

BCIS-CCAD data import

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There are a variety of issues that relate to the way data gets from a percutaneous coronary intervention (PCI) centre's database into the servers of the Central Cardiac Audit Database (CCAD). The BCIS-CCAD minimum dataset is being used by England and Wales, and hopefully soon by Northern Ireland.

I felt it important to document the mechanism of data import from the English and Welsh centres to help those who are interested understand the process, and make clear how any apparent anomalies might occur.

The current BCIS-CCAD dataset is version 5.3.3 and can be downloaded as an excel spreadsheet from the BCIS web site at http://www.bcis.org.uk/resources/database_page

The majority of units use a PCI database to collect the data, and then export it in the form of a csv file to CCAD. This document describes the import system for this csv file, the rules used to accept and reject data, the way each procedure is uniquely identified, and how data completeness are assessed.

In addition, the Scottish cardiologists have a well established electronic data collection system, but based on a different dataset. We are trying to set up import routines that will extract appropriate key fields from the Scottish data, so that we can move towards UK wide electronic procedure based data collection. The differences in datasets mean that a number of assumptions and translation rules are being made, which I felt were important to document.

Clearly this is an evolving process, and the import issues for England, Wales and Northern Ireland, and the translation rules for Scotland will change with time. I will try to update this document when important changes occur. I acknowledge that this is a rather dry piece of work, but hope it is of some help to those involved in dealing with the details of these processes. Please don't hesitate to contact me when you spot any of the inevitable errors or omissions.

Best wishes

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1 English, Welsh, N. Ireland data import

1.1 Introduction

The working pattern expected is that the complete dataset from any unit will be uploaded on about a monthly basis to the CCAD servers. This csv file will therefore contain:

- Cases that have already been imported and have not been altered since last import
- Cases imported on the last occasion, but that have now been altered (either by having previously missing fields completed, or by having erroneous fields corrected.)
- Cases that are new, and have never uploaded before. (Some of these will be complete and some incomplete).

1.2 Pre-Import routines

- The csv file being imported is first backed up on the CCAD server. The latest csv file replaces previous backed-up one.
- The importing computer's Regional Settings are checked (Control Panel) for US date format configuration of (mm/dd/yyyy). If the format is US, then a warning is generated and the import is aborted.

1.3 Importing

Each record (consisting of 103 or 104 data fields for dataset versions 5.2.3 and 5.3.3 respectively) is then analysed and must satisfy certain criteria if it will be allowed to be imported into the CCAD database. These are the critical validation rules, and if the record fails, it is rejected and a report listing reasons for failure is provided after import.

1.3.1 Critical Validation rules

1.3.1.1 **Mandatory data:**

A **Fatal** error occurs (and the record is rejected) if:

- csv record does not have 103 or 104 fields per record
- No valid hospital code.
- No valid corresponding encryption key for hospital code.
- No Hospital Number (i.e. patient Case Record No.)

- No valid Procedure date / time. (This must be date AND time as it uniquely identifies the procedure). 00:00 will be rejected as a time value as it is used as a default for some units when no time has been entered
- Clinical syndrome (2.01) data is missing (i.e. this field must contain the data 'stable' or 'ACS'. Unknown or blank fields will cause the record to be rejected.)
- Date of Birth field is missing or not a valid date format.

1.3.1.2 Appropriate Procedure:

Each record must either be a PCI procedure (defined as number of lesions or vessels attempted is >0), or be a diagnostic angiogram during which either an intravascular ultrasound study or fractional flow reserve study was performed.

A **Fatal** error therefore also occurs (and the record is rejected) if all of the following are false (i.e. the record is accepted if any one of the following are true):

- Diagnostic device (3.19) is 1 (IVUS)
- Diagnostic device (3.19) is 2 (Pressure wire)
- Number of lesion attempted (3.11) is =>1
- Number of vessels attempted (3.10) is =>1

1.3.1.3 Inconsistent data:

A **Fatal** error also occurs (and the record is rejected) if:

- If Clinical Syndrome (2.01) is '1. Stable',
Then Indication for Intervention (2.02) cannot be 3,4,5,6,7,8,11 or 12.
- If Clinical Syndrome (2.01) is '1. Stable', and an Indication for Intervention (2.02) of 1, 2,9,10,98 or 99,
Then Procedure Urgency (2.03) must be '1. Elective.'
- If Clinical Syndrome is '2. Acute Coronary Syndrome',
Then Indication for Intervention (2.02) cannot be 1 or 2
- If Clinical Syndrome is '2. Acute Coronary Syndrome', and Indication is 3-99,
Then Procedure Urgency (2.03) cannot be '1. Elective.'
- If Indication for Intervention (2.02) is 4,5,6,7, 8 or 12
Then Procedure Urgency (2.03) must be 3 emergency or 4 Salvage

