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## Australian and New Zealand Society of Cardiac and Thoracic Surgeons (ANZSCTS) Database Analysis Guide for Researchers

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This document gives an overview of the ANZSCTS Database variables and should be read before data analysis is undertaken.

Please note that all data that you receive from the ANZSCTS Database is strictly confidential. It is intended for authorised personnel only and is not to be re-distributed. Data is only to be used for the research purposes it was intended and approved (by the ANZSCTS Research Committee). If you wish to use the data for subsequent research projects, you will need to submit another request to the ANZSCTS Research Committee. Please refer to the *ANZSCTS Database Data Access Policy* (available at [anzscts.org/database/research/](https://anzscts.org/database/research/)) for further information regarding the use of research data.

### **Please note the following when writing your scripts:**

1. The codes used for the SPSS scripts are obtained from the data definitions manual (included in this package). Please ensure you refer to the data definitions manual when writing your scripts, and note that some variables may have changed over time (a document summarising the changes between the last two versions is also included with this information).
2. 'opno' is a filter that is used to omit double mortality (a patient with multiple procedures that has died) for 30 day / in hospital mortalities only. When writing your script include 'opno<9' to ensure that all double mortalities are omitted.
3. 'TP' is a variable that is not in the data definition manual, as it is calculated from other variables. 'TP' codes for the type of procedure:
  - TP = 1 is a code for isolated CABG procedures
  - TP = 2 is for isolated valve procedures
  - TP = 3 is a combination of CABG and valve procedures
  - TP = 4 is for other procedures not captured by the above groups
4. 'TP7' is another variable to code for the type of procedure. This variable codes for smaller more distinct groups:
  - TP7 = 1 is for isolated CABG procedures (matches TP=1)
  - TP7 = 2 is for isolated Aortic Valve Replacements (AVR)
  - TP7 = 3 is a combination of CABG with AVR only
  - TP7 = 4 is for isolated Mitral Valve repairs
  - TP7 = 5 is for isolated Mitral Valve replacements
  - TP7 = 6 is for Isolated other (tricuspid or pulmonary) valve

Note: The use of TP or TP7 will be at the discretion of the investigator. Please note, CABG and/or valve procedures with concomitant left atrial appendage (LAA=1), permanent left ventricular epicardial lead (PLVEL=1) and/or other (other=1) will still be coded as isolated CABG and/or valve procedures.

5. Stat>0 is used to ensure that all patients that are included in the analysis have been assigned a surgical status (i.e. elective, urgent, emergency or salvage). The ANZSCTS Database routinely excludes cases with no status entered from their analyses.
6. NewMort3 is an automated field that refers to whether a patient died within 30 days of the indexed procedure OR within hospital (both prior to and after 30 days). The fields used for this are Mort30 and Dischar.

NewMort3=1 when (mort30=1 or dischar=5)

## **Variables**

Your dataset has been customised to include the necessary variables for your analyses. In addition to the variables that are collected by the Database, these may include variables that are derived by the ANZSCTS Database Team after the datacut is taken and/or National Death Index (NDI) variables and require specific approval from the Research Committee. Please see below for a description of these additional variables.

If you have any questions about these variables, including how they are calculated, please contact the ANZSCTS Database Team via [anzscts@monash.edu](mailto:anzscts@monash.edu).

### ***Collected and automated ANZSCTS variables***

Please refer to Data Definitions v4 for a description of these variables. These variables are located at the start of the dataset. TP, opno and newmort3 (automated ANZSCTS Database variables) are described in detail above.

