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# BMJ Open

## Persistent opioid use and opioid-related harm after hospital admissions for surgery and trauma in New Zealand: A Population-based Cohort Study

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2020-044493
Article Type:	Protocol
Date Submitted by the Author:	04-Sep-2020
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Keywords:	Pain management < ANAESTHETICS, EPIDEMIOLOGY, ORTHOPAEDIC & TRAUMA SURGERY, PAEDIATRIC SURGERY, SURGERY, ACCIDENT & EMERGENCY MEDICINE

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# Study Protocol:

# Persistent opioid use and opioid-related harm after hospital admissions for surgery and trauma in New Zealand: A Population-based Cohort Study

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Word count: 3896 (excl. abstracts, figs, references, declarations)

## Abstract

### Introduction:

Opioid use has increased globally for the management of chronic non-cancer-related pain. There are concerns regarding the misuse of opioids leading to persistent opioid use and subsequent hospitalisation and deaths in developed countries. Hospital admissions related to surgery or trauma have been identified as contributing to the increasing opioid use internationally. There are minimal data on persistent opioid use and opioid-related harm in NZ, and how hospital admission for surgery or trauma contributes to this. We aim to describe rates and identify predictors of persistent opioid use among opioid-naïve individuals following hospital discharge for surgery or trauma.

### Methods and analysis:

This is a population-based, retrospective cohort study using linked data from national health administrative databases for opioid-naïve patients who have had surgery or trauma in NZ between January 2006 to December 2019. Linked data will be used to identify variables of interest including all types of hospital surgeries in NZ, all trauma hospital admissions, opioid dispensing, comorbidities, and sociodemographic variables. The primary outcome of this study will be the prevalence of persistent opioid use. Secondary outcomes will include mortality, opioid-related harms, and hospitalisation. We will compare the secondary outcomes between persistent and non-persistent opioid user groups. To compute rates, we will divide the total number of outcome events by total follow-up time. Multivariable logistic regression will be used to identify predictors of persistent opioid use. Multivariable Cox regression models will be used to estimate the risk of opioid-related harms and hospitalisation as well as all-cause mortality among the study cohort in a year following hospital discharge for surgery or trauma.

### Ethics and Dissemination:

This study has been approved by the Auckland Health Research Ethics Committee (AHREC- AH1159). Results will be reported in accordance with the Reporting of studies Conducted using Observational Routinely collected health data statement (RECORD).

## Article Summary

### Strength and Limitations of the study

- This will be the first study in New Zealand to examine the relationship between hospital admission for surgery or trauma and the incidence of persistent opioid use.
- The study will include 14 years of opioid usage data, making this one of the largest opioid usage studies to date (2006 to 2019).
- A limitation of the study lies in its use of retrospective secondary data, which has limited control over confounders.

## Background:

Opioids are widely prescribed in hospitals for acute, chronic non-cancer and cancer-related pain. However, in the last decade, opioid addiction and dependency have contributed substantially towards hospitalisation and death globally, especially in the United States (US).<sup>1</sup> Mortality related to opioid overdose accounts for nearly 530 deaths per week in the US.<sup>1</sup> In New Zealand (NZ), a study in 2017 showed from 2008 to 2012, a total of 325 deaths were primarily ascribed to opioid use.<sup>2</sup> Of these, 179 deaths were from unintentional overdose and may be preventable.<sup>2</sup> No studies have examined recent trends in NZ. In NZ, five strong opioids and a total of 33 different formulations are licensed for prescribing in pain management: 14 for morphine, 9 for oxycodone, 5 for fentanyl, 4 for methadone and 1 for pethidine. Three weak opioids and a total of 9 different formulations are available for prescribing: 5 for tramadol, 3 for codeine and 1 for dihydrocodeine.

The NZ Health Quality & Safety Commission (HQSC) in 2016<sup>3</sup> reports that opioid use has increased in NZ with 16.6 per 1000 people compared to 14.4 per 1000 in 2011. The rate of persistent opioid use, defined by the HQSC as use of six weeks or longer, has not changed between 2011 to 2016 and is around 2 per 1000 patients. The report also showed that almost half of the patients dispensed a strong opioid had a hospital admission in the week prior to opioid prescribing in the community.

Internationally, persistent opioid use is generally defined as opioid use for 90 days or longer.<sup>4</sup> Studies from the US and Canada have indicated the rate of persistent opioid use beyond 90 days to be between 0.1% to 8.2% in the context of pain management after surgery and trauma.<sup>5</sup> In the acute setting, higher rates of opioid prescribing by emergency physicians has also been linked to subsequent long-term opioid use in the US (Odds Ratio (OR) 1.30, 95% CI 1.23, 1.37,  $p < 0.001$ ).<sup>6</sup>

Hospital admissions may act as drivers for subsequent persistent opioid use in the community setting. NZ data shows that younger people (under 24 years of age) were more likely to have a hospital admission prior to the dispensing of a strong opioid than older people (80 years and over)— rates opioid dispensing were 7 per 10 people in younger people vs 3.7 per 10 in those above 80.<sup>3</sup> This usage rate may be due to clinicians' perception that opioids are generally safer in younger patients because they are more likely to have normal metabolic functions. However, studies have suggested that addictive behaviour tends to be overrepresented in younger patients (18 to 29 years old),<sup>7,8</sup> mainly concerning other substances of abuse such as cannabis and cocaine. Our study will examine persistent opioid use and opioid-related harm across all age groups, to describe how these rates may change across ages.

Outcomes related to persistent opioid use have also been poorly evaluated both in NZ and elsewhere. A recent study published by a Swedish group showed that post-trauma patients with persistent opioid use carry an excess risk of mortality, even after adjustment for age, sex, somatic comorbidity, psychiatric-morbidity, substance abuse, injury severity and admissions to intensive care (Hazard Ratio (HR) 1.82, 95% CI 1.34, 2.48,  $p < 0.001$ ).<sup>9</sup> There are few mortality data in NZ related to persistent opioid use, despite the presence of national databases recording health outcomes.

In NZ, the opportunity for population-based cohort studies is unique in several ways. Firstly, NZ has a single universal healthcare system; the government covers 80% of the cost of healthcare. All NZ citizens, permanent residents, and certain work visa holders have access to free or low-cost physician services, hospital care, and prescription medicines.<sup>10</sup> Physician services are private businesses that set their consultation fee, but the fees are set by the government and cannot exceed a certain limit. Patients enrolled in a specific physician service will have a lower cost per visit, as the government would partially fund the visit.<sup>10</sup> Most physician services are free for patients 13 years or under. Most

1  
2  
3 prescription medicines are fully funded by the government, with the patient having to co-pay only a  
4 dispensing fee of NZ\$5 per item to the pharmacy.<sup>11</sup> Secondly, all patients accessing the health and  
5 disability system will be assigned a unique identifier code, in both private and public funded hospitals,  
6 called the National Health Index (NHI) number.<sup>12</sup> The Ministry of Health (MOH) uses the NHI number  
7 in an encrypted form so that data can be used for statistical purposes to report on the health of the NZ  
8 population.<sup>12</sup> This then allows for linkage of data across different datasets for research, e.g. hospital  
9 admissions, medication dispensing, and mortality can be linked. Thirdly, it is possible to track all  
10 admissions to public and private hospitals. This permits the calculation of an emerging measure  
11 called Days Alive and Out of Hospital (DAOH). DAOH is a composite outcome that integrates several  
12 clinically significant outcomes, including mortality, hospital length-of-stay, and hospital readmission.<sup>13</sup>  
13 It is sensitive to any complication of surgery that prolongs an admission, leads to a readmission or  
14 results in death. Fourthly, data on ethnicity are routinely collected by the MOH. NZ has a large  
15 indigenous population (Māori) who experience substantial disadvantages in health status and  
16 outcomes compared with the non-Māori population.<sup>14</sup> A recent study assessing the use of non-opioid  
17 analgesia between ethnicities in NZ showed a significant disparity in outcome between Māori and  
18 non-Māori patients, with Māori patients having more in adverse events, with a relative risk 2.54 (95%  
19 CI 2.23-2.90).<sup>15</sup> The likely risk of persistent opioid use and subsequent opioid-related harm in NZ  
20 may also be distributed unequally across ethnic groups. The NZ healthcare system is obligated to  
21 address these inequities under the *protection* principle of the *Treaty of Waitangi*.<sup>16</sup>

22  
23 Thus, we aim to determine the patterns of opioid use and opioid-related harm in NZ following  
24 discharge from hospital for surgery or trauma over 14 years from 1<sup>st</sup> of January 2006 to 31<sup>st</sup> of  
25 December 2019. Specifically, in this study, we aim to determine the rates of persistent opioid use  
26 post-discharge from the hospital and evaluate outcomes including opioid dependence, opioid-related  
27 overdose, opioid-related hospitalisation and mortality. We will also measure DAOH at 365 days  
28 (DAOH<sub>365</sub>), as an outcome that will be used for measuring the quality of perioperative care and  
29 postoperative recovery.<sup>13</sup> We will also identify the predictors of these outcomes.

## 32 Methods and Analysis:

### 33 Study design and setting

34  
35 This will be a population-based retrospective cohort study involving residents of NZ using linked,  
36 routinely collected health data.

### 37 Sources of data

38  
39 The study will use several national administrative health databases, which can be linked via an  
40 encrypted, unique patient identifier known as the National Health Index (NHI).<sup>12</sup> To examine  
41 hospitalisations data, we will use the National Minimum Data Set (NMDS).<sup>17</sup> The NMDS is a national  
42 registry of all inpatient admissions reported to the MOH. The NMDS includes information on dates of  
43 hospital stay, diagnoses, and medical procedures. All medical procedures are coded according to the  
44 Australasian Classification of Health Interventions (ACHI).<sup>18</sup> In NMDS, primary and secondary  
45 diagnoses are coded according to the International classification of diseases 10th edition – Australian  
46 modified version (ICD-10AM). The NMDS captures 99 percent of all operations performed in NZ.<sup>19</sup>  
47 The National Non-Admitted Patients Collection (NNPAC) is the national database used to capture  
48 information on patients who presented to the emergency department (ED) and spent less than three  
49 hours in a hospital. This database will be linked with data from the Accident Compensation  
50 Corporation (ACC) to identify patients admitted to an NZ hospital with trauma but did not require  
51 prolonged hospital admission.<sup>20</sup> ACC is NZ's Crown entity responsible for administering the country's  
52 no-fault accidental injury compensation scheme.<sup>21</sup> The Mortality Collection (MORT) is a national  
53 database that classifies the underlying cause of death for all deaths registered in NZ. MORT uses the  
54 ICD-10AM classification for mortality coding.<sup>22</sup> Mortality related outcomes will be retrieved from this  
55 database.



Data on opioid dispensing and other medicines prescribed to patients receiving opioids will be obtained from the Pharmaceutical Collection (Pharms). Pharms is a data warehouse of information related to pharmaceutical subsidies and contains claim and payment information from pharmacists for subsidised dispensing.<sup>23</sup> The Pharms database contains information on all prescriptions dispensed by community pharmacies in NZ since 1998, according to local codes akin to the Anatomical Therapeutic Chemical classification system (ATC codes). The database includes medication name, quantity, days of supply, formulation, date of refill, route of administration, and codes identifying the therapeutic category of the medication. Medicines dispensed in hospitals are not included in the database. Patients meeting the inclusion criteria will be determined from the NMDS and NNPAC plus ACC then matched with their respective opioid dispensing data from Pharms via their respective encrypted NHI.

Other databases that we will access include the NHI and Primary Health Organisation (PHO) enrolment. These datasets will be used to retrieve information relevant to the patient, including demographic, gender, age, ethnicity, and social-economic status.<sup>24</sup>

## Study Cohort

The study design is illustrated in Fig. 1.<sup>25</sup> The study population includes all opioid-naïve patients (of any age) who had a surgical procedure or presented to the hospital with trauma in one of NZ's 39 public hospitals between the 1<sup>st</sup> of January 2006 to 31<sup>st</sup> of December 2019. Surgical patients will be defined as all individuals in the NMDS assigned a surgical procedure and associated anaesthetic code via the ACHI. Trauma patients with a hospital stay of greater than three hours will be identified using ICD-10AM codes for trauma in the NMDS dataset. Individuals with less than three hours of admission will only be registered on NNPAC. Thus their data will likely require linkage of ACC database via ACC injury codes and claimant number to obtain event details.

The date of hospital discharge following the initial surgical or traumatic event and exposed to opioids will be considered as the index date. For patients with more than one admission for surgical procedures or trauma during the study period, only the first admission will be included in the study cohort. Individuals will be considered opioid-naïve if they do not have dispensing records for any opioid medications in 180 days before the index date. We will exclude the following types of patients: 1) those who have evidence of a surgical procedure or traumatic event in 365 days prior to the index date; and 2) those with evidence of opioid use disorders (e.g. overdose, misuse or dependence) or opioid prescriptions in 180 days prior to the index date. Patients who underwent multiple procedures in 24 hours will be examined separately as their likely risk of persistent opioid use may be different from other patients.

We will follow-up all patients who meet the study inclusion criteria for a maximum of 365 days, or until subsequent hospital admission for surgery or trauma, the last opioid dispensing claims date, occurrence of the outcomes of interest, or death from any cause, whichever comes first- see fig. 1 for study design.

