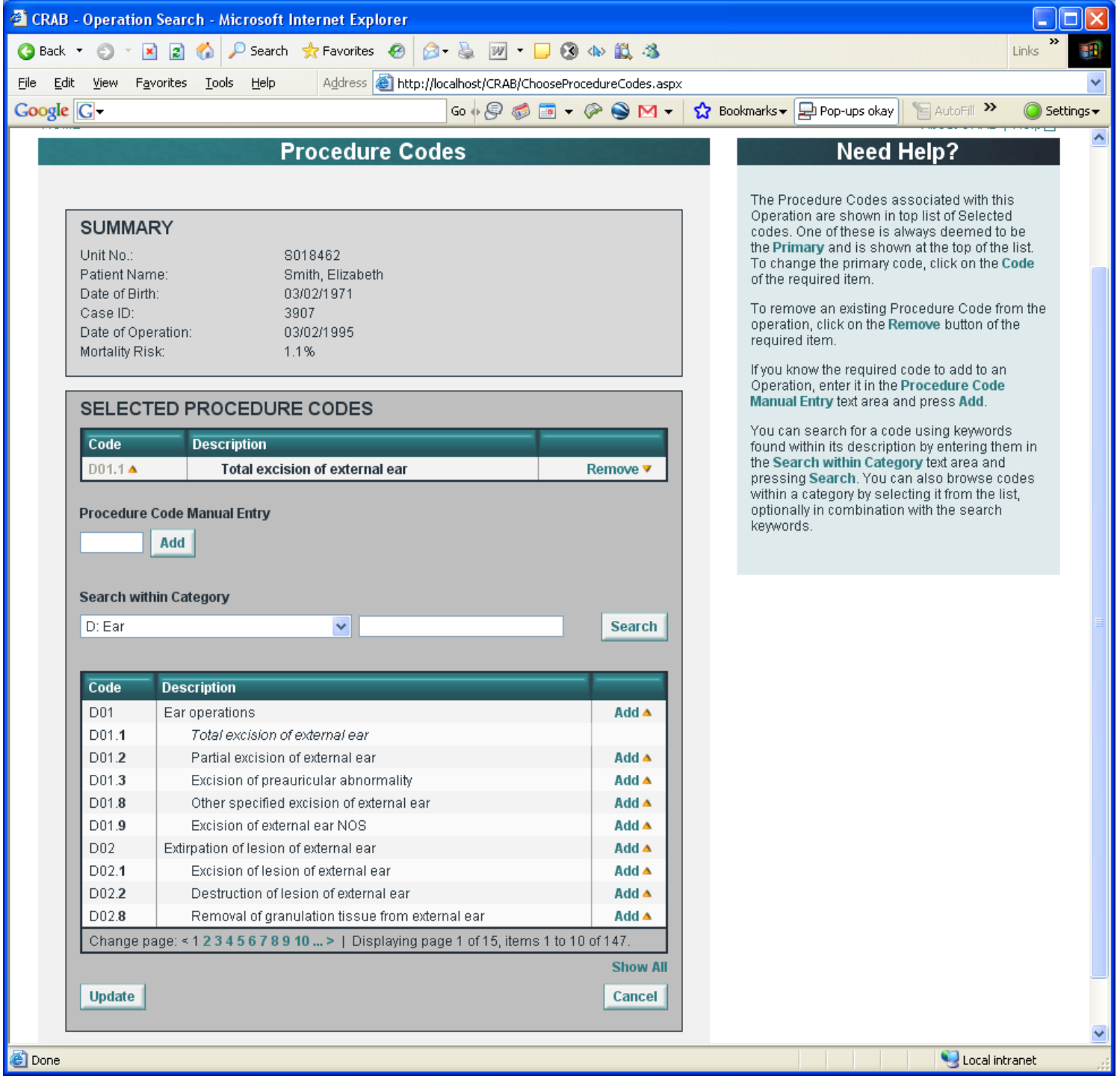
File Edit View Favorites Tools Help
Address
http://localhost/CRAB/ChooseDiagnosticCodes.aspx
Google
Go
Bookmarks
Pop-ups okay
AutoFill
Settings
Diagnostic Codes
SUMMARY
Unit No.: S018462
Patient Name: Smith, Elizabeth
Date of Birth: 03/02/1971
Case ID: 3907
Date of Operation: 03/02/1995
Mortality Risk: 1.1%
SELECTED DIAGNOSTIC CODES
Code
Description
A00 Cholera Remove
A01.2 Paratyphoid Fever B Remove
Diagnostic Code Manual Entry
Add
Search within Category
A: Certain infectious and parasitic disea
a
Search
Code
Description
A00 Cholera
A00.0 Cholera Due To Vibrio Cholerae 01, Biovar Cholerae Add
A00.1 Cholera Due To Vibrio Cholerae 01, Biovar Eltor Add
A00.9 Cholera, Unspecified Add
A01 Typhoid And Paratyphoid Fevers Add
A01.1 Paratyphoid Fever A Add
A01.2 Paratyphoid Fever B
A01.3 Paratyphoid Fever C Add
A01.4 Paratyphoid Fever, Unspecified Add
A02 Other Salmonella Infections Add
Change page: < 1 2 3 4 5 6 7 8 9 10 ... > | Displaying page 1 of 42, items 1 to 10 of 420.
Show All
Update
Cancel
Need Help?
The Diagnostic Codes associated with this Operation are shown in top list of Selected codes. One of these is always deemed to be the Primary and is shown at the top of the list. To change the primary code, click on the Code of the required item.
To remove an existing Diagnostic Code from the operation, click on the Remove button of the required item.
If you know the required code to add to an Operation, enter it in the Diagnostic Code Manual Entry text area and press Add.
You can search for a code using keywords found within its description by entering them in the Search within Category text area and pressing Search. You can also browse codes within a category by selecting it from the list, optionally in combination with the search keywords.
Done
Local intranet