### ***Derived ANZSCTS variables***

There are ten variables that are derived using existing ANZSCTS Database variables, which are used for calculating our key performance indicators. These are defined as follows:

- Complete identifies if a case is considered complete by our web system.
- PreviousSurgery is used in our risk adjustment model, as the standalone previous cardiac surgery (PCS) variable was only introduced in 2016. It is derived from PCS (where available), POP, PCAB, POPCAB, PVAL, and PCOP according to a set of coding rules. Where the data is heavily inconsistent, PreviousSurgery = null.
  - PreviousSurgery = 1, patient has had previous surgery
  - PreviousSurgery = 0, patient has *not* had previous surgery
- DoublePreCR doubles the preoperative creatinine for each patient. It is used to code derived new renal insufficiency (NRF\_DD).
- NRF\_DD is our derived variable for new renal insufficiency, characterised by an increase in serum creatinine to >200 µmol/L post-operatively AND a doubling or greater increase in creatinine over the baseline pre-operative value AND the patient did not require pre-operative dialysis/haemofiltration; OR a new post-operative requirement for dialysis/haemofiltration.

Note, patients that receive pre-operative dialysis/haemofiltration are placed in the '0' category. Where any of the variables used to code NRF\_DD are missing, NRF\_DD = null.

- NRF\_DD = 1, patient has met the definition for new renal insufficiency
- NRF\_DD = 0, patient has *not* met the definition for new renal insufficiency
- dis\_dsi indicates whether a patient had a deep sternal wound infection (DSWI) prior to, or at the time of, discharge. Where any of the variables used to code dis\_dsi are missing, dis\_dsi = null.
  - dis\_dsi = 1, patient has DSWI recorded prior to discharge
  - dis\_dsi = 0, patient has *no* DSWI recorded prior to discharge
- new\_DSWI indicates whether a patient had a DSWI prior to, or at the time of, discharge and/or was readmitted to hospital within 30 days for DSWI. This is the variable the Database reports on for DSWI. Where any of the variables used to code dis\_dsi are missing, dis\_dsi = null.
  - new\_DSWI = 1, patient has DSWI recorded within 30 days of procedure
  - new\_DSWI = 0, patient has *no* DSWI recorded within 30 days of procedure
- MultiRisk is a risk score for 30-day mortality intended for use with the four major procedure types (see TP above). The manuscript detailing the model is:
 

Billah B, Reid CM, Shardey GC, Smith JA. A preoperative risk prediction model for 30-day mortality following cardiac surgery in an Australian cohort. Eur J Cardiothorac Surg. 2010 May;37(5):1086-92. doi: 10.1016/j.ejcts.2009.11.021. Epub 2010 Feb 8. PMID: 20117015.
- TotalScore is another way of calculating MultiRisk to present it as an additive score.
- AusScoreMultiRisk is a risk score for 30-day mortality intended for use with isolated CABG (TP7=1) cases only. The manuscript detailing this model is:
 

Reid C, Billah B, Dinh D, Smith J, Skillington P, Yii M, Seevanayagam S, Mohajeri M, Shardey G. An Australian risk prediction model for 30-day mortality after isolated coronary artery bypass: the AusSCORE. J Thorac Cardiovasc Surg. 2009 Oct;138(4):904-10. doi: 10.1016/j.jtcvs.2009.03.020. Epub 2009 May 31. PMID: 19660369.
- AusScoreTotalRisk is another way of calculating AusScoreMultiRisk to present it as an additive score.
- AusScore2MultiRisk is an updated version of AusScoreMultirisk and is a risk score for 30-day mortality intended for use with isolated CABG (TP=1) cases only. The manuscript detailing the model is:
 

Billah B, Huq MM, Smith JA, Sufi F, Tran L, Shardey GC, Reid CM. AusSCORE II in predicting 30-day mortality after isolated coronary artery bypass grafting in Australia and New Zealand. J Thorac Cardiovasc Surg. 2014 Nov;148(5):1850-1855.e2. doi: 10.1016/j.jtcvs.2014.02.027. Epub 2014 Feb 10. PMID: 24655903.
- Mort30DayISOCABG is the ANZSCORE risk score for 30-day mortality intended for use with isolated CABG (TP7=1). For more detail on this model please see Appendix A.
- DNRIISOCABG is the ANZSCORE risk score for derived new renal insufficiency (see NRF\_DD above) intended for use with isolated CABG (TP7=1). For more detail on this model please see Appendix A.
- Mort30DayISOAvr is a risk score for 30-day mortality intended for use with isolated AVR (TP7=2).