*See supplementary section for surgical procedures and ICD-10AM codes for trauma-related admissions.*



**Fig 1.**

- a. Opioid-related harms include opioid use disorders (e.g. overdose, misuse or dependence)
- b. Other baseline characteristics include: depression (ICD 10AM codes: F32 -F33) , anxiety (F40-F48), dementia (F00-F03), schizophrenia and related psychotic conditions (F20-F29), bipolar disorder (F31), alcohol and nicotine dependence (F10.20-F10.29, F17.200- F17.299), substance use (F10-F16, F18-F19, F55), mood disorder (F30-F39), other mental health conditions (F04-F09, F51-F53, F59, F63, F68, F69, F930-F932, F99), other medications (paracetamol, NSAIDs, pregabalin, gabapentin, benzodiazepines, antipsychotics, antidepressants) and presence of chronic pain
- c. Earliest outcome of interest: persistent opioid beyond 90 days
- d. Secondary outcome at 365 days: total duration of persistent opioid use from an index date, opioid-related fatal overdose, all-cause mortality, opioid dependency, opioid misuse, and hospital admission related to opioid overdose and toxicity during the follow up period.

M3I = M3 Comorbidity Index

## Outcome Assessment

The primary outcome will be persistent use of opioids after trauma or surgery. As in previous studies of opioid use,<sup>26 27</sup> persistent opioid use will be defined as continuous pharmacy claim for one or more opioid prescription 91 days to 365 days after the index date. Patients who continuously filled one or more opioid prescriptions within 90 days after the index date but did not thereafter will be considered as non-persistent opioid users. Characteristics of persistent and non-persistent opioid users will be compared to identify predictors of persistent opioid use. Our secondary outcomes will include total duration of persistent opioid use from the index date, opioid-related fatal overdose, all-cause mortality, opioid dependency, opioid misuse, and hospitalisation related to opioid overdose and toxicity during the follow-up period. We will also measure DAOH<sub>365</sub>.

Mortality due to opioid overdose will be defined as the presence of a date of death and opioid overdose as the cause of death as recorded in the MORT database via ICD-10AM codes. These episodes of related harm will be identified during patients' subsequent admission after the index date.

*See the supplementary section for secondary outcome-related ICD-10AM.*

## Opioid Exposure Assessment

The primary exposure in this study is the receipt of a new opioid prescription after a surgical or traumatic event. All patients who filled at least one opioid prescription within 7 days of discharge will be considered exposed to prescription opioids and will be included in the study cohort. The 7-day grace period assumes that an opioid prescription filled by an opioid-naïve individual during this period is likely to be used to treat acute pain after surgery or trauma, and any opioid use after 7 days is unlikely to be related to the surgery or trauma event. Opioid use will be assessed by date of dispensing, dose, frequency, days or quantity supplied, and frequency (where available) of dispensing to infer the duration of use.

Of the different opioid formulations available in NZ, only topical (fentanyl only) and oral preparations will be included. Patients discharged with parenteral products will be excluded. The indication for parenteral opioids is unlikely related to postoperative pain management but more likely for other indications such as palliation.

To account for patients being on different strong opioids with variable potency, patients daily opioid dose will be standardised by converting the prescribed dose to oral morphine equivalence (OME) in milligrams to account for overall opioid exposures relative to morphine, per formula below- see supplementary material for OME conversion factors:<sup>28 29</sup>

$$\text{OME} = \text{Pack Strength} \times \text{OME conversion factor} \times \text{Quantity dispensed}$$

i.e. If 30 capsules of oxycodone 5 mg were dispensed, this would equate to an OME of 225 mg

Cessation of opioid use will be defined as a pause of medication supply for more than 45 days from the last dispensing. This is because the maximum legal period of supply for opioids in NZ is 30 days. To account for any leftover of supply a further 15 days will be included.

## Covariates of persistent opioid use and opioid-related harm

We will aim to identify predictors of persistent opioid use and other secondary outcomes of interest, including opioid-related mortality. Various predictors have been investigated previously, including age, type of surgery, length of stay for the index surgery or trauma event, surgical speciality (cardiac, vascular, digestive, thoracic, neurosurgery, musculoskeletal, urinary and other), multiple surgeries in one day, complexity and urgency of surgery.<sup>30 31</sup> These will be collected via the NMDS in addition to ethnicity, gender, socioeconomic status, social deprivation score (via NZ Deprivation Index-NZDep).<sup>32</sup> The NZDep is an area-based measure of socioeconomic deprivation in New Zealand. The urgency of the surgery will be categorised as elective or acute. The operative complexity will be categorised using the Johns Hopkins five-category classification, where each procedure will be given an operation

1  
2  
3 severity grade from one to five.<sup>33</sup> The method of identifying all procedures performed in NZ hospitals  
4 is consistent with a previously published paper involving current co-investigators on postoperative  
5 mortality risk.<sup>19</sup>  
6

7 Other comorbidities will be collected that have been shown in the literature to be predictors of  
8 persistent opioid use<sup>5 30 31</sup> such as depression (ICD-10AM codes: F32 -F33), anxiety (F40-F48),  
9 dementia (F00-F03), schizophrenia and related psychotic conditions (F20-F29), bipolar disorder  
10 (F31), alcohol and nicotine dependence (F10.20- F10.29, F17.200- F17.299), substance use (F10-  
11 F16, F18-F19, F55), mood disorder (F30-F39), other mental health conditions (F04-F09, F51-F53,  
12 F59, F63, F68, F69, F930-F932, F99), and presence of chronic pain in a year prior to index date. For  
13 each patient included in the cohort, the M3 index (M3I) score and the American Society of  
14 Anesthesiologists (ASA) physical status classification system<sup>34</sup> will be used as a measure of  
15 comorbidity using information from any inpatient or outpatient contact the five years before the index  
16 date.<sup>35</sup> M3I score will be computed from a list of 61 health conditions based on the presence/absence  
17 of previous diagnostic codes (see the supplementary section for the specific health conditions). We  
18 will use the ASA score on each patients' NMDS record at the time of surgery.  
19

20 To assess concurrent medications use, we will examine patient's medications at baseline and in 6  
21 months prior to the index date using the Pharms database. Concomitant medications that are  
22 potential predictors for persistent opioid use include non-opioid analgesia, including paracetamol,  
23 pregabalin, gabapentin, benzodiazepines, antipsychotics, mood stabilisers and antidepressants.  
24 Additionally, information on non-steroidal anti-inflammatories (NSAIDs) dispensing will be collected as  
25 these have been shown to predict persistent opioid use.<sup>29 36</sup>  
26

## 27 Data analysis

28 Descriptive statistics will be used to describe baseline characteristics and the outcomes of interest.  
29 Continuous variables will be described using the mean and standard deviation or median and  
30 interquartile range as appropriate, depending on data distribution. Categorical variables will be  
31 described using frequency distributions and percentages. Kolmogorov–Smirnov and Shapiro-Wilk tests  
32 of normality will be used to assess the distribution of continuous variables. Parametric and non-  
33 parametric bivariate tests (e.g. Student's t-test, Mann-Whitney U test or  $\chi^2$  test) will be used to compare  
34 the characteristics of individuals who may or may not exhibit persistent opioid use after surgery or  
35 trauma.  
36

37 A multivariable logistic regression model will be used to examine the association between potential  
38 predictors and persistent opioid use after surgery/trauma. Odds ratios with 95% confidence intervals  
39 will be reported for each predictor. All predictor variables will be included simultaneously in the  
40 multivariable regression model. Multicollinearity between variables will be assessed using variance  
41 inflation factors and tolerance.  
42

43 We will calculate the crude rate of each outcome of interest for both persistent and non-persistent opioid  
44 user groups. To compute the rates, we will divide the total number of outcome events by total follow-up  
45 time. These will be reported as cases per 1000 person-days with confidence intervals derived from a  
46 Poisson or negative binomial distribution as appropriate. Cox multivariate regression models will be  
47 used to estimate the risk of all-cause mortality, opioid-related harms, and hospitalisation associated  
48 with persistent use of opioids in the 365 days after the index date for all patients. Hazard ratios and  
49 95% confidence intervals will be reported. The proportional hazards assumption of the Cox model will  
50 be tested using log-minus-log plots, and C-statistics will be used to identify the C-index of the  
51 multivariable Cox regression models. The Kaplan–Meier method will be used to summarise survival  
52 time for persistent and non-persistent opioid users. A two-sided p-value < 0.05 will be considered  
53 statistically significant for all statistical tests. We will make appropriate corrections to allow for multiple  
54 statistical tests. We will undertake all analyses using the R statistical software package (R v4.0.2).  
55  
56

## 57 Sub-group analysis

58 We will repeat the primary analyses by stratifying across three age groups (<18, 18–44, 45–64, ≥65  
59 years) to examine whether the strength of the predictors for persistent opioid use and secondary  
60

1  
2  
3 outcomes vary across age. We will also assess whether the findings of the primary analysis are  
4 consistent across subgroups defined according to sex, ethnicity (Māori vs non- Māori), different opioids,  
5 urgency of surgery (elective vs non-elective) or surgery complexity via operation severity (grade one-  
6 five).

## 8 Sensitivity analysis

9  
10 To assess the robustness of our primary analyses, we will conduct several sensitivity analyses. As  
11 noted, our primary analysis will include all patients in the cohort, regardless of whether they survived  
12 up to 90 days after the index date. In a sensitivity analysis, we will repeat the primary analyses after  
13 restricting the cohort to only those who survived at least 90 days after the index date. To explore the  
14 effect of our definition of opioid cessation, we will repeat the analysis using a pause in medication  
15 supply of 30 days or more instead of 45 days or more, as the definition of cessation of opioid use.  
16 Given the uncertainties related to the length of the look-back time window for opioid exposure, we will  
17 test our definition of opioid-naivety by evaluating exposure with 365 instead of 180 days. Moreover,  
18 we will repeat the analysis by changing the definition of persistent opioid use to 61 to 365 days after  
19 the index date.

## 21 Missing value analysis

22  
23 We will run Little's Missing Completely at Random (MCAR) test to assess whether missing values in  
24 the final datasets are MCAR.<sup>37</sup> If the data are MCAR, multiple imputations with chained equations will  
25 be conducted to impute missing values. We will use the 'mice' function in the R software package to  
26 perform multiple imputations and the subsequent analysis. We will perform up to five imputations to  
27 generate five datasets, and the average of the five values will replace each missing value in each of the  
28 five datasets.

## 30 Patient and public involvement

31  
32 The study was presented at a Māori hui (gathering), Taia Te Hauora, to discuss study with Māori  
33 research advisors on study's Māori responsiveness. Our team includes Dr Matthew Moore (Ngāti  
34 Rangiwewehi, Rangitāne ki Manawatū) and the ethics approval process included consultation with a  
35 Māori research advisor external to our team. The consultation included information on how best to  
36 disseminate study results to Māori.

## 38 Discussion

39  
40 To our knowledge, this study will result in the most extensive collection of data over the longest period  
41 that examines the contribution of surgery or trauma to persistent opioid use and related adverse  
42 outcomes explicitly. As NZ has a unique mixture of ethnicities, including an indigenous Māori  
43 population, our study will have a particular focus in line with our obligations under the *Treaty of*  
44 *Waitangi* to assess outcomes related to Māori.<sup>16</sup>

45  
46 The definition of persistent opioid use has varied in the literature. A recent systematic review found 29  
47 definitions of persistent opioid use.<sup>38</sup> A 100-fold difference in the rate of persistent opioid has been  
48 reported due to the use of different definitions.<sup>38</sup> The review supports our interpretation of persistent  
49 opioid use. Continuous opioid use was shown to be a more accurate representation of persistent  
50 opioid use than single dispensing of opioids within a set period (90-180 days) and a better predictor of  
51 subsequent harm.<sup>38</sup>

52  
53 Our study's main limitation is its reliance on the information collected and coded in administrative  
54 datasets. Opioid consumption is extrapolated from pharmacy dispensing data, so medication  
55 consumption is not guaranteed. We will not have access to the indication for the continuation of opioid  
56 prescribing. Other limitations will include a follow-up period for secondary outcomes of only 365 days.  
57 We believe that 365 days would be an adequate time frame for events to occur related to opioid  
58 prescribed from the index event date.

We plan to use the M3I over other recognised comorbidity indices such as Charlson or Elixhauser due to its superior prognostic performance in the NZ population.<sup>35</sup> We will also use ASA for comorbidity as it is readily available on the NMDS, but we will assess which score performs the best. As our study is registry-based, we will not have access to each patient's perioperative anaesthetic assessments for the most accurate ASA classification.

## Ethics and Dissemination

### Data storage, retention and access

The Research team will not, at any time receive identifying data for any individual in the cohort as the data obtained from the Ministry of Health will be de-identified via encrypted NHIs. Data will be stored in a password-protected folder on the University of Auckland server, managed by the School of Pharmacy's pharmacoepidemiology research group. Data to be stored up to 10 years by the University of Auckland according to the Health Information Privacy Act<sup>39</sup>. Data governance will be as per the National Ethical Standards for Health and Disability Research 2019<sup>40</sup>. Only the primary and co-investigators will be allowed access to data, and data will be stored in a digital de-identified form.

*Refer to Data Management Plan in the supplementary material*

### Dissemination

The findings of this research will be relevant to multiple groups of people, include hospital policy stakeholders, surgeons, anaesthetists, ED physicians and other clinicians who have an interest in acute pain management and subsequent complications. We plan to disseminate our findings at scientific conferences and in high impact peer-reviewed journals that are read by a wide range of users. We plan to have an end of study hui to engage with Māori health users to disseminate study results. As the study uses routinely collected health data, results will be reported per the Reporting of studies Conducted using Observational Routinely-collected health Data statement (RECORD).<sup>41</sup>

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**Acknowledgement:** We would like to thank Mr Luke Boyle for the provision of procedure codes and complexity categorisation.

**Contributors:** This study idea was conceived and designed by JG, PJ, AC, DC, AM. JG, PJ, AC, AM, MM, KB, DC, and JM provided input to the study design and research questions. JG, KB developed the statistical plan. JG and AC obtained ethics approval for the study. JG completed the first draft of the manuscript. All authors reviewed and approved the final draft.