CRAB - Operation Search - Microsoft Internet Explorer
Back
Search
Favorites
Links
File Edit View Favorites Tools Help
Address
http://localhost/CRAB/ChooseProcedureCodes.aspx
Google
Go
Bookmarks
Pop-ups okay
AutoFill
Settings
Procedure Codes
SUMMARY
Unit No.: S018462
Patient Name: Smith, Elizabeth
Date of Birth: 03/02/1971
Case ID: 3907
Date of Operation: 03/02/1995
Mortality Risk: 1.1%
SELECTED PROCEDURE CODES
Code
Description
D01.1
Total excision of external ear
Remove
Procedure Code Manual Entry
Add
Search within Category
D: Ear
Search
Code
Description
D01 Ear operations Add
D01.1 Total excision of external ear
D01.2 Partial excision of external ear Add
D01.3 Excision of preauricular abnormality Add
D01.8 Other specified excision of external ear Add
D01.9 Excision of external ear NOS Add
D02 Extirpation of lesion of external ear Add
D02.1 Excision of lesion of external ear Add
D02.2 Destruction of lesion of external ear Add
D02.8 Removal of granulation tissue from external ear Add
Change page: < 1 2 3 4 5 6 7 8 9 10 ... > | Displaying page 1 of 15, items 1 to 10 of 147.
Show All
Update
Cancel
Need Help?
The Procedure Codes associated with this Operation are shown in top list of Selected codes. One of these is always deemed to be the Primary and is shown at the top of the list. To change the primary code, click on the Code of the required item.
To remove an existing Procedure Code from the operation, click on the Remove button of the required item.
If you know the required code to add to an Operation, enter it in the Procedure Code Manual Entry text area and press Add.
You can search for a code using keywords found within its description by entering them in the Search within Category text area and pressing Search. You can also browse codes within a category by selecting it from the list, optionally in combination with the search keywords.
Done
Local intranet

