Enhancing Hospital Outcomes
National Minimum Data Set
Filtering Documentation

Summer Studentship
with
COMPASS Research Centre

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This report contains computer code used to filter and prepare data sets and other resources obtained from the Ministry of Health. The availability of this information allows users of these data to save considerable resources by not having to replicate data manipulation work that has already been undertaken elsewhere.

The Ministry of Health (MoH) maintains hospital discharge data through a large database called the National Minimum Dataset (NMDS). Before performing the required analyses, the MoH carries out a number of steps in order to filter the data and achieve this ability to make valid comparisons across different data collections. The process is described in the following sections and SAS code detailing each step is included.

Introduction

Patient hospitalisation data is collected continuously over time through individual facility databases. Each time a patient has an event that requires medical care within a hospital, the details involved in the treatment are recorded and entered into a large database that is managed by the medical facility. This type of facility can range from a public hospital to the local cancer registry, a Kaupapa Māori Service to a drug and alcohol treatment service. All of these various services have slightly different methods of maintaining patient data. It is these differences and those that occur over time (an example being as disease coding changes from ICD9 to ICD10) that lead to inconsistencies between changing years of data collection. For example, in 1981, women who had given birth but did not require any medical or surgical procedure were included in the total number of discharges. This addition caused a sudden increase in the number of female hospitalisation cases which made the data inconsistent to directly compare to previous years where women giving birth were not included in discharge data. By filtering out these observations from the data set we can more reliably compare between different years and different medical providers or DHBs.

The Ministry of Health (MoH) maintains this hospital discharge data through a large data set called the National Minimum Dataset (NMDS). Before performing the required analyses, the MoH carries out the following steps in order to filter the data and achieve this ability to make valid comparisons across different data collections.

Project Summary

The main objective of this project was to ascertain whether increased investment in the health sector had produced meaningful results as measured by throughput, output and quality of care. The project assessed throughput, output and quality by analysing hospital data 2001–2009 from the NMDS, mortality data from the mortality collection, and emergency department / outpatient data from the National Non-Admitted Patient Collection (NNPAC). The study will influence health outcomes both directly – through the potential for the improvement of the quality of care – and indirectly – through contributing hard evidence on the productivity and effectiveness of investment in hospital and related services.

Description of the Data Sets

Data sets received from the Ministry of Health in 2010 came in several components, therefore prior to performing any filtering, they required slight alteration and merging into a single data set. Information regarding the variable names of the NMDS came from a data dictionary on the Ministry of Health website.

Data sets received

Purchase units:

- Jan 2001 to June 2001 (pus6617)
- July 2001 to June 2004 (pus6314_jul01_to_jun04)
- July 2004 to June 2007 (pus6314_jul04_to_jun07)
- July 2007 to June 2009 (pus6314_jul07_to_jun09)
- July 2009 to Dec 2009 (pus6617_2).

Diagnoses and procedures:

- ICD-9-CM-A
- ICD-10-AM 1st Edition
- ICD-10-AM 2nd Edition
- ICD-10-AM 3rd Edition
- ICD-10-AM 6th Edition.

Deprivation codes:

- NZDep96 for events before 1 July 2003
- NZDep01 for events 1 July 2003 to 30 June 2008
- NZDep06 for events after 30 June 2008.

Diagnostic Related Group codes:

- Clinical Version 3.1 (Drg_31)
- Clinical Version 4.2 (Drg_42)
- Clinical Version 5.0 (Drg_50).

ICD-10 operation codes (ICD10_blocks).

Mortality data January 2001 to December 2007 (Mos2709).