**Funding:** This publication was supported by the Auckland Academic Health Alliance (AAHA) grant number 8753.



**Competing interest:** JG receives grants from Auckland Academic Health Alliance (AAHA) and scholarship from the University of Auckland. KB reports grants from A+ charitable trust, New Zealand Pharmacy Education and Research Foundation, outside this submitted work, and U21 Health Sciences Research Development Fund. AC reports consultancy fees from Janssen-Cilag, and from Spoonful of Sugar Ltd, a UCL-Business spin-out company, and grants from Innovate UK, A+ charitable trust (Auckland District Health Board), and Maurice and Phyllis Paykel trust, outside this submitted work. DC reports receiving grants from the ADHB Research Trust, the Australian and New Zealand College of Anaesthetists, the Auckland Academic Health Alliance, the Auckland Medical Research Foundation and the Neurological Foundation of New Zealand.

**Patient consent:** Ethics approval includes a waiver of the requirement for patient consent.

**Ethics Approval:** The study has been approved by the Auckland Health Research Ethics Committee (AHREC), Ref: AH1159.

**Provenance and peer review:** Peer reviewed for ethical and funding approval prior to submission by the AAHA grant committee.

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## Reference

1. US centres for Disease Control and Prevention. Drug overdose deaths in the United States hit record numbers in 2014: US centres for Disease Control and Prevention; 2014 [cited 2020 the 1st of January]. Available from: <http://www.cdc.gov/drugoverdose/epidemic/> accessed the 1st of January 2020.
2. Shipton EE, Shipton AJ, Williman JA, et al. Deaths from Opioid Overdosing: Implications of Coroners' Inquest Reports 2008-2012 and Annual Rise in Opioid Prescription Rates: A Population-Based Cohort Study. *Pain and therapy* 2017;6(2):203-15. doi: 10.1007/s40122-017-0080-7 [published Online First: 2017/09/10]
3. Health Quality and Safety Commission New Zealand. Atlas of Healthcare Variation- opioids: HQSC New Zealand; 2017 [cited 2019 the 27th of August]. Available from: <https://www.hqsc.govt.nz/our-programmes/health-quality-evaluation/projects/atlas-of-healthcare-variation/opioids/>.
4. Schug SA, Lavand'homme P, Barke A, et al. The IASP classification of chronic pain for ICD-11: chronic postsurgical or posttraumatic pain. *Pain* 2019;160(1):45-52. doi: 10.1097/j.pain.0000000000001413 [published Online First: 2018/12/27]

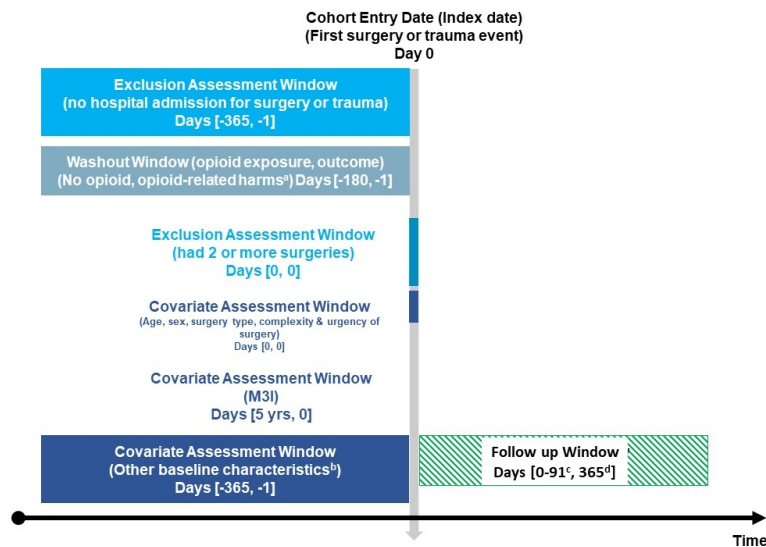
- 1  
2  
3 5. Stark N, Kerr S, Stevens J. Prevalence and predictors of persistent post-surgical opioid use: a  
4 prospective observational cohort study. *Anaesthesia and intensive care* 2017;45(6):700-06. doi:  
5 10.1177/0310057x1704500609 [published Online First: 2017/11/16]  
6  
7  
8  
9 6. Barnett ML, Olenski AR, Jena AB. Opioid-Prescribing Patterns of Emergency Physicians and Risk of  
10 Long-Term Use. *New England Journal of Medicine* 2017;376(7):663-73. doi:  
11 10.1056/NEJMsa1610524  
12  
13  
14  
15 7. Lopez-Quintero C, Hasin DS, de Los Cobos JP, et al. Probability and predictors of remission from  
16 life-time nicotine, alcohol, cannabis or cocaine dependence: results from the National Epidemiologic  
17 Survey on Alcohol and Related Conditions. *Addiction* 2011;106(3):657-69. doi: 10.1111/j.1360-  
18 0443.2010.03194.x [published Online First: 2010/11/17]  
19  
20  
21  
22  
23 8. Argyriou E, Um M, Carron C, et al. Age and impulsive behavior in drug addiction: A review of past  
24 research and future directions. *Pharmacol Biochem Behav* 2018;164:106-17. doi:  
25 10.1016/j.pbb.2017.07.013 [published Online First: 2017/08/06]  
26  
27  
28  
29 9. von Oelreich E, Eriksson M, Brattstrom O, et al. Risk factors and outcomes of chronic opioid use  
30 following trauma. *The British journal of surgery* 2020;107(4):413-21. doi: 10.1002/bjs.11507  
31 [published Online First: 2020/02/08]  
32  
33  
34  
35 10. New Zealand (NZ) Ministry of Health. New Zealand health system: Ministry of Health NZ; 2018  
36 [cited 2020 the 1st of May]. Available from: [https://www.health.govt.nz/new-zealand-health-](https://www.health.govt.nz/new-zealand-health-system)  
37 [system](https://www.health.govt.nz/new-zealand-health-system).  
38  
39  
40  
41 11. Pharmac. Costs of medicines: Pharmac; 2020 [cited 2020 the 5th of June]. Available from:  
42 <https://www.pharmac.govt.nz/medicines/medicines-information/costs-of-medicines/>.  
43  
44  
45  
46 12. New Zealand (NZ) Ministry of Health. The National Health Index (NHI) number: Ministry of Health  
47 NZ; [cited 2019 the 22nd of December]. Available from: [https://www.health.govt.nz/our-](https://www.health.govt.nz/our-work/health-identity/national-health-index)  
48 [work/health-identity/national-health-index](https://www.health.govt.nz/our-work/health-identity/national-health-index).  
49  
50  
51  
52 13. Jerath A, Austin PC, Wijeyesundera DN. Days Alive and Out of Hospital: Validation of a Patient-  
53 centered Outcome for Perioperative Medicine. *Anesthesiology* 2019;131(1):84-93. doi:  
54 10.1097/ALN.0000000000002701 [published Online First: 2019/05/17]  
55  
56  
57  
58  
59  
60

- 1  
2  
3 14. Davis P, Lay-Yee R, Dyllal L, et al. Quality of hospital care for Māori patients in New Zealand:  
4 retrospective cross-sectional assessment. *The Lancet* 2006;367(9526):1920-25. doi: 10.1016/s0140-  
5 6736(06)68847-8  
6  
7  
8  
9 15. Tomlin A, Woods DJ, Lambie A, et al. Ethnic inequality in non-steroidal anti-inflammatory drug-  
10 associated harm in New Zealand: A national population-based cohort study. *Pharmacoepidemiol*  
11 *Drug Saf* 2020 doi: 10.1002/pds.5028 [published Online First: 2020/06/02]  
12  
13  
14  
15 16. Treaty of Waitangi [English version], 1840.  
16  
17  
18 17. New Zealand (NZ) Ministry of Health. The National Minimum Dataset (NMDS): Ministry of Health  
19 NZ; [cited 2019 the 19th of August]. Available from: [http://www.health.govt.nz/nz-](http://www.health.govt.nz/nz-healthstatistics/national-collections-and-surveys/collections/national-minimum-dataset-hospital-events)  
20 [healthstatistics/national-collections-and-surveys/collections/national-minimum-dataset-hospital-](http://www.health.govt.nz/nz-healthstatistics/national-collections-and-surveys/collections/national-minimum-dataset-hospital-events)  
21 [events](http://www.health.govt.nz/nz-healthstatistics/national-collections-and-surveys/collections/national-minimum-dataset-hospital-events).  
22  
23  
24  
25 18. The Australian Consortium for Classification Development (ACCD). The Australian Classification of  
26 Health Interventions (ACHI) 2019 [cited 2020 the 20th of May].  
27  
28  
29  
30 19. Campbell D, Boyle L, Soakell-Ho M, et al. National risk prediction model for perioperative  
31 mortality in non-cardiac surgery. *The British journal of surgery* 2019;106(11):1549-57. doi:  
32 10.1002/bjs.11232 [published Online First: 2019/08/07]  
33  
34  
35  
36 20. New Zealand (NZ) Ministry of Health. National Non-Admitted Patients Collection (NNPAC):  
37 Ministry of Health NZ; [cited 2019 the 30th of December]. Available from:  
38 [https://www.health.govt.nz/nz-health-statistics/national-collections-and-](https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-collection)  
39 [surveys/collections/national-non-admitted-patient-](https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-collection)  
40 [collection](https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-collection).  
41  
42  
43  
44 21. (ACC) ACC. Who we are: Accident Compensation Corporation (ACC); [cited 2020 21st July].  
45 Available from: [https://www.acc.co.nz/about-us/who-we-are/what-we-do/?smooth-scroll=content-](https://www.acc.co.nz/about-us/who-we-are/what-we-do/?smooth-scroll=content-after-navs)  
46 [after-navs](https://www.acc.co.nz/about-us/who-we-are/what-we-do/?smooth-scroll=content-after-navs).  
47  
48  
49  
50 22. New Zealand (NZ) Ministry of Health. The Mortality Collection: Ministry of Health NZ; [cited  
51 2019 the 13th of March]. Available from: [https://www.health.govt.nz/nz-health-statistics/national-](https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/mortality-collection)  
52 [collections-and-surveys/collections/mortality-](https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/mortality-collection)  
53 [collection](https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/mortality-collection).  
54  
55  
56 23. New Zealand (NZ) Ministry of Health. Pharmaceutical Collection dataset: Ministry of Health NZ;  
57 [cited 2019 the 27th of August]. Available from: <https://minhealthnz.shinyapps.io/datapharm/>.  
58  
59  
60



- 1  
2  
3 24. New Zealand (NZ) Ministry of Health. The Primary Health Organisation Enrolment Collection  
4 (PHO): Ministry of Health NZ; [cited 2019 the 30th of December]. Available from:  
5 [https://www.health.govt.nz/nz-health-statistics/national-collections-and-](https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/primary-health-organisation-enrolment-collection)  
6 [surveys/collections/primary-health-organisation-enrolment-collection](https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/primary-health-organisation-enrolment-collection).  
7  
8  
9  
10  
11 25. Schneeweiss S, Rassen JA, Brown JS, et al. Graphical Depiction of Longitudinal Study Designs in  
12 Health Care Databases. *Annals of internal medicine* 2019;170(6):398-406. doi: 10.7326/m18-3079  
13 [published Online First: 2019/03/12]  
14  
15  
16  
17 26. Dunn KM, Saunders KW, Rutter CM, et al. Opioid prescriptions for chronic pain and overdose: a  
18 cohort study. *Annals of internal medicine* 2010;152(2):85-92. doi: 10.7326/0003-4819-152-2-  
19 201001190-00006 [published Online First: 2010/01/20]  
20  
21  
22  
23 27. Braden JB, Russo J, Fan MY, et al. Emergency department visits among recipients of chronic  
24 opioid therapy. *Archives of internal medicine* 2010;170(16):1425-32. doi:  
25 10.1001/archinternmed.2010.273 [published Online First: 2010/09/15]  
26  
27  
28  
29 28. New Zealand Formulary. Opioid analgesics- Switching opioids: New Zealand Formulary; 2020  
30 [cited 2020 the 27th of May]. Available from: [https://nzf.org.nz/nzf\\_70672#nzf\\_70708](https://nzf.org.nz/nzf_70672#nzf_70708).  
31  
32  
33  
34 29. Lalic S, Gisev N, Bell JS, et al. Predictors of persistent prescription opioid analgesic use among  
35 people without cancer in Australia. *Br J Clin Pharmacol* 2018;84(6):1267-78. doi: 10.1111/bcp.13556  
36 [published Online First: 2018/02/17]  
37  
38  
39  
40 30. Brummett CM, Waljee JF, Goesling J, et al. New Persistent Opioid Use After Minor and Major  
41 Surgical Procedures in US Adults. *JAMA Surg* 2017;152(6):e170504. doi:  
42 10.1001/jamasurg.2017.0504 [published Online First: 2017/04/14]  
43  
44  
45  
46 31. Clarke H, Soneji N, Ko DT, et al. Rates and risk factors for prolonged opioid use after major  
47 surgery: population based cohort study. *BMJ* 2014;348:g1251. doi: 10.1136/bmj.g1251 [published  
48 Online First: 2014/02/13]  
49  
50  
51  
52 32. Atkinson J SC, Crampton P. NZDep2013 Index of Deprivation. *University of Otago, Dunedin* 2014  
53  
54  
55  
56 33. Pasternak LR. Preanesthesia Evaluation of the Surgical Patient. *ASA Refresher Courses in*  
57 *Anesthesiology* 1996;24:205-19. doi: 10.1097/00126869-199624000-00016  
58  
59  
60