1.3.1.4 Timing errors:

A **Fatal** error also occurs (and the record is rejected) if:

- If Clinical Syndrome(2.01) is 2
Then reject record if 3.01 date/time of operation < date/time of arrival

Discharge date (4.04) cannot precede Date / Time of operation (3.01)

Rejection also occurs if the following date/time fields have a value but are not in a valid date and time format and is not after 01/01/1957:

- onset of symptoms (2.07)
- arrival first at hospital (2.08)
- procedure date time (3.01)
- first balloon date time (3.26)
- discharge date (4.04) [date only field]

Records passing all these requirements are imported.

1.3.2 Unique record identification

A unique record is defined by:

Hospital Site Identifier
Local Patient Record Number
Date and time of PCI procedure

If during the importing of a record, an existing record has identical values for these 3 fields, it will be assumed to be the same record, and any updated or modified fields will be overwritten in the existing record.

If no record is found with identical values in these 3 fields, then it will be assumed to be a new record, and will be imported as such.

Therefore, when updating an existing record to fill in missing fields or correct errors, BE CAREFUL if you modify data in these 3 key fields. If you do, then after uploading the new csv file, you will need to delete the first (and now duplicated) record from CCAD.

1.3.3 Data Quality

Records passing the above tests will be imported, but further checks on quality are performed, and warnings generated as follows:

1.3.3.1 Warnings (record saved)

Right most semi- colon is removed if present in a multi-value field item (PFL database). No warning logged. For all other poorly formatted multi-values, report as a warning, then fix formatting to “v1;v2;v3...n”

- Number of lesions attempted cannot be less than number of chronic occlusions attempted (including grafts)
- Number of lesions attempted cannot be less than number of restenoses attempted (including grafts)
- Number of lesions attempted cannot be less than number of InStent stenoses attempted (including grafts)
- Number of restenoses attempted (including grafts) cannot be less than number of InStent stenoses attempted (including grafts)
- Number of stents used (including grafts) cannot be less than number of drug eluting stents used (including grafts)
- Stent Drugs cannot just be '0. None' (single value) when the number of PCI eluting stents used is greater than zero [it can contain a 0 among other values]

- The Number of Lesions Successful (3.32) cannot be more than Number of Lesions Attempted (3.11)
- PCI Hospital Outcome (4.01) cannot be '6. (death)' if the Status at discharge (4.03) is '0. alive'.
- Arterial complications cannot be 'none' if PCI hospital outcome is '5. arterial complication'
- PCI hospital outcome cannot be 'none' if patient status during transfer to theatre is 'external massage', 'haemodynamically unstable' or 'haemodynamically stable'
- PCI Hospital Outcome must be 1 or 2 if Clinical syndrome = 1 and Enzyme postop =1 or 2 (elevated)

1.3.3.2 Minor errors (missing values)

Any value recorded as unknown or left blank is considered missing.

Firstly there are 7 (or 8 if no emCABG) fields that are exempt from all 3 sub data-sets. In addition, determining completeness is not as simple as determining the blank field count, then dividing this by total dataset count * 100. This is because patients will actually fall into one of three data subsets (i.e 1. Stable Patients, 2. Unstable Patients no STEMI, and 3. STEMI Patients), each of which can have a different number of fields that can be counted as legitimately "blank".

For example, if a patient is stable, a total of 10 fields are not required. Thus:

Items excluded from all data completeness calculations (7 or 8 if no emergency CABG)

- 2.20 LVEF
- 3.05 Operator2
- 3.06 Operator2Status
- 3.07 Operator3
- 3.08 Operator3Status
- 3.35 ProcedureComment
- 5.14 Research Id

Also

- Exclude 5.20 time to by-pass in data completeness calc if 5.21 patient status during transfer to theatre is 0

If stable, exclude

- 2.04 Shock
- 2.07 SymptomOnset
- 2.08 Date/Time arrival at First hospital (ACS only)
- 2.09 AdmRoute
- 2.10 PresentingECG

- 2.11 RecentLysis
- 2.12 EnzymesRaised
- 2.28 IRAFlowPreOp
- 3.26 IRAOpen
- 3.34 IRAFlowPostOp
- 5.26 Date/Time arrival at PCI hospital (ACS only)

If Unstable patient NO STEMI, exclude

- 2.05 AnginaClass
- 2.06 NYHAScore
- 2.28 IRAFlowPreOp
- 3.26 IRAOpen
- 3.34 IRAFlowPostOp
- 4.02 PostOpEnzymes