CRAB - Complications - Microsoft Internet Explorer
Back
Search
Favorites
Links
File Edit View Favorites Tools Help
Address
http://localhost/CRAB/OperationComplications.aspx
Google
Go
Bookmarks
Pop-ups okay
AutoFill
Settings
CRAB
See the whole picture.
Hello Mr Chris Smith
Log Off | User Profile
HOME
About CRAB | Help
Operation Complications
SUMMARY
Unit No.: S018462
Patient Name: Smith, Elizabeth
Date of Birth: 03/02/1971
Case ID: 3907
Date of Operation: 03/02/1995
Mortality Risk: 1.1%
COMPLICATIONS: 1
Complications for this operation:
Anastomotic leak / Minor
Add to Operation
Remove from Operation
Available Complications:
Anastomotic leak / Major
Cardio-respiratory / Arrythmia
Cardio-respiratory / Cardiac failure
Cardio-respiratory / Effusion
Cardio-respiratory / Hypotension
Cardio-respiratory / Other cardiac
Cardio-respiratory / Other respiratory
Cardio-respiratory / Pulm collapse
Cardio-respiratory / Respiratory failure
Death / Death at home within 30 days
Update
Cancel
Need Help?
Each complication consists of a Category and Option; shown as a pair. First select the required complication for the list, then click on the button Add to Operation.
To remove a complication, first select it from the upper list, then click on the button Remove from Operation.
When any complications have been selected, click on the Update button to apply the change
Tip: you can select more than one complication and add/remove then all in one go.
Done
Local intranet

Medical care?

Medical outcomes are less obvious / more long term.

Quality ≈ Absence of harm

Adobe Reader - [Uk trigger tool.pdf]
File Edit View Document Tools Window Help
Open Save a Copy Print Email Search Select Text 91% Share photos like a pro
eBooks
Bookmarks Signatures Layers Pages

Trigger	+	Event Description and Severity E-I
	General care module	
G 1	Lack of early warning score or early warning score requiring response	
G 2	Any patient fall	
G 3	Decubiti	
G 4	Readmission to hospital within 30 days	
G 5	Shock or cardiac arrest	
G 6	DVT/PE following admission evidenced by imaging +/or D dimmers	
G 7	Complication of procedure or treatment	
G 8	Transfer to higher level of care	

	Surgical c	
S 1	Return to theatre	
S 2	Change in planned procedure	
S3	Removal/Injury or repair of organ	

	Intensive care module	
I 1	Readmission to ICU or HDU	
I 2	Unplanned transfer to ICU or HDU	

	Patient identifier	
	Total events	
	Total length of stay	

Trigger	+	Event Description and Severity E-I
	Medication module	
M 1	Vitamin K	
M 2	Naloxone	
M 3	Flumazenil	
M 4	Glucagon or 50% glucose	
M 5	Abrupt medication stop	

	Lab test module	
	Rising urea or creatinine (>2x baseline)	
L5 L6	Electrolyte abnormalities Na^+ <120 or >160 K^+ <2.5 or >6.5	
L7	Hypoglycaemia (<3mmol/l)	
L8	Raised Troponin (>1.5 ng/ml)	
	Microbiology	
:L9	MRSA bacteraemia	
L10	C. difficile	
L11	VRE	
L12	Wound infection	
L13	Nosocomial pneumonia	
L14	Positive blood culture	

UK Trigger Tool

32 trigger events.
30 can be captured from coding

11 x 8.5 in
4 of 11

CRAB
Medical Tracker

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Trigger alerts
+ Case-mix
+ Process audit

- Mortality
- Morbidity

Snapshot	Time period	Number alerts: >3/4/5/6	Patient details	• Demographics • Length of Stay • Outcome
Trend	• All deaths • Multiple alerts	• All • By alert group • By consultant /		• Patient details • Number of consultant
Specialty / sub-specia drill-down	• All patients • % mortality • % complicatio • % >3 alerts	Patient details		Coding for: • Complication • Diagnosis • Procedure / process