- 1  
2  
3 34. American Society of Anesthesiologists. ASA Physical Status Classification System: American  
4 Society of Anesthesiologists; 2019 [cited 2020 the 1st of June]. Available from:  
5  
6 <https://www.asahq.org/standards-and-guidelines/asa-physical-status-classification-system>.  
7  
8
- 9 35. Stanley J, Sarfati D. The new measuring multimorbidity index predicted mortality better than  
10 Charlson and Elixhauser indices among the general population. *Journal of clinical epidemiology*  
11 2017;92:99-110. doi: 10.1016/j.jclinepi.2017.08.005 [published Online First: 2017/08/29]  
12  
13
- 14 36. Rhon DI, Snodgrass SJ, Cleland JA, et al. Predictors of chronic prescription opioid use after  
15 orthopedic surgery: derivation of a clinical prediction rule. *Perioper Med (Lond)* 2018;7:25. doi:  
16 10.1186/s13741-018-0105-8 [published Online First: 2018/11/28]  
17  
18
- 19 37. Roderick JAL. A Test of Missing Completely at Random for Multivariate Data with Missing Values.  
20 *Journal of the American Statistical Association* 1988;83:1198-202. doi:  
21 10.1080/01621459.1988.10478722  
22  
23
- 24 38. Jivraj NK, Raghavji F, Bethell J, et al. Persistent Postoperative Opioid Use: A Systematic Literature  
25 Search of Definitions and Population-based Cohort Study. *Anesthesiology* 2020;132(6):1528-39. doi:  
26 10.1097/ALN.0000000000003265 [published Online First: 2020/04/04]  
27  
28
- 29 39. Privacy Commissioner. Health Information Privacy Code 1994: Privacy Commissioner; 2013 [cited  
30 2020 19th April]. Available from: [https://www.privacy.org.nz/the-privacy-act-and-codes/codes-of-  
31 practice/health-information-privacy-code-1994/](https://www.privacy.org.nz/the-privacy-act-and-codes/codes-of-practice/health-information-privacy-code-1994/).  
32  
33
- 34 40. National Ethics Advisory Committee. National Ethical Standards for Health and Disability, and  
35 Quality Improvement: Ministry of Health of NZ; 2019 [cited 2020 the 20th of February]. Available  
36 from: [https://neac.health.govt.nz/publications-and-resources/neac-publications/national-ethical-  
37 standards-health-and-disability](https://neac.health.govt.nz/publications-and-resources/neac-publications/national-ethical-standards-health-and-disability).  
38  
39
- 40 41. Benchimol EI, Smeeth L, Guttman A, et al. The REporting of studies Conducted using  
41 Observational Routinely-collected health Data (RECORD) Statement. *PLOS Medicine*  
42 2015;12(10):e1001885. doi: 10.1371/journal.pmed.1001885  
43  
44  
45  
46  
47  
48  
49  
50  
51  
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37 Fig 1. Study Design Diagram

- 38 a. Opioid-related harms include opioid use disorders (e.g. overdose, misuse or dependence)
- 39 b. Other baseline characteristics include: depression (ICD 10AM codes: F32 -F33) , anxiety (F40-F48),
- 40 dementia (F00-F03), schizophrenia and related psychotic conditions (F20-F29), bipolar disorder (F31),
- 41 alcohol and nicotine dependence (F10.20- F10.29, F17.200- F17.299), substance use (F10-F16, F18-F19,
- 42 F55), mood disorder (F30-F39), other mental health conditions (F04-F09, F51-F53, F59, F63, F68, F69,
- 43 F930-F932, F99), other medications (paracetamol, NSAIDs, pregabalin, gabapentin, benzodiazepines,
- 44 antipsychotics, antidepressants) and presence of chronic pain
- 45 c. Earliest outcome of interest: persistent opioid use beyond 90 days
- 46 d. Secondary outcome at 365 days: total duration of persistent opioid use from an index date, opioid-related
- 47 fatal overdose, all-cause mortality, opioid dependency, opioid misuse, and hospital admission related to
- 48 opioid overdose and toxicity during the follow-up period.

49 M3I = M3 Comorbidity Index

50 338x317mm (96 x 96 DPI)

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# Opioid study- supplementary section

## Opioid related harm- ICD-10AM codes

Outcome	ICD-10AM code
Mental and behavioural disorders due to use of opioids	F11
Mental and behavioural disorders due to use of opioids, acute intoxication	F110
Mental and behavioural disorders due to use of opioids, harmful use	F111
Mental and behavioural disorders due to use of opioids, dependence syndrome	F112
Mental and behavioural disorders due to use of opioids, withdrawal state	F113
Mental and behavioural disorders due to use of opioids, withdrawal state with delirium	F114
Mental and behavioural disorders due to use of opioids, psychotic disorder	F115
Mental and behavioural disorders due to use of opioids, amnesic syndrome	F116
Mental and behavioural disorders due to use of opioids, residual and late-onset psychotic disorder	F117
Mental and behavioural disorders due to use of opioids, other mental and behavioural disorders	F118
Mental and behavioural disorders due to use of opioids, unspecified mental and behavioural disorder	F119
Neonatal withdrawal symptoms from maternal use of drugs of addiction	P961
Poisoning by opium	T400
Poisoning by heroin	T401
Poisoning by other opioids	T402
Poisoning by methadone	T403
Poisoning by other synthetic narcotics	T404
Poisoning by cocaine	T405
Poisoning by other and unspecified narcotics	T406
Opioids and related analgesics causing adverse effect in therapeutic use	Y450

## Trauma admissions- ICD-10AM codes

Site of Trauma	ICD-10AM code
Head	S00- S09
Neck	S10- S19
Thorax	S20- S29
Abdomen/Lower back, Pelvis	S30- S39
Shoulder/Upper arm	S40- S49
Elbow/Forearm	S50- S59
Wrist/Hand	S60- S69
Hip/Thigh	S70- S79
Knee/Lower leg	S80- S89
Ankle/Foot	S90- S99
Multiple	T00- T07
Unspecified part of trunk, limb, or body region	T08- T14

### M3 Index variables

Condition	Beta coefficient: log (HR) (95% CI)
AIDS	0.45 (-0.18 to 1.08)
Alcohol abuse	0.58 (0.47 to 0.68)
Anemia deficiency	0.18 (0.12 to 0.24)
Anxiety and behavioural disorders	0.12 (0.04 to 0.21)
Aortic and other aneurysms	0.26 (0.14 to 0.38)
Bone disorders	0.13 (0.03 to 0.24)
Bowel disease inflammatory	0.09 (0.03 to 0.14)
Breast Cancer	0.41 (0.26 to 0.56)
Cardiac Arrhythmia	0.17 (0.13 to 0.21)
Cardiac valve	0.26 (0.19 to 0.32)
Cerebrovascular disease	0.10 (0.04 to 0.16)
Chronic pulmonary	0.63 (0.58 to 0.67)
Chronic renal	0.33 (0.28 to 0.39)
Coagulopathy and other blood disorders	0.27 (0.22 to 0.31)
Colorectal cancer	0.37 (0.26 to 0.49)
Congestive heart failure	0.54 (0.49 to 0.59)
Connective tissue disease	0.29 (0.18 to 0.40)
Dementia	1.02 (0.97 to 1.07)
Diabetes (complicated)	0.27 (0.22 to 0.32)
Diabetes (uncomplicated)	0.30 (0.17 to 0.43)
Drug abuse	0.56 (0.38 to 0.74)
Endocrine disorder	0.11 (0.03 to 0.20)
Epilepsy	0.59 (0.47 to 0.72)
Eye problem long term	0.18 (0.12 to 0.24)
Gastrointestinal ulcer or upper GI disease	0.15 (0.07 to 0.23)
Gynecological cancers	0.71 (0.47 to 0.94)
Hepatitis, chronic viral	0.57 (0.42 to 0.72)
Hypertension uncomplicated	0.12 (0.06 to 0.17)
Immune system disorder	0.40 (0.18 to 0.61)
Inner ear disorder	0.06 (-0.02 to 0.14)
Joint or spinal disorder	0.10 (0.02 to 0.18)
Liver disease (Moderate or severe)	0.47 (0.36 to 0.59)
Lung cancer	1.97 (1.85 to 2.09)
Lymphomas and leukaemia	1.19 (1.08 to 1.30)
Major psychiatric disorder	0.21 (0.13 to 0.29)
Malignant melanoma	0.34 (0.21 to 0.47)
Malnutrition and other nutritional disorders	0.33 (0.25 to 0.41)
Mental and behavioural disorders due to brain damage	0.04 (-0.17 to 0.24)
Mental retardation	1.41 (1.21 to 1.60)
Metabolic disorder	0.01 (-0.05 to 0.06)
Metastatic cancer	2.47 (2.42 to 2.51)
Muscular peripheral nerve disorders	0.21 (0.11 to 0.31)
Myocardial infarction	0.20 (0.14 to 0.25)
Obesity	0.25 (0.16 to 0.34)

Osteoporosis (uncomplicated)	0.08 (-0.06 to 0.23)
Other cancers	1.10 (1.02 to 1.18)
Other neurologic disorders (excl. epilepsy)	0.56 (0.50 to 0.63)
Paralysis	0.28 (0.21 to 0.36)
Peripheral vascular disease	0.35 (0.28 to 0.42)
Prostate cancer	0.43 (0.33 to 0.53)
Pulmonary circulation disorders	0.40 (0.31 to 0.48)
Sleep disorder	0.25 (0.12 to 0.37)
Upper gastrointestinal cancer	1.94 (1.82 to 2.07)
Urinary tract problem (chronic)	0.05 (-0.05 to 0.15)
Venous insufficiency	0.21 (0.06 to 0.36)

## Medication and Form ID code

Form ID	Chemical	Formulation
183101	Morphine sulphate	Tab long-acting 10 mg
183102	Morphine sulphate	Tab long-acting 30 mg
183103	Morphine sulphate	Tab long-acting 60 mg
183104	Morphine sulphate	Tab long-acting 100 mg
183119	Morphine sulphate	Cap long-acting 100 mg
183120	Morphine sulphate	Tab immediate-release 10 mg
183121	Morphine sulphate	Tab immediate-release 20 mg
183122	Morphine sulphate	Cap long-acting 10 mg
183126	Morphine sulphate	Cap long-acting 30 mg
183127	Morphine sulphate	Cap long-acting 60 mg
183001	Morphine hydrochloride	Oral liq 1 mg per ml
183002	Morphine hydrochloride	Oral liq 2 mg per ml
183003	Morphine hydrochloride	Oral liq 5 mg per ml
183004	Morphine hydrochloride	Oral liq 10 mg per ml
382225	Oxycodone hydrochloride	Cap immediate-release 5 mg
382226	Oxycodone hydrochloride	Cap immediate-release 10 mg
382227	Oxycodone hydrochloride	Cap immediate-release 20 mg
382228	Oxycodone hydrochloride	Tab controlled-release 10 mg
382229	Oxycodone hydrochloride	Tab controlled-release 20 mg
382230	Oxycodone hydrochloride	Tab controlled-release 40 mg
382231	Oxycodone hydrochloride	Tab controlled-release 80 mg
382232	Oxycodone hydrochloride	Tab controlled-release 5 mg
382233	Oxycodone hydrochloride	Oral liq 5 mg per 5 ml
380132	Fentanyl	Transdermal patch, matrix 100 mcg per hour
380133	Fentanyl	Patch 12.5 mcg per hour
380134	Fentanyl	Patch 25 mcg per hour
380135	Fentanyl	Patch 50 mcg per hour
380136	Fentanyl	Patch 75 mcg per hour
380137	Fentanyl	Patch 100 mcg per hour

133201	Codeine phosphate	Tab 15 mg
133202	Codeine phosphate	Tab 30 mg
133203	Codeine phosphate	Tab 60 mg
242701	Dihydrocodeine tartrate	Tab long-acting 60 mg
390625	Tramadol hydrochloride	Cap 50 mg
390626	Tramadol hydrochloride	Tab sustained-release 100 mg
390627	Tramadol hydrochloride	Tab sustained-release 150 mg
390628	Tramadol hydrochloride	Tab sustained-release 200 mg
195301	Pethidine hydrochloride	Tab 50 mg
195302	Pethidine hydrochloride	Tab 100 mg
179501	Methadone hydrochloride	Tab 5 mg
179505	Methadone hydrochloride	Oral liq 2 mg per ml
179506	Methadone hydrochloride	Oral liq 5 mg per ml
179507	Methadone hydrochloride	Oral liq 10 mg per ml

## Oral Morphine Equivalence conversion factors

Opioid name	Route of administration	Conversion factor
Morphine	Oral	1
Oxycodone	Oral	1.5
Fentanyl	Transdermal	7200*
Methadone	Oral	4.7
Pethidine	Oral	0.4
Dihydrocodeine	Oral	0.1
Codeine	Oral	0.1
Tramadol	Oral	0.1

Usual conversion for transdermal for fentanyl to oral morphine is 100:1, but given the patches dosing are mcg/hr for \*24 over 3 days

## Concurrent medication and Form ID code

Form ID	Chemical	Formulation
181501	Metoclopramide hydrochloride with paracetamol	Tab 5 mg with paracetamol 500 mg
192902	Paracetamol	Oral liq 120 mg per 5 ml
192903	Paracetamol	Oral liq 250 mg per 5 ml
192904	Paracetamol	Suppos 125 mg
192905	Paracetamol	Suppos 250 mg
192906	Paracetamol	Suppos 500 mg
192908	Paracetamol	Tab 500 mg - blister pack
192925	Paracetamol	Tab 500 mg - bottle pack
193101	Paracetamol with codeine	Tab paracetamol 500 mg with codeine phosphate 8 mg
279805	Ibuprofen	Oral liq 20 mg per ml
279801	Ibuprofen	Tab 200 mg