SAS code was written to combine the data sets into a form ready to be filtered and then analysed:

```
*Combine received data sets and preparing for filtering;

*Combine different Purchase Units;
data allpus;
set original.pus6617 original.pus6314_jul01_to_jun04 original.pus6314_jul04_to_jun07
original.pus6314_jul07_to_jun09 original.pus6617_2;

if fac_type = '01'; *public hospitals;

*Clinical codes used to classify the principal diagnosis / description of a condition;
diag1_06 = principal_diag_06_clin_code;
diag1_10 = principal_diag_10_clin_code;
diag1_11 = principal_diag_11_clin_code;

*Set up for ICD recoding. Not all ICD versions were included for all years in the
data set. Investigation across all years showed that for consistency we would need
to import ICD10-AM 1st Edition codes from the ICD data sets;
drop diag01-diag20 op01-op20 ecode01-ecode10;

*The data set for the first half of 2001 contained only version 3.1 DRG codes; the
drg_current variable tracked the appropriate version across years;
if drg_current = '' then drg_current = drg_31;
run;
```

```
*Add in everything from external files;
*Set up full diagnosis data for ICD10-AM 1st edition;
data allicd;
set original.allicddiagpros_10_01 original.allicddiagpros_10
original.allicddiagpros_10_09;
run;

*Extract only events with a 'principal' ('A') or 'other type' ('B') of diagnosis;
proc sort data = allicd out = diagnoses;
where diag_typ in ('A','B');
by event_id diag_seq;

*Create new data set called diags that contains all diagnostic codes for each event;
data diags;
length diag1-diag20 $8;
array diagvar[20] diag1-diag20;
do i = 1 to 20 until (last.event_id);
set diagnoses;
by event_id;
diagvar[i] = clin_code;
end;
drop i clin_sys clin_code diag_typ diag_seq sub_sys acdte;
run;

*Merge events and diagnoses; keep only the first diagnosis per event (of up to 20);
proc sort data = events diags;
by event_id;

data events;
merge events diags;
by event_id;
if first.event_id;
run;

*Re-format diagnoses to save disc space; remove rows with no encrypted NHI number;
data events;
length diag1-diag20 $5;
format diag1-diag20 $5.;
informat diag1-diag20 $5.;
set events;
where enc_mast_hcu ne '';
run;

*Set up full operation data for ICD10-AM 1st edition;
proc sort data = allicd out = operations;
where diag_typ = 'O';
by event_id diag_seq;

*Create a new data set called ops which contains all operation codes for each event;
data ops;
length op1-op20 $8;
array opvar[20] op1-op20;
do i = 1 to 20 until (last.event_id);
set operations;
by event_id;
opvar[i] = clin_code;
end;
drop i clin_sys clin_code diag_typ diag_seq sub_sys acdte;
run;
```

```
*Merge events and operations; keep only the first operation per event (of up to 20);
data events;
merge events ops;
by event_id;
if first.event_id;
run;

*Remove empty encrypted NHI observations;
data events;
set events;
where enc_mast_hcu ne '';
run;

*Set up full external causes data for ICD10-AM 1st edition;
proc sort data = allicd out = externals;
where diag_typ = 'E';
by event_id diag_seq;

*Prepare to merge mortality data with the current working set;
proc sort data = mortality;
by enc_mast_hcu;

proc sort data = events;
by enc_mast_hcu;

*Merge events with mortality data using encrypted NHI as the unique identifier;
data events;
merge events mortality (drop = event_enc country_code age_yrs ethnicg1 ethnicg2
ethnicg3 sex domicile_code yrs_in_nz dob ethnicgp dhbdom tladom facility);
by enc_mast_hcu;
run;

*Remove all empty event IDs;
data events;
set events;
where event_id ne .;
run;

*Set up medical/surgical/other partition variable for DRGs;
proc sort data = events;
by drg_current;

*Create a new data set for DRGs using the AN-DRG version 3.1;
data events_311;
set events;
where drg_grouper_type = '02';
run;

*Merge the newly created data set with the DRGs 3.1 data set;
data events_312;
merge events_311 original.drg_31;
by drg_current;
if enc_mast_hcu = '' then delete;
run;
```

```
*Create a new data set for DRGs using the AN-DRG version 4.1 & 4.2;
data events_421;
set events;
where drg_grouper_type in ('03','04');
run;

*Merge the newly created data set with the DRGs 4.1 & 4.2 data set;
data events_422;
merge events_421 original.drg_42;
by drg_current;
if enc_mast_hcu = '' then delete;
run;

*Create a new data set for DRGs using the AN-DRG version 5.0;
data events_501;
set events;
where drg_grouper_type = '05';
run;

*Merge the newly created data set with the DRGs 5.0 data set;
data events_502;
merge events_501 original.drg_50;
by drg_current;
if enc_mast_hcu = '' then delete;
run;

*Combine all newly created DRG inclusive event data sets;
data events;
set events_312 events_422 events_502;
run;

*Sort the newly modified data set;
proc sort data = events;
by event_id;
run;

*Domicile mapping implementation;

*Use data dictionary suggested date cutoffs for each version;
proc sort data = original.dom out = dep96;
by dom96;

*Determine whether the event end date falls within the 1996 domicile code version;
proc sort data = events out = events_dom961;
where evendate <= 15886;

*Match the domicile codes with the events that occurred before the 1996 code cutoff
(which occurred in 30/06/2003) by renaming the variables concerned so they match;
data mortality;
set original.mos2709;
rename mast_enc = enc_mast_hcu;
run;

*Merge the 1996 domicile codes with those events that occurred before the cutoff;
data events_dom962;
merge events_dom961 dep96 (rename = (dom96 = dom_cd dep96 = dep_cd));
by dom_cd;
run;
```

```
*Reformat to save disc space;
data events_dom962;
length dep_cd $2;
format dep_cd $2.;
informat dep_cd $2.;
label dom_cd = 'dom_cd' dep_cd = 'dep_cd' rural = 'rural';
length rural $1;
format rural $1.;
informat rural $1.;
set events_dom962;
where evendate ne .;
run;

*Sort data to determine when to use the 2001 domicile codes;
proc sort data = events_dom962;
by event_id;

*Access the first event;
data events_dom962;
set events_dom962;
by event_id;
if first.event_id;
drop dom01 dom06 dep01 dep06;
run;

*Access and sort the 2001 domicile codes;
proc sort data = original.dom out = dep01;
by dom01;

*Determine whether the event end date falls within the 2001 domicile code version;
proc sort data = events out = events_dom011;
where evendate > 15886 and evendate <= 17713;
by dom_cd;
run;

*Merge the 2001 domicile codes with the events that occurred before the cutoff;
data events_dom012;
merge events_dom011 dep01 (rename = (dom01 = dom_cd dep01 = dep_cd));
by dom_cd;
run;

*Reformat variables;
data events_dom012;
length dep_cd $2;
format dep_cd $2.;
informat dep_cd $2.;
label dom_cd = 'dom_cd' dep_cd = 'dep_cd' rural = 'rural';
length rural $1;
format rural $1.;
informat rural $1.;
set events_dom012;
where evendate ne .;
run;

*Sort the data to determine when to use the 2006 domicile codes;
proc sort data = events_dom012;
by event_id;
```

```
*Access the first event;
data events_dom012;
set events_dom012;
by event_id;
if first.event_id;
drop dom96 dom06 dep96 dep06;
run;

*Access and sorting the 2006 domicile codes;
proc sort data = original.dom out = dep06;
by dom06;

*Establish whether the event date falls within the 2006 domicile coding version;
proc sort data = events out = events_dom061;
where evendate > 17713;
by dom_cd;

*Merge the 2006 codes with the events that occurred before the cutoff;
data events_dom062;
merge events_dom061 dep06 (rename = (dom06 = dom_cd dep06 = dep_cd));
by dom_cd;
run;

*Reformat variables;
data events_dom062;
length dep_cd $2;
format dep_cd $2.;
informat dep_cd $2.;
label dom_cd = 'dom_cd' dep_cd = 'dep_cd' rural = 'rural';
length rural $1;
format rural $1.;
informat rural $1.;
set events_dom062;
where evendate ne .;
run;

*Create final data set ready for filtering;
data events;
set events_dom962 events_dom012 events_dom062;
run;
```