- DNRIISOAvr is the ANZSCORE risk score for derived new renal insufficiency (see NRF\_DD above) intended for use with isolated AVR (TP7=2).
- Mort30DayISOCabgPlusAvr is a risk score for 30-day mortality intended for use with CABG + AVR (TP7=3).
- DNRCabgPlusAVR is the ANZSCORE risk score for derived new renal insufficiency (see NRF\_DD above) intended for use with CABG+AVR (TP7=3).

### **Other derived variables prepared on special request**

Other variables that may have been included in your dataset upon special request are defined as follows:

- New\_HID is an anonymised code used to distinguish hospitals. Note, this code does not correspond to any code used to identify hospitals in any reports published by the Database.
- newsurg is an anonymised code used to distinguish surgeons. Note, any surgeons with 10 or fewer cases in the Database are assigned a code of 0. This applies to approximately 7% of the surgeons in the Database.
- Private identifies if a patient was admitted to a private or public hospital.
  - Private = 1, patient was admitted to a private hospital
  - Private = 0, patient was admitted to a public hospital
- HospState identifies what state the patient had their procedure in.
  - HospState = 1, Victoria (inc. Tasmania)
  - HospState = 2, NSW (inc. ACT)
  - HospState = 3, QLD
  - HospState = 4, SA
  - HospState = 5, WA

### **NDI variables**

- Accepted = 1, identifies that the record has been matched to the NDI and a death found.
- DEATH\_CODE, ICD10\* code for primary cause of death.
- DEATH\_CODE\_OTHER\_1-10, ICD10\* code for secondary causes of death.
- NDI\_Deathdate, date of death recorded by the NDI.
- Final\_Deathdate, this is a combination of the NDI\_Deathdate and the ANZSCTS Database's Mort\_D. Where a mortality is recorded in the ANZSCTS Database but not matched to an NDI record Final\_Deathdate=Mort\_D, otherwise Final\_Deathdate=NDI\_Deathdate.

\*The online version of the ICD10 can be found at: <http://www.who.int/classifications/icd/en/>.

### **Please read before undertaking analysis with NDI variables:**

The ANZSCTS Database conducted a linkage project with the Australian Institute of Health and Welfare's National Death Index (NDI) database using ANZSCTS Database records up until the end of

2018 (i.e. records with a date of procedure before or including the 31<sup>st</sup> December, 2018). ANZSCTS Database records with a date of procedure after the 31<sup>st</sup> December, 2018, do not currently have NDI information available in the research dataset. The censor date (date the linkage was run) was 1<sup>st</sup> August, 2019.

All ANZSCTS Database records with an NDI date of death ('NDI\_Deathdate') were deemed a suitable match with an NDI record. Cases with a weighting (a measure of the quality of the record linkage) above or below a certain threshold were automatically accepted or rejected, respectively, unless a warning flag was present. Cases with weightings in between the thresholds were manually reviewed. For further details about the clerical review procedure, please contact the Database.

The 'Final\_Deathdate' field includes merged data from the ANZSCTS Database (in-hospital and 30-day mortality data) and NDI date of death data. In some accepted cases, the NDI date of death differed from the ANZSCTS Database date of death. For these cases, the reported ANZSCTS Database date of death was selected and is used in the 'Final\_Deathdate' field. Records that were not sent to the NDI for linkage (i.e. records with a date of procedure on or after the 1<sup>st</sup> January, 2019) but have an ANZSCTS Database date of death recorded, have this value recorded in the 'Final\_Deathdate' field.

After the linkage process was completed, duplicate cases were reconciled to remove double mortalities.

**When conducting analyses DO NOT assume that cases with a date of procedure greater than the 31<sup>st</sup> December 2018 are still alive if no date of death is recorded.**

### **Changes in definitions**

In September of 2016 there was a notable change in the Data Definitions Manual and dataset from version 3 to version 4. This involved many updates to existing definitions as well as new additions. A summary of these changes can be found in another provided document:

- 170306 ANZSCTS Data Definitions Manual - Changes for 4 1.pdf.