279802	Ibuprofen	Tab 400 mg
279803	Ibuprofen	Tab 600 mg
279804	Ibuprofen	Tab long-acting 800 mg
140109	Diclofenac sodium	Suppos 100 mg
140106	Diclofenac sodium	Suppos 12.5 mg
140107	Diclofenac sodium	Suppos 25 mg
140108	Diclofenac sodium	Suppos 50 mg
140111	Diclofenac sodium	Tab 50 mg dispersible
140101	Diclofenac sodium	Tab EC 25 mg
140102	Diclofenac sodium	Tab EC 50 mg
140112	Diclofenac sodium	Tab long-acting 100 mg
140103	Diclofenac sodium	Tab long-acting 75 mg
278209	Naproxen	Tab 250 mg
278211	Naproxen	Tab 500 mg
278206	Naproxen	Tab long-acting 1 g
278205	Naproxen	Tab long-acting 750 mg
169708	Ketoprofen	Cap long-acting 100 mg
169703	Ketoprofen	Cap long-acting 200 mg
176901	Mefenamic acid	Cap 250 mg
391225	Meloxicam	Tab 7.5 mg
408125	Celecoxib	Cap 100 mg
408126	Celecoxib	Cap 200 mg
219301	Sulindac	Tab 100 mg
219302	Sulindac	Tab 200 mg
253601	Tenoxicam	Tab 20 mg
184901	Nefopam hydrochloride	Tab 30 mg
409727	Pregabalin	Cap 150 mg
409725	Pregabalin	Cap 25 mg
409728	Pregabalin	Cap 300 mg
409726	Pregabalin	Cap 75 mg
106225	Gabapentin	Cap 100 mg
106201	Gabapentin	Cap 300 mg
106202	Gabapentin	Cap 400 mg
106026	Gabapentin (Neurontin)	Tab 600 mg
139701	Diazepam	Tab 2 mg
139702	Diazepam	Tab 5 mg
173004	Lorazepam	Tab 1 mg
173002	Lorazepam	Tab 2.5 mg
222425	Temazepam	Tab 10 mg
186501	Nitrazepam	Tab 5 mg
173101	Lormetazepam	Tab 1 mg
229501	Triazolam	Tab 125 mcg
229502	Triazolam	Tab 250 mcg
263203	Alprazolam	Tab 1 mg



263201	Alprazolam	Tab 250 mcg
263202	Alprazolam	Tab 500 mcg
131603	Clonazepam	Oral drops 2.5 mg per ml
131602	Clonazepam	Tab 2 mg
131601	Clonazepam	Tab 500 mcg
191101	Oxazepam	Tab 10 mg
191102	Oxazepam	Tab 15 mg
119301	Citalopram hydrobromide	Tab 20 mg
119025	Citalopram hydrobromide (Celapram)	Tab 20 mg
392625	Escitalopram	Tab 10 mg
392626	Escitalopram	Tab 20 mg
263601	Fluoxetine hydrochloride	Cap 20 mg
263602	Fluoxetine hydrochloride	Tab dispersible 20 mg, scored
600901	Paroxetine	Tab 20 mg
392726	Sertraline	Tab 100 mg
392725	Sertraline	Tab 50 mg
105901	Amitriptyline	Tab 10 mg
105902	Amitriptyline	Tab 25 mg
105903	Amitriptyline	Tab 50 mg
131501	Clomipramine hydrochloride	Tab 10 mg
131502	Clomipramine hydrochloride	Tab 25 mg
143702	Dosulepin [Dothiepin] hydrochloride	Cap 25 mg
143701	Dosulepin [Dothiepin] hydrochloride	Tab 75 mg
143801	Doxepin hydrochloride	Cap 10 mg
143802	Doxepin hydrochloride	Cap 25 mg
143803	Doxepin hydrochloride	Cap 50 mg
164201	Imipramine hydrochloride	Tab 10 mg
164202	Imipramine hydrochloride	Tab 25 mg
187601	Nortriptyline hydrochloride	Tab 10 mg
187602	Nortriptyline hydrochloride	Tab 25 mg
176001	Maprotiline hydrochloride	Tab 25 mg
176002	Maprotiline hydrochloride	Tab 75 mg
195501	Phenelzine sulphate	Tab 15 mg
228501	Tranlycypromine sulphate	Tab 10 mg
263802	Moclobemide	Tab 150 mg
263803	Moclobemide	Tab 300 mg
390125	Mirtazapine	Tab 30 mg
390126	Mirtazapine	Tab 45 mg
378526	Venlafaxine	Cap 150 mg
378527	Venlafaxine	Cap 37.5 mg
378525	Venlafaxine	Cap 75 mg
378530	Venlafaxine	Tab 150 mg
378531	Venlafaxine	Tab 225 mg
378528	Venlafaxine	Tab 37.5 mg

378529	Venlafaxine	Tab 75 mg
389225	Bupropion hydrochloride	Tab modified release 150 mg
128301	Chlorpromazine hydrochloride	Tab 10 mg
128304	Chlorpromazine hydrochloride	Tab 100 mg
128302	Chlorpromazine hydrochloride	Tab 25 mg
158304	Haloperidol	Oral liq 2 mg per ml
158302	Haloperidol	Tab 1.5 mg
158303	Haloperidol	Tab 5 mg
158301	Haloperidol	Tab 500 mcg
253003	Haloperidol decanoate	Inj 100 mg per ml, 1 ml
253001	Haloperidol decanoate	Inj 50 mg per ml, 1 ml
195002	Pericyazine	Tab 10 mg
195001	Pericyazine	Tab 2.5 mg
601205	Prochlorperazine	Suppos 25 mg
601201	Prochlorperazine	Tab 3 mg buccal
601202	Prochlorperazine	Tab 5 mg
229801	Trifluoperazine hydrochloride	Tab 1 mg
229802	Trifluoperazine hydrochloride	Tab 2 mg
229803	Trifluoperazine hydrochloride	Tab 5 mg
199025	Pimozide	Tab 4 mg
380325	Zuclopenthixol decanoate	Inj 200 mg per ml, 1 ml
389825	Zuclopenthixol hydrochloride	Tab 10 mg
388428	Amisulpride	Oral liq 100 mg per ml
388425	Amisulpride	Tab 100 mg
388426	Amisulpride	Tab 200 mg
388427	Amisulpride	Tab 400 mg
387825	Aripiprazole	Tab 10 mg
387826	Aripiprazole	Tab 15 mg
387827	Aripiprazole	Tab 20 mg
387828	Aripiprazole	Tab 30 mg
387829	Aripiprazole	Tab 5 mg
387830	Aripiprazole	Tablet 5 mg
107827	Clozapine	Suspension 50 mg per ml
107802	Clozapine	Tab 100 mg
107826	Clozapine	Tab 200 mg
107801	Clozapine	Tab 25 mg
107825	Clozapine	Tab 50 mg
114015	Olanzapine	Inj 210 mg vial
114016	Olanzapine	Inj 300 mg vial
114017	Olanzapine	Inj 405 mg vial
114002	Olanzapine	Tab 10 mg
114003	Olanzapine	Tab 2.5 mg
114001	Olanzapine	Tab 5 mg
114028	Olanzapine	Tab orodispersible 10 mg

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4	114027	Olanzapine	Tab orodispersible 5 mg
5	118302	Quetiapine	Tab 100 mg
6	118303	Quetiapine	Tab 200 mg
7	118301	Quetiapine	Tab 25 mg
8	118325	Quetiapine	Tab 300 mg
9	101126	Risperidone	Inj 25 mg vial
10	101127	Risperidone	Inj 37.5 mg vial
11	101128	Risperidone	Inj 50 mg vial
12	101105	Risperidone	Oral liq 1 mg per ml
13	101125	Risperidone	Tab 0.5 mg
14	101101	Risperidone	Tab 1 mg
15	101102	Risperidone	Tab 2 mg
16	101103	Risperidone	Tab 3 mg
17	101104	Risperidone	Tab 4 mg
18	101129	Risperidone	Tab orodispersible 0.5 mg
19	101130	Risperidone	Tab orodispersible 1 mg
20	101131	Risperidone	Tab orodispersible 2 mg
21	402528	Paliperidone	Inj 100 mg syringe
22	402529	Paliperidone	Inj 150 mg syringe
23	402525	Paliperidone	Inj 25 mg syringe
24	402526	Paliperidone	Inj 50 mg syringe
25	402527	Paliperidone	Inj 75 mg syringe
26	387325	Ziprasidone	Cap 20 mg
27	387326	Ziprasidone	Cap 40 mg
28	387327	Ziprasidone	Cap 60 mg
29	387328	Ziprasidone	Cap 80 mg
30	153203	Flupenthixol decanoate	Inj 100 mg per ml, 1 ml
31	153201	Flupenthixol decanoate	Inj 20 mg per ml, 1 ml
32	153202	Flupenthixol decanoate	Inj 20 mg per ml, 2 ml
33	153304	Fluphenazine decanoate	Inj 100 mg per ml, 1 ml
34	153301	Fluphenazine decanoate	Inj 12.5 mg per 0.5 ml, 0.5 ml
35	153302	Fluphenazine decanoate	Inj 25 mg per ml, 1 ml
36	153303	Fluphenazine decanoate	Inj 25 mg per ml, 2 ml
37	246604	Lithium carbonate	Cap 250 mg
38	246601	Lithium carbonate	Tab 250 mg
39	246602	Lithium carbonate	Tab 400 mg
40	246603	Lithium carbonate	Tab long-acting 400 mg
41	121703	Carbamazepine	Oral liq 20 mg per ml
42	121704	Carbamazepine	Tab 200 mg
43	121706	Carbamazepine	Tab 400 mg
44	121705	Carbamazepine	Tab long-acting 200 mg
45	121707	Carbamazepine	Tab long-acting 400 mg
46	216604	Sodium valproate	Oral liq 200 mg per 5 ml
47	216601	Sodium valproate	Tab 100 mg
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216602	Sodium valproate	Tab 200 mg EC
216603	Sodium valproate	Tab 500 mg EC
100228	Lamotrigine	Tab dispersible 100 mg
100230	Lamotrigine	Tab dispersible 2 mg
100226	Lamotrigine	Tab dispersible 25 mg
100225	Lamotrigine	Tab dispersible 5 mg
100227	Lamotrigine	Tab dispersible 50 mg
130801	Clobazam	Tab 10 mg

## Procedure list and complexity category- Adapted from 11<sup>th</sup> edition of Australasian Classification of Health Interventions (ACHI)

Procedure	Operation severity
1 Examination of skull, meninges or brain	3
2 Cranial tap or puncture	3
3 Insertion of intracranial cerebrospinal fluid devices	3
4 Removal of intracranial cerebrospinal fluid devices	3
5 Irrigation, insertion or removal of intracranial cerebrospinal fluid shunt	3
6 Other application, insertion or removal procedures on skull, meninges or brain	3
7 Incisional exploration of meninges or brain	4
8 Intracranial drainage	5
9 Intracranial decompression	5
10 Postoperative reopening of craniotomy or craniectomy site	5
11 Destruction of intracranial aneurysm or other vascular lesion	5
12 Biopsy of brain or meninges	4
13 Excision of lesion of skull	3
14 Removal of intracranial haematoma or abscess	5
15 Removal of intracranial lesion	5
16 Other intracranial excision	5
17 Skull base surgery for lesion	5
19 Ventriculostomy	4
20 Repair of dura of brain	4
21 Extracranial to intracranial bypass	5
22 Other repair of meninges or brain	5
23 Cranioplasty	4
24 Revision of intracranial cerebrospinal fluid shunt	4
25 Procedures for skull fracture	4
27 Functional intracranial stereotactic procedure	4
28 Other procedures on skull, meninges or brain	4

29 Examination of spinal canal and spinal cord structures	4
30 Lumbar puncture	2
31 Application, insertion or removal procedures on vertebra or intervertebral disc	3
32 Epidural injection	2
33 Epidural infusion	2
34 Caudal injection	2
35 Caudal infusion	2
36 Spinal injection	2
37 Spinal infusion	2
38 Spinal blood patch	2
39 Insertion of spinal catheter, infusion device or pump	2
40 Removal of spinal catheter, infusion device or pump	2
41 Insertion and removal of spinal cerebrospinal fluid drain	3
42 Insertion and removal of spinal cerebrospinal fluid shunt	3
43 Insertion, replacement or removal of epidural electrodes	2
45 Cordotomy or myelotomy	4
46 Decompression of cervical spinal cord	3
47 Decompression of thoracic and thoracolumbar spinal cord	3
48 Decompression of lumbar spinal canal	3
49 Other incision procedures on spinal canal or spinal cord structures	3
50 Biopsy of spinal cord or spinal meninges	3
51 Discectomy for recurrent disc lesion	3
52 Other discectomy	3
53 Removal of spinal lesion	3
54 Other excision procedures on spinal canal or spinal cord structures	3
55 Repair of spinal canal or spinal cord structures	3
56 Revision procedures on spinal canal or spinal cord structures	3
58 Functional spinal stereotactic procedure	3
59 Other procedures on spinal canal or spinal cord structures	3
60 Administration of anaesthetic agent around cranial nerve	2
61 Administration of neurolytic agent into cranial nerve	2
62 Administration of agent into posterior primary rami of spinal nerve	2
63 Administration of anaesthetic agent around other peripheral nerve	2
64 Administration of neurolytic agent into other peripheral nerve	2
65 Administration of therapeutic agent around sympathetic nervous system	2
66 Administration of neurolytic agent into sympathetic nervous system	2