Ministry of Health Filtering Steps

The following criteria were described by the Ministry of Health to establish appropriate filtering for their hospital discharge data. They appeared in the "Hospital Throughput" reports, and the 2003/04 edition is still available at https://www.health.govt.nz/publication/ministry-healths-hospital-throughput-2003-2004-report. We implemented these in SAS as follows.

Step 1 – Removing Non-Treated Patients

Non-treated patients include boarders and cancelled operations.

Boarders are defined as those that stay in hospital but do not require medical treatment, usually a support person for another patient in the facility. They are identified by primary diagnosis codes: V650 (ICD9) or Z763, Z764 (ICD10).

Cancelled operations are identified by blank primary operation codes for non-acute (not type 'AC' or 'ZC') events with length of stay <2 days, and where at least one of the first six diagnosis codes is: V64 (ICD9) or Z530, Z531, Z532, Z538, Z539 (ICD10).

```
*Create final data set ready for filtering;
data events;
set events_dom962 events_dom012 events_dom062;
run;'dep_cd' 15886

data events;
set events;
if diag1 in ('Z763','Z764') then moh_nontreated = '1';
else if op1 = '' and adm_type not in ('AC','ZC') and los < 2
and (diag1 in ('Z530','Z531','Z532','Z538','Z539')
or diag2 in ('Z530','Z531','Z532','Z538','Z539')
or diag3 in ('Z530','Z531','Z532','Z538','Z539')
or diag4 in ('Z530','Z531','Z532','Z538','Z539')
or diag5 in ('Z530','Z531','Z532','Z538','Z539')
or diag6 in ('Z530','Z531','Z532','Z538','Z539')) then moh_nontreated = '1';
else moh_nontreated = '0';
run;
```