When conducting analyses please note that this change in definitions is demarcated by Date of Admission (DOA):

- Where DOA < 01/09/2016, version 3 of the definitions apply
- Where DOA ≥ 01/09/2016, version 4 of the definitions apply

The following exceptions apply:

- Four units submitted data in line with version 4 of the definitions for all of 2016.
- One unit submitted data in line with version 3 of the definitions for all of 2016.

The change in definitions and timing of their implementation may impact your analysis plan. If you require assistance with setting your filters to ensure you capture the cases and period of interest for your study, or have any other questions, please contact the Data Management and Analysis Centre.

**Contact Information:**

Data coding and analysis queries: [anzscts@monash.edu](mailto:anzscts@monash.edu)

Research approvals and project amendments: [Lavinia.Tran@monash.edu](mailto:Lavinia.Tran@monash.edu) or [Jenni.Williams-Spence@monash.edu](mailto:Jenni.Williams-Spence@monash.edu)

## Appendix A- ANZSCORE OM and dNRI Models for isolated CABG Patients

The final ANZSCORE (OM; isolated CABG) model contains 20 variables. The model discrimination measured by the AUC (area under the receiver operating characteristic [ROC] curve) was 0.8235, indicating excellent discrimination. When validated on separate Australian and New Zealand data, the model also performs well.

The final ANZSCORE (dNRI; isolated CABG) model contains 21 individual variables. The model discrimination measured by the AUC (area under the ROC curve) was 0.7278, indicating that the model had acceptable discrimination.

**Table A: Variables that define risk in the ANZSCORE isolated CABG models**

ANZSCORE (RA-OM, isolated CABG) model variables	ANZSCORE (dNRI; isolated CABG) model variables
<i>Age<sup>^</sup></i>	<i>Age<sup>^</sup></i>
<i>Timing of previous myocardial infarction</i>	<i>Previous myocardial infarction</i>
<i>Clinical status</i>	<i>Clinical status</i>
<i>Estimated glomerular filtration rate<sup>^</sup></i>	<i>Estimated glomerular filtration rate<sup>^</sup></i>
<i>NYHA* class</i>	<i>NYHA* class</i>
<i>Medicare</i>	<i>Medicare</i>
<i>Cerebrovascular disease</i>	<i>Cerebrovascular disease</i>
<i>Previous surgery</i>	<i>Previous surgery with cardiopulmonary bypass</i>
<i>Ejection fraction grade</i>	<i>Ejection fraction grade</i>
<i>Direct transfer from catheter lab/ICU to theatre</i>	<i>Direct transfer from catheter lab/ICU to theatre</i>
<i>Cardiogenic shock at the time of procedure</i>	<i>Cardiogenic shock at the time of procedure</i>
<i>IV nitrates at time of surgery</i>	<i>IV nitrates at time of surgery</i>
<i>Peripheral vascular disease</i>	<i>Peripheral vascular disease</i>
<i>Race</i>	<i>Number of diseased vessels</i>
<i>Pre-operative dialysis</i>	<i>Body mass index<sup>^</sup></i>
<i>Resuscitation within 1 hour prior to operation</i>	<i>Hypertension</i>
<i>Lung disease</i>	<i>Permanent pacemaker in situ</i>
<i>Pre-operative arrhythmia</i>	<i>History of diabetes</i>
<i>Left main disease</i>	<i>Congestive heart failure at the current admission</i>
<i>Inotropes at time of surgery</i>	<i>Sex</i>
	<i>Previous catheterisation</i>

\*New York Heart Association

<sup>^</sup>data for continuous variables has an upper limit, any data that exceeds this upper limit for a case will not generate a risk score for that patient – the upper limits for age, eGFR and BMI are 130, 200mL/min/1.73m<sup>2</sup> and 60kg/m<sup>2</sup> respectively