67	Insertion, replacement or removal of peripheral nerve electrodes	2
68	Exploration of brachial plexus	2
69	Incision of optic nerve meninges	3
70	Trigeminal gangliotomy	2
71	Percutaneous neurotomy of primary posterior rami of spinal nerve	2
72	Percutaneous neurotomy of other peripheral nerve	2
73	Division of intracranial nerve	2
74	Division of peripheral nerve	2
75	Decompression of intracranial nerve	4
76	Release of carpal and tarsal tunnel	2
77	Other neurolysis of peripheral nerve and nerve trunk	2
78	Destruction of nerve	2
79	Biopsy of nerve	2
80	Removal of lesion of nerve	2
81	Surgical sympathectomy	2
82	Other peripheral neurectomy	2
83	Repair of nerve or nerve trunk	2
84	Secondary repair of nerve or nerve trunk	2
85	Reoperation for previous sympathectomy	2
86	Other procedures on nerves	2
110	Application, insertion or removal procedures on thyroid or parathyroid gland	3
111	Incision procedures on thyroid	3
112	Biopsy of parathyroid or thyroid gland	2
113	Parathyroidectomy	3
114	Subtotal thyroidectomy	3
115	Total thyroidectomy	3
116	Other excision procedures on thyroid or parathyroid gland	3
117	Other procedures on thyroid or parathyroid gland	3
118	Biopsy of adrenal gland	3
119	Adrenalectomy	4
121	Other procedures on adrenal gland	4
122	Excision procedures on pineal gland	4
123	Other procedures on pineal gland	4
124	Biopsy of pituitary gland	4
125	Other excision procedures on pituitary gland	4
126	Other procedures on pituitary gland	4
127	Biopsy of thymus	3
128	Removal of thymus	3
129	Other procedures on thymus	3
160	Examination procedures on eyeball	1

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3	161	Excision procedures on eyeball
4		2
5	162	Repair of perforating wound of eyeball
6		2
7	163	Other repair procedures on eyeball
8		2
9	164	Secondary procedures after removal of eyeball
10		2
11	165	Other procedures on eyeball
12		2
13	166	Application, insertion or removal procedures on cornea
14		2
15	167	Incision procedures on cornea
16		2
17	168	Destruction procedures on cornea
18		2
19	169	Biopsy of cornea
20		2
21	170	Keratectomy
22		2
23	171	Excision of lesion of limbus
24		2
25	172	Other excision procedures on cornea
26		2
27	173	Keratoplasty
28		2
29	174	Other repair procedures on cornea
30		2
31	175	Reoperation procedures on cornea
32		2
33	176	Other procedures on cornea
34		2
35	177	Application, insertion or removal procedures on sclera
36		2
37	178	Incision procedures on sclera
38		2
39	179	Destruction procedures on sclera
40		2
41	180	Biopsy of sclera
42		2
43	181	Other excision procedures on sclera
44		2
45	182	Repair procedures on sclera
46		2
47	183	Revision procedures on sclera
48		2
49	184	Other procedures on sclera
50		2
51	185	Application, insertion or removal procedures on iris, ciliary body or anterior chamber
52		2
53	186	Division of synechiae
54		2
55	187	Other incision procedures on iris, ciliary body or anterior chamber
56		2
57	188	Destruction procedures on iris, ciliary body or anterior chamber
58		2
59	189	Excision procedures on iris, ciliary body or anterior chamber
60		2
	190	Repair procedures on iris, ciliary body or anterior chamber
		2
	191	Procedures for glaucoma
		2
	192	Other procedures on iris, ciliary body or anterior chamber
		2
	193	Insertion of intraocular lens prosthesis
		2
	194	Replacement or removal of artificial lens
		2
	195	Intracapsular crystalline lens extraction
		2
	196	Extracapsular crystalline lens extraction by aspiration alone
		2
	197	Extracapsular crystalline lens extraction by phacoemulsification
		2
	198	Extracapsular crystalline lens extraction by mechanical phacofragmentation
		2
	199	Other extracapsular crystalline lens extraction
		2

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3	200 Other extraction of crystalline lens	2
4	201 Removal of after cataract	2
5	202 Other application, insertion or removal procedures on lens	2
6	203 Other procedures on lens	2
7	204 Aspiration of aqueous or vitreous	2
8	205 Other application, insertion or removal procedures on aqueous or vitreous	2
9	206 Destruction procedures on aqueous or vitreous	2
10	207 Vitrectomy	2
11	208 Other procedures on vitreous	2
12	209 Application, insertion or removal procedures on retina, choroid or posterior chamber	2
13	210 Incision procedures on retina, choroid or posterior chamber	2
14	211 Destruction procedures on retina, choroid or posterior chamber	1
15	212 Repair of retinal detachment	1
16	213 Revision procedures on retina, choroid or posterior chamber	1
17	214 Other procedures on retina, choroid or posterior chamber	1
18	215 Excision procedures on extraocular muscle	2
19	216 Strabismus repair	2
20	217 Other repair of extraocular muscle	2
21	218 Revision procedures on extraocular muscle	2
22	219 Reoperation procedures on extraocular muscle	2
23	220 Other procedures on extraocular muscle or tendon	2
24	221 Application, insertion or removal procedures on orbit	2
25	222 Orbitotomy	2
26	223 Other incision procedures on orbit	2
27	224 Orbitotomy with biopsy or excision	2
28	225 Exenteration of orbit	2
29	226 Other excision procedures on orbit	2
30	227 Orbitotomy with removal and replacement of bone	2
31	228 Other repair procedures on orbit	2
32	229 Other procedures on orbit	2
33	230 Application, insertion or removal procedures on eyelid	2
34	231 Incision procedures on eyelid	2
35	232 Biopsy of eyelid	2
36	233 Other excision procedures on eyelid	2
37	234 Graft to eyelid	2
38	235 Canthoplasty	2
39	236 Other repair procedures on eyelid	2
40	237 Reconstruction procedure on eyelid	2
41	238 Procedures for correction of trichiasis	2
42	239 Procedures for ectropion or entropion	2
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4	240 Other procedures on eyelid	2
5	241 Probing of lacrimal passages	2
6	242 Insertion, replacement or removal of nasolacrimal tube	2
7	243 Other application, insertion or removal procedures on	2
8	lacrimal system	
9		
10	244 Incision procedures on lacrimal system	2
11	245 Destruction procedures on lacrimal system	2
12	246 Excision procedures on lacrimal system	2
13	247 Repair procedures on lacrimal system	2
14	248 Reoperation procedures on lacrimal passages	2
15	249 Procedures for establishment of lacrimal patency	2
16		
17	250 Other procedures on lacrimal system	2
18		
19	251 Application, insertion or removal procedures on	2
20	conjunctiva	
21	252 Incision procedures on conjunctiva	2
22		
23	253 Destruction procedures on conjunctiva	2
24	254 Excision procedures on conjunctiva	2
25	255 Repair procedures on conjunctiva	2
26	256 Other procedures on conjunctiva	2
27		
28	300 Examination procedures on external ear	1
29		
30	301 Application, insertion or removal procedures on external	2
31	ear	
32	302 Incision procedures on auditory canal	2
33	303 Excision procedures on external ear	2
34	304 Repair procedures on external ear	2
35	305 Reconstruction procedures on external ear	2
36	306 Other procedures on external ear	2
37		
38	307 Examination procedures on eardrum or middle ear	1
39		
40	308 Application, insertion or removal procedures on eardrum or	1
41	middle ear	
42	309 Myringotomy	1
43		
44	310 Other incision procedures on eardrum or middle ear	1
45	311 Destruction procedures on eardrum or middle ear	2
46	312 Excision procedures on eardrum or middle ear	2
47		
48	313 Myringoplasty	2
49	314 Other repair procedures on eardrum or middle ear	2
50	315 Reconstruction procedures on eardrum or middle ear	2
51	316 Other procedures on eardrum or middle ear	2
52		
53	317 Excision procedures on ossicles of ear	2
54	318 Repair procedures on ossicles of ear	2
55		
56	319 Reconstruction procedures on ossicles of ear	2
57	320 Other procedures on ossicles of ear	2
58		
59	321 Application, insertion or removal procedures on mastoid or	2
60	temporal bone	

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4	322 Incision procedures on mastoid or temporal bone	2
5	323 Mastoidectomy	2
6	324 Other excision procedures on mastoid or temporal bone	2
7	325 Repair procedures on mastoid or temporal bone	2
8		
9	326 Reconstruction procedures on mastoid or temporal bone	2
10	327 Revision procedures on mastoid or temporal bone	2
11	328 Other procedures on mastoid or temporal bone	2
12		
13	329 Application, insertion or removal procedures on inner ear	2
14	330 Incision procedures on inner ear	2
15	331 Excision procedures on inner ear	2
16	332 Repair procedures on inner ear	2
17	333 Other procedures on inner ear	2
18		
19	370 Examination procedures on nose	1
20	371 Application, insertion or removal procedures on nose	1
21	372 Incision procedures on nose	1
22		
23	373 Arrest of nasal haemorrhage	2
24	374 Other destruction procedures on nose	2
25	375 Biopsy of nasal cavity	2
26	376 Excision procedures on nasal turbinates	2
27	377 Removal of intranasal lesion	2
28	378 Other excision procedures on nose	2
29	379 Repair of nasal septum	2
30	380 Other repair procedures on nose	2
31	381 Other procedures on nose	2
32	382 Application, insertion or removal procedures on nasal sinuses	2
33	383 Incision procedures on nasal sinuses	2
34	384 Biopsy of nasal sinuses	2
35	385 Intranasal removal of polyp from nasal sinuses	2
36	386 Other excision procedures on nasal sinuses	2
37	387 Maxillary antrostomy	2
38	388 Other repair procedures on nasal sinuses	2
39	389 Other procedures on nasal sinuses	2
40	390 Incision procedures on tongue	2
41	391 Destruction procedures on tongue	2
42	392 Excision procedures on tongue	2
43	393 Repair procedures on tongue	2
44	394 Other procedures on tongue	2
45	395 Incision procedures on salivary gland or duct	2
46	396 Destruction procedures on salivary gland or duct	2
47	397 Excision procedures on salivary gland or duct	2
48	398 Repair procedures on salivary gland or duct	2
49	399 Other procedures on salivary gland or duct	2
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4	400 Application, insertion or removal procedures on mouth, palate or uvula	2
5	401 Incision procedures on mouth, palate or uvula	2
6	402 Biopsy of oral cavity or soft palate	2
7	403 Excision of lesion of mouth or palate	2
8	404 Other excision procedures on mouth, palate or uvula	2
9	405 Uvulopalatopharyngoplasty	2
10	406 Other repair procedures on mouth, palate or uvula	2
11	407 Revision procedures on mouth, palate or uvula	2
12	408 Other procedures on mouth, palate or uvula	2
13	409 Incision procedures on tonsils or adenoids	2
14	410 Destruction procedures on tonsils or adenoids	2
15	411 Biopsy of tonsils or adenoids	2
16	412 Tonsillectomy or adenoidectomy	2
17	413 Other excision procedures on tonsils or adenoids	2
18	414 Other repair procedures on tonsils or adenoids	2
19	415 Other procedures on tonsils or adenoids	2
20	416 Examination procedures on pharynx	1
21	417 Application, insertion or removal procedures on pharynx	2
22	418 Incision procedures on pharynx	2
23	419 Destruction procedures on pharynx	2
24	420 Pharyngectomy	3
25	421 Other excision procedures on pharynx	3
26	422 Other procedures on pharynx	2
27	520 Examination procedures on larynx	1
28	521 Application, insertion or removal procedures on larynx	2
29	522 Incision procedures on larynx	2
30	523 Laryngoscopy with excision	2
31	524 Laryngectomy	4
32	525 Other excision procedures on larynx	2
33	526 Laryngoplasty	3
34	527 Laryngofissure	3
35	528 Other repair procedures on larynx	3
36	529 Reconstruction procedures on larynx	4
37	530 Reoperation procedures on larynx	3
38	531 Other procedures on larynx	2
39	532 Examination procedures on trachea	1
40	533 Application, insertion or removal procedures on trachea	2
41	534 Excision procedures on trachea	2
42	535 Cricothyrostomy	3
43	536 Tracheostomy	3
44	537 Resection of endotracheal lesion with repair	3
45	538 Resection of endotracheal stricture with repair	3
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4	539 Other repair procedures on trachea	4
5	540 Reconstruction procedures on trachea	5
6	541 Revision procedures on trachea	5
7	542 Other procedures on trachea	3
8	543 Examination procedures on bronchus	1
9	544 Bronchoscopy with biopsy or removal of foreign body	2
10	545 Other excision procedures on bronchus	2
11	546 Repair procedures on bronchus	5
12	547 Other procedures on bronchus	3
13	548 Application, insertion or removal procedures on lung or pleura	2
14	549 Incision procedures on lung or pleura	3
15	550 Biopsy of lung or pleura	3
16	551 Partial resection of lung	5
17	552 Lobectomy of lung	5
18	553 Pneumonectomy	5
19	554 Other excision procedures on lung or pleura	5
20	555 Transplantation of lung	5
21	556 Other repair procedures on lung or pleura	5
22	557 Revision procedures on lung or pleura	5
23	558 Other procedures on lung or pleura	5
24	559 Examination procedures on chest wall, mediastinum or diaphragm	4
25	560 Application, insertion or removal procedures on chest wall, mediastinum or diaphragm	4
26	561 Incision procedures on chest wall, mediastinum or diaphragm	4
27	562 Destruction procedures on chest wall, mediastinum or diaphragm	4
28	563 Excision procedures on chest wall, mediastinum or diaphragm	4
29	564 Repair of pectus carinatum or excavatum	4
30	565 Thoracoplasty	4
31	566 Other repair procedures on chest wall, mediastinum or diaphragm	5
32	567 Other procedures on chest wall, mediastinum or diaphragm	4
33	568 Airway management	2
34	569 Ventilatory support	2
35	570 Noninvasive ventilatory support	2
36	600 Incision procedures on atrium	5
37	601 Destruction procedures on atrium	5
38	602 Excision procedures on atrium	5
39	603 Repair procedures on atrium	5
40	604 Reconstruction procedures on atrium	5
41	605 Revision procedures on atrium	5
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3	606 Other procedures on atrium	5
4	607 Examination procedures on ventricle	5
5	608 Application, insertion or removal procedures on ventricle	5
6	609 Destruction procedures on ventricle	5
7	610 Ventricular myectomy	5
8	611 Excision of ventricular aneurysm	5
9	612 Other excision procedures on ventricle	5
10	613 Baffle or conduit procedures	5
11	614 Other repair procedures on ventricle	5
12	615 Other procedures on ventricle	5
13	616 Excision procedures on septum	5
14	617 Closure of atrial septal defect	5
15	618 Closure of ventricular septal defect	5
16	619 Other repair procedures on septum	5
17	620 Other procedures on septum	5
18	621 Incision procedures on aortic valve	5
19	622 Repair of aortic valve	5
20	623 Replacement of aortic valve	5
21	624 Other procedures on aortic valve	5
22	625 Incision procedures on mitral valve	5
23	626 Repair of mitral valve	5
24	627 Mitral valve annuloplasty	5
25	628 Replacement of mitral valve	5
26	629 Reconstruction procedures on mitral valve	5
27	630 Other procedures on mitral valve	5
28	631 Incision procedures on tricuspid valve	5
29	632 Repair of tricuspid valve	5
30	633 Tricuspid valve annuloplasty	5
31	634 Replacement of tricuspid valve	5
32	635 Other procedures on tricuspid valve	5
33	636 Incision procedures on pulmonary valve	5
34	637 Repair or replacement of pulmonary valve	5
35	638 Other procedures on pulmonary valve	5
36	639 Incision procedures on myocardium	5
37	640 Excision procedures on myocardium	5
38	641 Repair procedures on myocardium	5
39	642 Myocardial preservation	5
40	643 Drainage of heart	5
41	644 Other incision procedures on pericardium	4
42	645 Biopsy of pericardium	4
43	646 Other excision procedures on pericardium	5
44	647 Insertion of temporary transvenous electrode for cardiac pacemaker or defibrillator	3
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648 Insertion of permanent transvenous electrode for cardiac pacemaker or defibrillator	3
649 Insertion of other electrode or patch for cardiac pacemaker or defibrillator	3
650 Insertion of cardiac pacemaker generator	3
653 Insertion of cardiac defibrillator generator	3
654 Adjustment, replacement or removal of electrode for cardiac pacemaker or defibrillator	3
655 Adjustment, replacement or removal of cardiac pacemaker generator	3
656 Adjustment, replacement or removal of cardiac defibrillator generator	3
657 Other application, insertion or removal procedures on other sites of heart	3
659 Removal of donor heart or lung	999
660 Transplantation of heart or lung	5
661 Other repair procedures on other sites of heart	5
662 Reconstruction procedures on other sites of heart	5
663 Revision procedures on other sites of heart	5
664 Reoperation procedures on other sites of heart	5
665 Electrophysiological studies [EPS]	2
666 Other procedures on other sites of heart	5
667 Cardiac catheterisation	2
668 Coronary angiography	2
669 Excision procedures on coronary arteries	5
670 Transluminal coronary angioplasty	2
671 Transluminal coronary angioplasty with stenting	2
672 Coronary artery bypass - saphenous vein graft	5
673 Coronary artery bypass - other vein graft	5
674 Coronary artery bypass - left internal mammary artery [LIMA] graft	5
675 Coronary artery bypass - right internal mammary artery [RIMA] graft	5
676 Coronary artery bypass - radial artery graft	5
677 Coronary artery bypass - epigastric artery graft	5
678 Coronary artery bypass - other artery graft	5
679 Coronary artery bypass - other material graft	5
680 Reoperation procedures on coronary arteries	5
681 Other procedures on coronary arteries	5
682 Application, insertion or removal procedures on aorta	5
684 Repair of ascending thoracic aorta	5
685 Repair of aortic arch and ascending thoracic aorta	5
686 Repair of descending thoracic aorta	5
687 Replacement of ascending thoracic aorta	5
688 Replacement of aortic arch and ascending thoracic aorta	5