Step 2 – Removing Error DRGs

Diagnosis Related Groups (DRGs) relate the patients treated to the resources required by the medical facility. They were developed by the Department of Health and Ageing of the Clinical Casemix Committee of Australia, Clinical Classification and Coding Groups, the University of Wollongong, State and Territory Health Authorities and other organisations. Error DRGs that need to be excluded are: 951, 952, 955, 956 (DRG3) and 960Z, 961Z, 962Z, 963Z (DRG4).

```
data events;
set events;
if drg_31 in ('951','952','955','956') or drg_current in ('960Z','961Z','962Z','963Z')
then moh_errordrg = '1';
else moh_errordrg = '0';
run;
```

Step 3 – Removing Renal Dialysis units

DRGs related to renal dialysis need to be excluded: 572 (DRG3) and LK1Z, L61Y (DRG4).

```
data events;
set events;
if drg_current in ('L61Y','L61Z') then moh_renaldialysis = '1';
else moh_renaldialysis = '0';
run;
```

Step 4 – Removing Same Day Chemotherapy and Radiotherapy units

Day visits for chemotherapy and radiotherapy are removed. These are where the admission and discharge dates are the same, and either the first or second diagnosis code is: V580, V581 (ICD9) or Z510, Z511, Z512 (ICD10).

```
data events;
set events;
if los = 0 and diag1 in ('Z510','Z511','Z512') or diag2 in ('Z510','Z511','Z512')
then moh_sdchemo = '1';
else moh_sdchemo = '0';
run;
```

Step 5 – Removing Sleep Apnoea units

Events representing overnight stays with sleep apnoea are removed. These are where the difference between admission and discharge dates is less than 2 days, and the DRG code is: 174, 175 (DRG3) or E63Z (DRG4).

```
data events;
set events;
if los < 2 and drg_current in ('174','175','E63Z') then moh_sleepapnoea = '1';
else moh_sleepapnoea = '0';
run;
```

Step 6 – Removing Lithotripsy units

Some same day events with lithotripsy are excluded. These are where non-acute events have admission and discharge dates the same, and:

1. The first procedure code is: 9851 (ICD9) or 3654600 (ICD10);
2. The second procedure code is: 9851 (ICD9) or 3654600, 9250202, 9250300 (ICD10) or blank;
3. The third procedure code is: 9250202, 9250300 (ICD10) or blank.

```
data events;
set events;
if los = 0 and adm_type not in ('AC','ZC') and op1 = '3654600'
and op2 in ('3654600','9250202','9250300','') and op3 in ('9250202','9250300','')
then moh_lithotripsy = '1';
else moh_lithotripsy = '0';
run;
```

Step 7 – Removing Colposcopy units

Some same day colposcopy events are excluded. These are where non-acute events have admission and discharge dates the same, and:

1. The first procedure code is: 6711, 6712, 6713, 6719, 6732, 6733, 6734, 6735, 6736, 6737, 6738, 6739, 6815, 7021, 7022, 7023, 7024, 7025, 7026, 7027, 7028, 7029 (ICD9) or 3553902, 3553903, 3553904, 3560800, 3560801, 3560802, 3561100, 3561400, 3563705, 3564600, 3564700.
2. The second procedure code is: 6711, 6712, 6713, 6719, 6732, 6733, 6734, 6735, 6736, 6737, 6738, 6739, 6815, 7021, 7022, 7023, 7024, 7025, 7026, 7027, 7028, 7029 (ICD9) or 3553902, 3553903, 3553904, 3560800, 3560801, 3560802, 3561100, 3561400, 3563705, 3564600, 3564700, 9250202, 9250300 (ICD10) or blank.
3. The third procedure code is: 9250202, 9250300 (ICD10) or blank.

```
data events;
set events;
if los = 0 and adm_type not in ('AC','ZC') and op1 in ('3553902','3553903','3553904',
'3560800','3560801','3560802','3561100','3561400','3563705','3564600','3564700')
and op2 in ('3553902','3553903','3553904','3560800','3560801','3560802','3561100',
'3561400','3563705','3564600','3564700','9250202','9250300','')
and op3 in ('9250202', '9250300','') then moh_colposcopy = '1';
else moh_colposcopy = '0';
run;
```