If Unstable patient WITH STEMI exclude

- 2.05 AnginaClass
- 2.06 NYHAScore
- 4.02 PostOpEnzymes

1.3.3.3 Data Completeness of Key Fields

While the calculation above looks at the overall completeness of the record against the entire dataset, there are several key fields for which data completeness is extremely important. These are the fields involved with risk stratified outcome assessment. It is a priority that units have more than 90% data completeness for these fields which are:

- 1.06 Date of Birth
- 1.07 Sex
- 5.05 Medical History
- 2.04 Pre-procedure shock
- 2.03 Procedure urgency
- 3.09 Vessels treated
- 5.06 Renal disease
- 2.16 Diabetes
- 4.04 Discharge date
- 4.03 Discharge status
- 4.01 PCI hospital outcome
- 1.03 NHS number

2 Scottish data upload from Minerva

Scottish PCI records submitted to CCAD are sourced from the Scottish Cardiac Register and are submitted by the Co-ordinator, on behalf of the individual hospitals, in one file. A number of assumptions have been made which are critical in understanding the derivation of the data, and for the appropriate analysis of these data.

They are as follows:

2.1 Fields currently included in the Scottish return

1.01	Hospital Identifier
1.02	Local Patient Identifier (REP_MinervaID)
1.06	Birth Date
1.07	Sex
1.08	Patient Ethnic Group
2.01	Clinical Syndrome (PCI)
2.02	Indication for Intervention
2.03	Procedure Urgency
2.04	Cardiogenic shock (Pre-procedure)
2.05	CCS Angina Status (Pre-procedure; Stable only)
2.06	NYHA Dyspnoea Status (Pre-procedure; Stable only)
2.11	Recent Lysis (ACS only)
2.13	Previous MI
2.14	Previous CABG
2.15	Previous PCI
2.16	Diabetes
2.17	Height
2.18	Weight
2.19	LV Ejection Fraction Category
2.21	Number grafts present (Pre-operation)
2.22	Number grafts patent (Pre-operation)
3.01	Date and time of operation
3.09	Vessels attempted (CCAD territories)
3.10	Number of vessels attempted
3.11	Number of lesions attempted
3.12	Number of Chronic Occlusions attempted
3.13	Number Restenoses attempted
3.14	Number Instent stenoses attempted
3.15	Number Stents used
3.16	Number Drug-eluting stents used
3.17	Drug(s) eluted by stent(s)
3.18	GP IIb/IIIa drug(s) used during procedure
3.24	Circulatory support
3.25	Arterial management
3.32	Number Lesions Successful
4.01	PCI Hospital Outcome
4.03	Status at discharge

4.04	Discharge Date
5.01	Local Procedure Identifier
5.02	Cholesterol
5.03	Smoking status
5.04	Family history of CAD
5.05	Medical history
5.06	History of renal disease
5.07	Ventilated PreOp
5.09	ECG ischaemia
5.11	Follow on (Adhoc) procedure
5.15	Arterial access

2.2 Fields excluded from the Scottish return

1.03	NHS Number (under review regarding Data Protection compliance)
1.04	Patient Name (Surname)
1.05	Patient Name (Forename)
1.09	Administrative Category
1.10	Postcode Of Usual Address
2.07	Date/time of symptom onset (PCI; ACS only)
2.08	Date/Time arrival at hospital (ACS only)
2.09	Admission route (ACS only)
2.10	Presenting ECG (ACS only)
2.12	Cardiac Enzymes/Markers Raised
2.20	LV Ejection Fraction
2.23	Left Main Stem Stenosis (Pre-PCI)
2.24	LAD Proximal (Pre-PCI)
2.25	LAD Other Stenosis (Pre-PCI)
2.26	RCA Stenosis (Pre-PCI)
2.27	Cx Stenosis (Pre-PCI)
2.28	Flow in IRA PreOp (ACS only)
3.02	Consultant Responsible for Procedure (under review regarding Data Protection compliance)
3.03	Primary Operator
3.04	Primary Operator status
3.05	Second Operator
3.06	Second Operator status
3.07	Third Operator
3.08	Third Operator status
3.19	Diagnostic device(s) used during procedure
3.20	Procedural device(s) used
3.21	Athero-thrombus removal device(s) used
3.22	Brachytherapy device(s) used
3.23	Emboli protection device(s) used
3.26	Date/Time of first balloon inflation (PCI)
3.27	Left Main Stem Stenosis (Post PCI)
3.28	LAD Proximal Stenosis (Post PCI)
3.29	LAD Other Stenosis (Post PCI)
3.30	RCA Stenosis (PCI)