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3	689 Replacement of descending thoracic aorta	5
4	690 Closure of patent ductus arteriosus	5
5	691 Closure of cardiac collateral vessel	5
6	693 Repair procedures on aorta	5
7	694 Arterial catheterisation	2
8	695 Exploration of artery	3
9	696 Other incision procedures on artery	3
10	697 Interruption of artery	3
11	698 Other destruction procedures on artery	3
12	699 Biopsy of peripheral artery	2
13	700 Endarterectomy	4
14	701 Endarterectomy to prepare site for anastomosis	4
15	702 Arterial embolectomy or thrombectomy	4
16	703 Embolectomy or thrombectomy of an arterial bypass graft	4
17	704 Arterial atherectomy	4
18	705 Resection of lesion of carotid artery	4
19	706 Resection of recurrent lesion of carotid artery	4
20	707 Patch graft of artery	4
21	708 Direct closure of artery	4
22	709 Repair of artery by anastomosis	4
23	710 Repair of artery by interposition graft	4
24	711 Arterial bypass graft using vein	4
25	712 Arterial bypass graft using synthetic material	4
26	713 Arterial bypass graft using composite, sequential or crossover graft	4
27	714 Repair of aneurysm of neck, intra-abdominal area or extremities	4
28	715 Replacement of aneurysm with graft	4
29	716 Repair of aorto-enteric fistula	5
30	717 Repair procedures on pulmonary artery for congenital heart disease	5
31	718 Other repair procedures on arteries	4
32	719 Intraoperative arteriography	2
33	720 Other procedures on arteries	3
34	721 Application of external stent to vein	3
35	722 Injection of varicose veins	2
36	723 Other application, insertion or removal procedures on veins	2
37	724 Exploration of vein	2
38	725 Other incision procedures on veins	2
39	726 Interruption of vein	2
40	727 Interruption of sapheno-femoral or sapheno-popliteal junction varicose veins	2
41	728 Other destruction procedures on veins	2
42	729 Venous thrombectomy	2
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3	730 Procurement of vein	2
4	731 Patch graft of vein	2
5	732 Direct closure of vein	2
6	733 Repair of vein by anastomosis	2
7	734 Repair of vein by interposition graft	2
8	735 Venous bypass graft using vein or synthetic material	2
9	736 Other repair procedures on veins	2
10	737 Reoperation procedures on veins	2
11	738 Venous catheterisation	2
12	739 Other procedures on veins	2
13	740 Examination procedures on other vascular sites	2
14	741 Surgical peripheral arterial or venous catheterisation	2
15	742 Other application, insertion or removal procedures on other vascular sites	2
16	743 Destruction of vascular lesions	3
17	744 Laser photocoagulation of cutaneous vascular lesion	2
18	745 Interruption of feeding vessels of arteriovenous fistula	2
19	746 Other destruction procedures on vascular sites	2
20	747 Biopsy of blood vessel	2
21	748 Excision of vascular anomaly	2
22	750 Excision of arteriovenous fistula of neck	3
23	751 Excision of arteriovenous fistula of limb	3
24	752 Excision of arteriovenous fistula of abdomen	3
25	753 Other excision procedures on vascular sites	3
26	754 Transluminal balloon angioplasty	2
27	758 Peripheral laser angioplasty	1
28	759 Repair of arteriovenous fistula of neck	4
29	760 Repair of arteriovenous fistula of extremity	4
30	761 Repair of arteriovenous fistula of abdomen	4
31	762 Other repair procedures on vascular sites	4
32	763 Reoperation procedures on other vascular sites	4
33	764 Procedures for external arteriovenous shunt	4
34	765 Procedures for surgically created arteriovenous fistula	4
35	766 Vascular access device	2
36	768 Transcatheter embolisation of blood vessels	2
37	777 Other procedures on arteries and veins	2
38	800 Biopsy of bone marrow	2
39	801 Other excision procedures on bone marrow	2
40	802 Bone marrow/stem cell transplantation	2
41	803 Other procedures on bone marrow	2
42	804 Incision procedures on lymphatic structure	2
43	805 Biopsy of lymphatic structure	2
44	806 Excision procedures on lymph node of neck	2
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4	807	Excision of internal mammary lymph node	2
5	808	Excision procedures on lymph node of axilla	2
6	809	Excision procedures on lymph node of groin	2
7	810	Excision procedures on lymph nodes for gynaecological malignancy	3
8			
9	811	Excision procedures on lymph node of other sites	2
10	812	Other procedures on lymphatic structures	2
11	813	Incision procedures on spleen	4
12	814	Biopsy of spleen	4
13	815	Other excision procedures on spleen	4
14	816	Repair of spleen	4
15	817	Other procedures on spleen	4
16	850	Oesophagoscopy	1
17	851	Endoscopic administration of agent into lesion of oesophagus	2
18	852	Removal of foreign body from oesophagus	2
19	853	Other application, insertion or removal procedures on oesophagus	2
20	854	Oesophagogastric myotomy	3
21	855	Other incision procedures on oesophagus	3
22	856	Destruction procedures on oesophagus	4
23	857	Resection of oesophagus, paediatric	5
24	858	Oesophagectomy by abdominal and thoracic mobilisation	5
25	859	Oesophagectomy by abdominal and cervical mobilisation	5
26	860	Oesophagectomy by abdominal and transthoracic mobilisation	5
27	861	Other excision procedures on oesophagus	5
28	862	Dilation of oesophagus	2
29	863	Oesophagogastric myotomy and repair, laparoscopic	3
30	864	Oesophagogastric myotomy and repair, abdominal	4
31	865	Oesophagogastric myotomy and repair, thoracic	5
32	866	Repair of oesophageal atresia	5
33	867	Other repair procedures on oesophagus	5
34	868	Reconstruction procedures on oesophagus	5
35	869	Other procedures on oesophagus	5
36	870	Application, insertion or removal procedures on stomach	3
37	871	Gastrotomy	3
38	872	Vagotomy	3
39	873	Other incision procedures on stomach	3
40	874	Destruction procedures on stomach	4
41	875	Partial gastrectomy	4
42	876	Partial gastrectomy following previous procedure for peptic ulcer disease	4
43	877	Selective vagotomy with partial gastrectomy	4
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4	878 Selective vagotomy with partial gastrectomy following previous procedure for peptic ulcer disease	4
5	879 Other gastrectomy	4
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7	880 Other excision procedures on stomach	4
8	881 Gastrostomy or gastro-enterostomy	4
9		
10	882 Endoscopic dilation of gastric stricture	2
11	883 Pyloroplasty	3
12	884 Other vagotomy with repair	3
13		
14	886 Fundoplasty	3
15	887 Other repair procedures on stomach	3
16	888 Reconstruction procedures on stomach	4
17		
18	889 Procedures for morbid obesity	4
19	890 Other procedures on stomach	4
20		
21	891 Exploration of small intestine	4
22	892 Application, insertion or removal procedures on small intestine	4
23		
24	893 Enterotomy	4
25		
26	894 Other incision procedures on small intestine	4
27	895 Resection of small intestine	4
28	896 Other excision procedures on small intestine	4
29		
30	897 Stomas of small intestine	4
31	898 Reduction procedures on small intestine	4
32	899 Closure of stoma of small intestine	4
33		
34	900 Repair of small intestine	4
35	901 Other repair procedures on small intestine	4
36	902 Revision of stoma and ileostomy reservoir	4
37		
38	903 Other procedures on small intestine	4
39	904 Rigid sigmoidoscopy	1
40	905 Fibreoptic colonoscopy	1
41		
42	906 Application, insertion or removal procedures on large intestine	3
43		
44	907 Incision procedures on large intestine	3
45	908 Destruction procedures on large intestine	3
46		
47	909 Biopsy of large intestine	2
48	910 Rigid sigmoidoscopy with excision	2
49	911 Fibreoptic colonoscopy with excision	2
50		
51	913 Colectomy	4
52	914 Other excision procedures on large intestine	4
53	915 Other stomas of large intestine	4
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55	916 Reduction procedures on large intestine	4
56	917 Other repair of large intestine	4
57		
58	918 Revision procedures on large intestine	4
59	924 Procedures for exomphalos	4
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4	925 Other procedures on large intestine	4
5	926 Appendicectomy	3
6	927 Other procedures on appendix	3
7	928 Examination procedures on rectum or anus	1
8	929 Application, insertion or removal procedures on rectum or anus	1
9		
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11	930 Incision procedures on rectum or anus	2
12	931 Destruction procedures on rectum or anus	2
13		
14	932 Rectal or anal biopsy	2
15	933 Excision of lesion or tissue of rectum or anus	1
16	934 Rectosigmoidectomy or proctectomy	4
17		
18	935 Anterior resection of rectum	4
19	936 Total proctocolectomy	4
20	937 Other excision procedures on rectum or anus	4
21		
22	938 Anoplasty or anorectoplasty	4
23	939 Repair of cloacal exstrophy	4
24	940 Other repair procedures on rectum or anus	4
25		
26	941 Procedures for haemorrhoids	2
27	942 Other procedures on rectum or anus	2
28		
29	951 Application, insertion or removal procedures on liver	3
30	952 Incision procedures on liver	4
31	953 Excision procedures on liver	4
32	954 Repair procedures on liver	5
33		
34	955 Procedures for hydatid cyst of liver	4
35	956 Other procedures on liver	4
36		
37	957 Examination of gallbladder or biliary tract	2
38	958 Stenting of biliary tract	2
39		
40	959 Endoscopic and percutaneous removal of calculus	2
41	960 Removal and replacement of biliary stent	2
42	961 Other application, insertion or removal procedures on gallbladder or bile ducts	2
43		
44	962 Destruction procedures on biliary tract and gallbladder	2
45		
46	963 Incision of gallbladder, biliary tract or sphincter of Oddi	2
47	964 Biopsy of gallbladder, bile ducts or sphincter of Oddi	2
48		
49	965 Cholecystectomy	3
50	966 Resection of hepatic duct or porta hepatis	4
51	967 Resection of choledochal cyst	3
52		
53	968 Other excision procedures on gallbladder, bile ducts or sphincter of Oddi	2
54		
55	969 Stoma of gallbladder or bile duct	2
56	970 Roux-en-Y bypass	4
57		
58	971 Other repair of sphincter of Oddi, gallbladder or biliary tract	4
59	972 Procedures for portal hypertension	4
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4	973 Other procedures on gallbladder or biliary tract	4
5	974 Examination of pancreas	3
6	975 Application, insertion or removal procedures on pancreas	3
7	976 Incision procedures on pancreas	3
8	977 Biopsy of pancreas	3
9	978 Pancreatectomy	4
10	979 Other excision procedures on pancreas or pancreatic duct	4
11	980 Anastomosis of pancreas	4
12	981 Other repair procedures on pancreas	4
13	982 Other procedures on pancreas	4
14	983 Application, insertion or removal procedures on abdomen, peritoneum or omentum	4
15	984 Laparoscopy	2
16	985 Laparotomy	4
17	986 Division of abdominal adhesions	3
18	987 Other incision procedures on abdomen, peritoneum or omentum	3
19	988 Biopsy of abdomen, peritoneum or omentum	2
20	989 Other excision procedures on abdomen, peritoneum or omentum	3
21	990 Repair of inguinal hernia	2
22	991 Repair of femoral hernia	2
23	992 Repair of umbilical, epigastric or linea alba hernia	2
24	993 Repair of incisional hernia	3
25	994 Repair of parastomal hernia	3
26	996 Repair of other abdominal wall hernia	2
27	997 Repair of incarcerated, obstructed or strangulated hernia	3
28	998 Repair of diaphragmatic hernia	4
29	1000 Other repair procedures on abdomen, peritoneum or omentum	4
30	1001 Revision procedures on abdomen, peritoneum or omentum	4
31	1002 Procedures for hydatid cyst of peritoneum or abdominal organs	4
32	1003 Procedures for gastroschisis	4