Step 8 – Removing Cystoscopy units

Some same day cystoscopy events are excluded. These are where non-acute events for patients aged 15 or over have admission and discharge dates the same, and:

1. The first procedure code is: 5731, 5732, 5733, 5749, 5822, 5831 (ICD9) or 3681200, 3681201, 3681501, 3682700, 3683600, 3683900, 3683902, 3683904, 3684500, 3684501, 3684502, 3684503, 3684504, 3684505, 3731500, 3731801 (ICD10);
2. The second procedure code is: 5731, 5732, 5733, 5749, 5822, 5831 (ICD9) or 3681200, 3681201, 3681501, 3682700, 3683600, 3683900, 3683902, 3683904, 3684500, 3684501, 3684502, 3684503, 3684504, 3684505, 3731500, 3731801, 9250202, 9250300 (ICD10) or blank;
3. The third procedure code is: 9250202, 9250300 (ICD10) or blank.

```
data events;
set events;
if los = 0 and adm_type not in ('AC','ZC') and age_dsch > 15
and op1 in ('3681200','3681201','3681501','3682700','3683600','3683900','3683902',
'3683904','3684500','3684501','3684502','3684503','3684504','3684505','3731500','3731801')
and op2 in ('3681200','3681201','3681501','3682700','3683600','3683900','3683902',
'3683904','3684500','3684501','3684502','3684503','3684504','3684505','3731500',
'3731801','9250202','9250300','') and op3 in ('9250202', '9250300','')
then moh_cystoscopy = '1';
else moh_cystoscopy = '0';
run;
```

Step 9 – Removing Endoscopic Retrograde Cholangio Pancreatography (ERCP) units

Some same day ERCP events are excluded. These are where non-acute events for patients aged 15 or over have admission and discharge dates the same, and:

1. The first procedure code is: 5110, 5111, 5114, 5115, 5164, 5184, 5185, 5186, 5187, 5188, 5213, 5214, 5221, 5293, 5294, 5297, 5298, 9705 (ICD9) or 3044200, 3045100, 3045200, 3045201, 3045202, 3048400, 3048401, 3048402, 3048500, 3048501, 3049100, 3049101, 3049400;
2. The second procedure code is: 4223, 4224, 4233, 4234, 4341, 4413, 4414, 4419, 4422, 4443, 4445, 4512, 4513, 4514, 4516, 4519, 4522, 4523, 4524, 4525, 4528, 4530, 4542, 4543, 4685, 4823, 4824, 4829, 4831, 4832, 4833, 4834, 4835, 5110, 5111, 5114, 5115, 5164, 5184, 5185, 5186, 5187, 5188, 5213, 5214, 5221, 5293, 5294, 5297, 5298, 9705, 9802 (ICD9) or 3044200, 3045100, 3045200, 3045201, 3045202, 3047300, 3047301, 3047303, 3047304, 3047500, 3047501, 3047600, 3047601, 3047602, 3047603, 3047801, 3047802, 3047803, 3047804, 3047806, 3047807, 3047809, 3047810, 3047811, 3047812, 3047813, 3047900, 3048400, 3048401, 3048402, 3048500, 3048501, 3049100, 3049101, 3049400, 3207200, 3207201, 3207500, 3207501, 3207800, 3208100, 3208400, 3208401, 3208700, 3209000, 3209001, 3209300, 3209400, 3209500, 3209900, 3210500, 3210800, 4181600, 4182200, 4182500, 9030800, 9031200, 9031201, 9034100, 9250202, 9250300 (ICD10) or blank;
3. The third procedure code is: 9250202, 9250300 (ICD10) or blank.

```
data events;
set events;
if los = 0 and adm_type not in ('AC','ZC') and age_dsch > 15
and op1 in ('3044200','3045100','3045200','3045201','3045202','3048400','3048401',
'3048402','3048500','3048501','3049100','3049101','3049400')
and op2 in ('3044200','3045100','3045200','3045201','3045202','3047300','3047301',
'3047303','3047304','3047500','3047501','3047600','3047601','3047602','3047603',
'3047801','3047802','3047803','3047804','3047806','3047807','3047809','3047810',
'3047811','3047812','3047813','3047900','3048400','3048401','3048402','3048500',
'3048501','3049100','3049101','3049400','3207200','3207201','3207500','3207501',
'3207800','3208100','3208400','3208401','3208700','3209000','3209001','3209300',
'3209400','3209500','3209900','3210500','3210800','4181600','4182200','4182500',
'9030800','9031200','9031201','9034100','9250202','9250300','')
and op3 in ('9250202', '9250300','') then moh_ercp = '1';
else moh_ercp = '0';
run;
```