3.31	Cx Stenosis (PCI)
3.33	Number coronary grafts patent PostOp
3.34	Flow in IRA PostOp (ACS)
3.35	Operation report/comment
3.36	Device failure
4.02	Enzymes PostOp
5.08	Q Wave on ECG
5.10	Drug therapy PreOp
5.12	Training procedure
5.13	Research procedure
5.14	Research title
5.16	Largest balloon/stent used
5.17	Longest stented / treated segment
5.18	Procedural Complication
5.19	Arterial Complications
5.20	Time to bypass
5.21	Patient status during transfer to theatre
5.22	Why no Iib/IIIA during procedure
5.23	Indication for stent
5.24	Surgical cover
5.25	Left Main Stem Protected

This means that several of the validation checks for the English data will not apply to the Scottish upload, specifically here are the rules and the problem in purple below each:

A **Fatal** error therefore also occurs (and the record is rejected) if all of the following are false (i.e. the record is accepted if any one of the following are true):

- Diagnostic device (3.19) is 1 (IVUS)
- Diagnostic device (3.19) is 2 (Pressure wire)
- Number of lesion attempted (3.11) is =>1
- Number of vessels attempted (3.10) is =>1

The Scottish Register does not currently return values to field 3.19

2. If Clinical Syndrome(2.01) is 2

Then reject record if 3.01 date/time of operation < date/time of arrival

The Scottish Register does not currently return values to field 2.08

3. Rejection also occurs if the following date/time fields have a value but are not in a valid date and time format and is not after 01/01/1957:

- onset of symptoms (2.07)
- arrival first at hospital (2.08)
- procedure date time (3.01)
- first balloon date time (3.26)
- discharge date (4.04) [date only field]

The Scottish Register does not currently return values to fields 2.07, 2.08 or 3.26

4. **Warnings** (record saved)

Arterial complications cannot be 'none' if PCI hospital outcome is '5. arterial complication' **The Scottish Register does not currently return values to field 5.19**

In addition any measurements of data completeness will need to be defined differently.

2.3 Agreed data correlations

2.3.1 Indication for intervention – 2.02

Values not collected.

- 2. Stable – coronary /LV anatomy
- 10. Hybrid procedure
- 11. Acute or subacute PCI thrombosis

2.3.2 Procedure Urgency – 2.03

Values not collected.

- 4. Salvage

2.3.3 Recent Lysis (ACS only) – 2.11

“Required but contraindicated” coded to CCAD “0. No”

2.3.4 Patent Grafts – 2.22

Grafts will be considered 'patent' if not recording 'occluded' or 'sub-total occlusion'

2.3.5 PCI Hospital Outcome - 4.01

Complications directly collected (“Register text”)	
1. Q wave MI	12. Re-infarction (ACS only)
2. Non-Q wave MI	13. Blood transfusion (“Major bleed”)
3 Elective CABG	14. Renal failure/dialysis
4 Emergency CABG	15. GI bleed
5. Arterial complication (“Peripheral vessel”)	16. Tamponade
6. Death	17. Platelet transfusion
9. TIA/RIND	
10. Re-intervention PCI	“Unknown” is returned as Null
11. Re-cath (No PCI)	
Complication texts returned as “99.Unlisted”	
"CVA"	"Complete heart block"
"Abrupt closure"	"bradycardia"
"Re-Intervention PTCA - Different Lesion"	"Minor bleed"
"dissection"	"Anaphylactic"
"perforation"	"contrast allergy"
"Arrest -"	"Equipment lost in body"
"arrhythmia"	"Other - See comments"
Complications not specified	
7.CVA Embolic	8.CVA Bleed

2.3.6 History of renal disease – 5.06

Can not specify acute or chronic.

“4.Chronic renal failure” includes CAPD, Filtration and Haemodialysis

2.3.7 Medical history – 5.05

Values not collected

6. Valvular heart disease

7. Non coronary cardiac surgery

2.3.8 ECG ischaemia – 5.09

1. On resting ECG

"Yes - ECG - Changes at rest"

"Yes - ECG - Post MI"

2. On stress ECG

"Yes - ECG - Changes on Holter"

"Yes - ETT - Positive ECG"

"Yes - ETT - Positive symptoms"

"Yes - ETT - Positive symptoms and ECG change"

"Yes - Other"

3. On perfusion scan

"Yes - Echo - Positive stress echo"

"Yes - Nuclear - Positive perfusion scan"

"Yes - Nuclear - Positive wall motion study"