Step 10 – Removing Colonoscopy units

Some same day colonoscopy events are exclude. These are where non-acute events for patients aged 15 or over have admission and discharge dates the same, and:

1. The first procedure code is: 4522, 4523, 4524, 4525, 4528, 4542, 4543, 4685, 4823, 4824, 4829, 4831, 4832, 4833, 4834, 4835 (ICD9) or 3207200, 3207201, 3207500, 3207501, 3207800, 3208100, 3208400, 3208401, 3208700, 3209000, 3209001, 3209300, 3209400, 3209900, 3210500, 3210800, 9030800, 9031200, 9031201, 9034100 (ICD10);
2. The second procedure code is: 4223, 4224, 4233, 4234, 4341, 4413, 4414, 4419, 4422, 4443, 4445, 4512, 4513, 4514, 4516, 4519, 4522, 4523, 4524, 4525, 4528, 4530, 4542, 4543, 4685, 4823, 4824, 4829, 4831, 4832, 4833, 4834, 4835, 5110, 5111, 5114, 5115, 5164, 5184, 5185, 5186, 5187, 5188, 5213, 5214, 5221, 5293, 5294, 5297, 5298, 9705, 9802 (ICD9) or 3044200, 3045100, 3045200, 3045201, 3045202, 3047300, 3047301, 3047303, 3047304, 3047500, 3047501, 3047600, 3047601, 3047602, 3047603, 3047801, 3047802, 3047803, 3047804, 3047806, 3047807, 3047809, 3047810, 3047811, 3047812, 3047813, 3047900, 3048400, 3048401, 3048402, 3048500, 3048501, 3049100, 3049101, 3049400, 3207200, 3207201, 3207500, 3207501, 3207800, 3208100, 3208400, 3208401, 3208700, 3209000, 3209001, 3209300, 3209400, 3209500, 3209900, 3210500, 3210800, 4181600, 4182200, 4182500, 9030800, 9031200, 9031201, 9034100, 9250202, 9250300 (ICD10) or blank;
3. The third procedure code is: 9250202, 9250300 (ICD10) or blank.

```
data events;
set events;
if los = 0 and adm_type not in ('AC','ZC') and age_dsch > 15
and op1 in ('3207200','3207201','3207500','3207501','3207800','3208100','3208400',
'3208401','3208700','3209000','3209001','3209300','3209400','3209900','3210500',
'3210800','9030800','9031200','9031201','9034100')
and op2 in ('3044200','3045100','3045200','3045201','3045202','3047300','3047301',
'3047303','3047304','3047500','3047501','3047600','3047601','3047602','3047603',
'3047801','3047802','3047803','3047804','3047806','3047807','3047809','3047810',
'3047811','3047812','3047813','3047900','3048400','3048401','3048402','3048500',
'3048501','3049100','3049101','3049400','3207200','3207201','3207500','3207501',
'3207800','3208100','3208400','3208401','3208700','3209000','3209001','3209300',
'3209400','3209500','3209900','3210500','3210800','4181600','4182200','4182500',
'9030800','9031200','9031201','9034100','9250202','9250300','')
and op3 in ('9250202', '9250300','') then moh_colonoscopy = '1';
else moh_colonoscopy = '0';
run;
```

Step 11 – Removing Gastroscopy units

Some same day gastroscopy events are excluded. These are where non-acute events for patients aged 15 or over have admission and discharge dates the same, and:

1. The first procedure code is: 4223, 4224, 4233, 4234, 4341, 4413, 4414, 4419, 4422, 4443, 4445, 4512, 4513, 4514, 4516, 4519, 4530, 9802 (ICD9) or 3047300, 3047301, 3047303, 3047304, 3047500, 3047501, 3047600, 3047601, 3047602, 3047603, 3047801, 3047802, 3047803, 3047804, 3047806, 3047807, 3047809, 3047810, 3047811, 3047812, 3047813, 3047900, 3209500, 4181600, 4182200, 4182500 (ICD10);
2. The second procedure code is: 4223, 4224, 4233, 4234, 4341, 4413, 4414, 4419, 4422, 4443, 4445, 4512, 4513, 4514, 4516, 4519, 4522, 4523, 4524, 4525, 4528, 4530, 4542, 4543, 4685, 4823, 4824, 4829, 4831, 4832, 4833, 4834, 4835, 5110, 5111, 5114, 5115, 5164, 5184, 5185, 5186, 5187, 5188, 5213, 5214, 5221, 5293, 5294, 5297, 5298, 9705, 9802 (ICD9) or 3044200, 3045100, 3045200, 3045201, 3045202, 3047300, 3047301, 3047303, 3047304, 3047500, 3047501, 3047600, 3047601, 3047602, 3047603, 3047801, 3047802, 3047803, 3047804, 3047806, 3047807, 3047809, 3047810, 3047811, 3047812, 3047813, 3047900, 3048400, 3048401, 3048402, 3048500, 3048501, 3049100, 3049101, 3049400, 3207200, 3207201, 3207500, 3207501, 3207800, 3208100, 3208400, 3208401, 3208700, 3209000, 3209001, 3209300, 3209400, 3209500, 3209900, 3210500, 3210800, 4181600, 4182200, 4182500, 9030800, 9031200, 9031201, 9034100, 9250202, 9250300 (ICD10) or blank;
3. The third procedure code is: 9250202, 9250300 (ICD10) or blank.

```
data events;
set events;
if los = 0 and adm_type not in ('AC','ZC') and age_dsch > 15
and op1 in ('3047300','3047301','3047303','3047304','3047500','3047501','3047600',
'3047601','3047602','3047603','3047801','3047802','3047803','3047084','3047806',
'3047807','3047809','3047810','3047811','3047812','3047813','3047900','3209500',
'4181600','4182200','4182500')
and op2 in ('3044200','3045100','3045200','3045201','3045202','3047300','3047301',
'3047303','3047304','3047500','3047501','3047600','3047601','3047602','3047603',
'3047801','3047802','3047803','3047804','3047806','3047807','3047809','3047810',
'3047811','3047812','3047813','3047900','3048400','3048401','3048402','3048500',
'3048501','3049100','3049101','3049400','3207200','3207201','3207500','3207501',
'3207800','3208100','3208400','3208401','3208700','3209000','3209001','3209300',
'3209400','3209500','3209900','3210500','3210800','4181600','4182200','4182500',
'9030800','9031200','9031201','9034100','9250202','9250300','')
and op3 in ('9250202', '9250300','') then moh_gastroscopy = '1';
else moh_gastroscopy = '0';
run;
```

Step 12 – Removing Bronchoscopy units

Some same day bronchoscopy events are excluded. These are where non-acute events for patients aged 15 or over have admission and discharge dates the same, and:

1. The first procedure code is: 3141, 3142, 3143, 3144, 3321, 3322, 3323, 3324 (ICD9) or 4176403, 4176404, 4184600, 4184900, 4185500, 4188900, 4188901, 4189200, 4189500, 4189800, 4189801 (ICD10);
2. The second procedure code is: 3141, 3142, 3143, 3144, 3321, 3322, 3323, 3324 (ICD9) or 4176403, 4176404, 4184600, 4184900, 4185500, 4188900, 4188901, 4189200, 4189500, 4189800, 4189801, 9250202, 9250300 (ICD10) or blank;
3. The third procedure code is: 9250202, 9250300 (ICD10) or blank.

```
data events;
set events;
if los = 0 and adm_type not in ('AC','ZC') and age_dsch > 15
and op1 in ('4176403','4176404','4184600','4184900','4185500','4188900','4188901',
'4189200','4189500','4189800','4189801')
and op2 in ('4176403','4176404','4184600','4184900','4185500','4188900','4188901',
'4189200','4189500','4189800','4189801','9250202','9250300','')
and op3 in ('9250202', '9250300','') then moh_bronchoscopy = '1';
else moh_bronchoscopy = '0';
run;
```

Step 13 – Removing Blood Transfusion units

Some same day blood transfusion events are excluded. These are where non-acute events for patients aged 15 or over have admission and discharge dates the same, and:

1. The first diagnosis code is: V582 (ICD9) or Z513 (ICD10);
2. The first procedure code is: 9902, 9903, 9904, 9905 (ICD9) or 1370601, 1370602, 1370603, 9206000 (ICD10);
3. The second procedure code is: 9902, 9903, 9904, 9905 (ICD9) or 1370601, 1370602, 1370603, 9206000 (ICD10) or blank;
4. The third procedure code is blank.

```
data events;
set events;
if los = 0 and adm_type not in ('AC','ZC') and age_dsch > 15 and diag1 = 'Z513'
and op1 in ('1370601','1370602','1370603','9206000')
and op2 in ('1370601','1370602','1370603','9206000','')
and op3 = '') then moh_bloodtrans = '1';
else moh_bloodtrans = '0';
run;
```

Step 14 – Removing Inconsistent Stays

Events that took place simultaneously are excluded. Each period of hospitalisation for an individual must have unique admission and discharge dates, and. The Ministry of Health acknowledges that it is difficult to ascertain which event is "correct" in these cases, we retain the first event ID in these instances.

```
data events;
set events;
moh_inconsistent = '0';
run;

proc iml;
use events;
read all var {event_id enc_mast_hcu evstdate evendate moh_inconsistent};
n = nrow(enc_mast_hcu);
do i = 2 to n;
if ((enc_mast_hcu[i] = enc_mast_hcu[i-1]) & (evstdate[i] > evstdate[i-1]) &
(evstdate[i] < evendate[i-1])) then moh_inconsistent[i] = '1';
end;
quit;
```

Step 15 – Removing Well Babies

"Well baby" visits are excluded. These are where the first diagnosis code is: V30–V39 (ICD9) or Z38 (ICD10).

```
data events;
set events;
if substr(diag1,1,3) = 'Z38' then moh_wellbaby = '1';
else moh_wellbaby = '0';
run;
```

Step 16 – Removing Mental Health cases

Mental health cases are excluded if they have a mental health service specialty code, a mental health DRG with no operations performed; or DRGs: 841–848 (DRG3) or U40Z–U68Z (DRG4).

```
data events;
set events;
if substr(hlthspec,1,1) = 'Y' or (drg_31 in ('841','842','843','844','845','846',
'847','848') and op1 = '') then moh_mhealth = '1';
else moh_mhealth = '0';
run;
```

Step 17 – Removing Disability Support Services (DSS) Cases

DSS cases are excluded if they:

- are a respite care case – first diagnosis code: V604, V605 (ICD9) or Z742, Z755 (ICD10); or
- have a DSS specialty code – "D"; or
- have a rehab DRG: 940,941 (DRG3) or Z60A, Z60B, Z60C (DRG4); or
- are discharged from a DSS institution (not involving a delivery), have no operation performed, and have a length of stay of more than 10 days.

```
data events;
set events;
if substr(hlthspec,1,1) = 'D' then moh_dsscase = '1';
else if drg_current in ('940','941','Z60A','Z60B','Z60C') then moh_dsscase = '1';
else if diag1 in ('Z742','Z755') then moh_dsscase = '1';
else if facility in ('3217','3220','3226','3228','3232','3235','3237','3238','3614',
'3912','3913','4015','4017','4024','4031','4222','4314','5229','5330','5750','5814',
'5914') and hlthspec not in ('P10','P11','P12','P13','P14','P15','P16','P17','P18')
and op1 = '' and los > 10 then moh_dsscase = '1';
else moh_dsscase = '0';
run;
```

Step 18 – Removing Transfers
Transferring a patient to another facility can result in multiple records for a single event. Transferrals are joined if it is found that a patient is moved on the same or the following day to a hospital within the same DHB, with a discharge type of transfer. The patient's diagnostic information containing the most expensive DRG is retained and linked back to that hospital from which the information was received.

We did not prepare code for this exclusion criterion as we did not sufficiently understand the complexity involved.

Step 19 – Removing Accident & Emergency Shortstay cases
A&E daystay/shortstay cases are removed due to inconsistencies between facilities in recording data. These are where admission and discharge dates are the same, the health specialty code is: M05, M06, M07, or M08, and the patient was not discharged dead.

```
data events;
set events;
if los = 0 and end_type ne 'DD' and hlthspec in ('M05','M06','M07','M08') then
moh_aedaystay = '1';
else moh_aedaystay = '0';
run;
```

Step 20 – Removing Overseas cases
All cases with a DHB code of 'XXX' are excluded, to ensure that only local DHB regions are compared. The data sets received also used '9999' as an overseas marker, so these were removed as well.

```
data events;
set events;
if dom_cd in ('9999','XXX') then moh_overseas = '1';
else moh_overseas = '0';
run;
```