33	1004 Other procedures on abdomen, peritoneum or omentum	4
34	1005 Panendoscopy	1
35	1006 Panendoscopy with removal of foreign body	2
36	1007 Panendoscopy with destruction	2
37	1008 Panendoscopy with excision	2
38	1009 Repair procedures on other and multiple sites of digestive system	3
39	1011 Other procedures on digestive system	2
40	1040 Examination procedures on kidney	2
41	1041 Manipulation or extraction of calculus of kidney	2
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4	1042 Other application, insertion or removal procedures on kidney	2
5	1043 Percutaneous nephroscopy	2
6	1044 Nephrolithotomy with removal of calculi	2
7	1045 Other incision procedures on kidney	2
8	1046 Destruction procedures on kidney	3
9	1047 Biopsy of kidney	3
10	1048 Partial nephrectomy	4
11	1049 Complete nephrectomy	4
12	1050 Complete nephrectomy for transplantation	4
13	1051 Complete nephrectomy for removal of transplanted kidney	4
14	1052 Complete nephrectomy complicated by previous surgery on same kidney	4
15	1053 Radical nephrectomy	4
16	1054 Nephroureterectomy	4
17	1055 Other excision procedures on kidney	2
18	1056 Nephrostomy or pyelostomy	3
19	1057 Pyeloplasty	3
20	1058 Kidney transplantation	4
21	1059 Other repair procedures on kidney	2
22	1060 Haemodialysis	1
23	1061 Peritoneal dialysis	1
24	1062 Procedures for establishment or maintenance of peritoneal dialysis	2
25	1063 Other interventions for renal dialysis	1
26	1064 Other procedures on kidney	1
27	1065 Examination procedures on ureter	1
28	1066 Endoscopic ureteric catheterisation	2
29	1067 Endoscopic insertion, replacement or removal of ureteric stent	2
30	1068 Endoscopic manipulation or extraction of ureteric calculus	2
31	1069 Other application, insertion or removal procedures on ureter	2
32	1070 Exploration of ureter	2
33	1071 Ureterolysis	2
34	1072 Ureterolithotomy	2
35	1073 Other incision procedures on ureter	2
36	1074 Destruction procedures on ureter	2
37	1075 Biopsy of ureter	2
38	1076 Ureterectomy	2
39	1077 Other excision procedures on ureter	2
40	1078 Ureterolysis with repositioning of ureter	2
41	1079 Repair of divided ureter	2
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3	1080 Transplantation of ureter into skin	3
4	1081 Transplantation of ureter into other ureter	3
5	1082 Transplantation of ureter into intestine	3
6	1084 Reimplantation of ureter into bladder	3
7	1085 Reimplantation of ureter into bladder with repair	3
8	1086 Other repair procedures on ureter	3
9	1087 Revision procedures on ureter	3
10	1088 Other procedures on ureter	3
11	1089 Examination procedures on bladder	1
12	1090 Urinary catheterisation	1
13	1091 Implantation or removal of electronic bladder stimulator	2
14	1092 Other application, insertion or removal procedures on bladder	1
15	1093 Cystotomy	2
16	1094 Cystolithotomy	2
17	1095 Other incision procedures on bladder	2
18	1096 Destruction procedures on bladder	2
19	1097 Endoscopic destruction of bladder lesion or tissue	2
20	1098 Biopsy of bladder	2
21	1099 Removal of foreign body from bladder	2
22	1100 Endoscopic resection of bladder lesion or tissue	2
23	1101 Endoscopic resection of bladder neck	2
24	1102 Cystectomy	3
25	1103 Other excision procedures on bladder	2
26	1104 Repair of ruptured bladder	3
27	1105 Closure of fistula of bladder	3
28	1106 Repair of bladder exstrophy	3
29	1107 Enlargement of bladder	2
30	1108 Other repair procedures on bladder	2
31	1109 Procedures for male stress incontinence	2
32	1110 Procedures for female stress incontinence	2
33	1111 Other procedures on bladder	1
34	1112 Examination procedures on urethra	1
35	1113 Insertion, replacement or removal of artificial urinary sphincter	2
36	1114 Other application, insertion or removal procedures on urethra	2
37	1115 Incision procedures on urethra	2
38	1116 Destruction procedures on urethra	2
39	1117 Biopsy of urethra	2
40	1118 Other excision procedures on urethra	2
41	1119 Closure of fistula of urethra	2
42	1120 Repair of laceration of urethra	2
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3	1121 Urethroplasty	2
4	1122 Other repair procedures on urethra	2
5	1123 Reconstruction procedures on urethra	2
6	1124 Revision procedures on urethra	2
7	1125 Other procedures on urethra	2
8	1126 Destruction procedures on other sites of urinary system	2
9	1127 Incision procedures on other sites of urinary system	2
10	1128 Excision procedures on other sites of urinary system	2
11	1129 Other procedures on urinary system	2
12	1162 Destruction of tissue of prostate	2
13	1163 Closed biopsy of prostate or seminal vesicle	2
14	1164 Open biopsy of prostate or seminal vesicle	3
15	1165 Transurethral prostatectomy	3
16	1166 Other closed prostatectomy	3
17	1167 Open prostatectomy	4
18	1168 Other excision procedures on prostate or seminal vesicle	3
19	1169 Repair procedures on prostate or seminal vesicle	3
20	1170 Other procedures on prostate or seminal vesicle	3
21	1171 Application, insertion or removal procedures on scrotum or tunica vaginalis	2
22	1172 Exploration of scrotum	2
23	1173 Exploration of scrotal contents with biopsy	2
24	1174 Other excision procedures on scrotum or tunica vaginalis	2
25	1175 Repair procedures on scrotum or tunica vaginalis	2
26	1176 Other procedures on scrotum or tunica vaginalis	2
27	1177 Application, insertion or removal procedures on testis, vas deferens, epididymis or spermatic cord	2
28	1178 Incision procedures on testis, vas deferens, epididymis or spermatic cord	2
29	1179 Destruction procedures on testis, vas deferens, epididymis or spermatic cord	2
30	1180 Biopsy of testis, vas deferens, epididymis or spermatic cord	2
31	1181 Excision of lesion of testis, epididymis or spermatic cord	2
32	1182 Excision of spermatic cord	2
33	1183 Vasectomy and epididymectomy	2
34	1184 Orchidectomy	1
35	1185 Vasovasostomy and vasoepididymostomy	1
36	1186 Orchidopexy for undescended testis	2
37	1187 Other repair procedures on testis, vas deferens, epididymis or spermatic cord	1
38	1188 Revision procedures on testis, vas deferens, epididymis or spermatic cord	2
39	1189 Other procedures on testis, vas deferens, epididymis or spermatic cord	2
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3	1190 Examination procedures on penis	1
4	1191 Insertion or removal of artificial erection device	2
5	1192 Other application, insertion or removal procedures on penis	2
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8	1193 Decompression of priapism	2
9		
10	1194 Other incision procedures on penis	2
11	1195 Destruction procedures on penis	2
12	1196 Excision procedures on penis	2
13		
14	1197 Correction of chordee of penis	2
15	1198 Repair of hypospadias	2
16	1199 Repair of epispadias	2
17		
18	1200 Other repair procedures on penis	2
19	1201 Revision of artificial erection device	2
20	1202 Other procedures on penis	2
21		
22	1203 Other procedures on male genital organs	2
23	1240 Application, insertion or removal procedures on ovary	2
24	1241 Incision procedures on ovary	2
25	1242 Biopsy of ovary	2
26	1243 Oophorectomy	2
27	1244 Other excision procedures on ovary	2
28		
29	1245 Transposition of ovary	2
30	1246 Other repair procedures on ovary	2
31	1247 Other procedures on ovary	2
32		
33	1248 Application, insertion or removal procedures on fallopian tube	2
34	1249 Incision procedures on fallopian tube	2
35	1250 Biopsy of fallopian tube	2
36	1251 Salpingectomy	2
37	1252 Salpingo-oophorectomy	2
38	1253 Salpingoplasty	2
39	1254 Anastomosis of fallopian tube	2
40	1255 Other repair procedures on fallopian tube	2
41	1256 Procedures for management of ectopic pregnancy	2
42	1257 Procedures for female sterilisation	2
43	1258 Other procedures on fallopian tube	2
44		
45	1259 Examination procedures on uterus	1
46	1260 Insertion or removal of intrauterine device	1
47	1261 Other application, insertion or removal procedures on uterus	2
48	1262 Incision procedures on uterus	2
49	1263 Destruction procedures on uterus	2
50	1264 Biopsy of endometrium	2
51	1265 Curettage and evacuation of uterus	2
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3	1266	Excision of lesion of uterus
4	1268	Abdominal hysterectomy
5	1269	Vaginal hysterectomy
6	1270	Other excision procedures on uterus
7	1271	Uterine suspension procedures
8	1272	Reconstruction procedures on uterus and supporting structures
9	1273	Other procedures on uterus
10	1274	Application, insertion or removal procedures on cervix
11	1275	Destruction procedures on cervix
12	1276	Excision procedures on cervix
13	1277	Repair procedures on cervix
14	1278	Other procedures on cervix
15	1279	Examination procedures on vagina
16	1280	Incision procedures on vagina
17	1281	Destruction procedures on vagina
18	1282	Excision procedures on vagina
19	1283	Repair of prolapse of uterus, pelvic floor or enterocele
20	1284	Repair of vaginal fistula
21	1285	Vaginal suspension procedures
22	1286	Other repair procedures on vagina
23	1287	Reconstruction procedures on vagina
24	1288	Other procedures on vagina
25	1289	Destruction procedures on vulva or perineum
26	1290	Incision procedures on vulva or perineum
27	1291	Biopsy of vulva or perineum
28	1292	Vulvectomy
29	1293	Other excision procedures on vulva, perineum or clitoris
30	1294	Repair procedures on vulva or perineum
31	1295	Other procedures on vulva or perineum
32	1296	Examination procedures on other gynaecological sites
33	1297	Procedures for reproductive medicine
34	1298	Procedures for anomalies of genitalia
35	1299	Other procedures on female genital organs
36	1340	Caesarean section
37	1344	Postpartum suture
38	1345	Postpartum evacuation of uterus
39	1346	Correction of inverted uterus
40	1347	Other postpartum procedures
41	1360	Application, insertion or removal procedures of head
42	1361	External fixation of mandible
43	1362	Exploration of temporomandibular joint
44	1363	Other incision procedures on maxilla or mandible
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4	1364	Excision procedures on maxilla, mandible or temporomandibular joint
5		2
6	1365	Reduction of fracture of nasal bone
7		2
8	1366	Reduction of fracture of mandible or maxilla
9		2
10	1367	Reduction of fracture of mandibular or maxillary alveolar ridge
11		2
12	1368	Reduction of fracture of zygomatic bone
13		2
14	1369	Reduction of temporomandibular joint
15		2
16	1370	Reduction of fracture or dislocation of other facial bone
17		2
18	1371	Repair procedures on maxilla, mandible or temporomandibular joint
19		2
20	1373	Application, insertion or removal procedures of neck or thorax
21		2
22	1374	Incision procedures on neck or thorax
23		2
24	1375	Ostectomy of rib
25		2
26	1376	Other excision procedures on neck or thorax
27		2
28	1377	Reduction of fracture/dislocation of neck or thorax
29		3
30	1378	Repair procedures on neck or thorax
31		3
32	1379	Reoperation procedures on neck or thorax
33		3
34	1381	Immobilisation of fracture or dislocation of spine
35		3
36	1382	Biopsy of intervertebral disc and vertebra
37		3
38	1383	Excision of vertebra
39		3
40	1384	En bloc resection of lesion of soft tissue involving sacrum or spine
41		4
42	1385	Other excision procedures on spine (vertebral column)
43		4
44	1386	Manipulation of spine
45		2
46	1387	Closed reduction of fracture/dislocation of spine
47		3
48	1388	Open reduction of fracture/dislocation of spine
49		4
50	1389	Spinal fusion
51		4
52	1390	Internal fixation of spine
53		4
54	1393	Other spinal procedures
55		3
56	1394	Application, insertion or removal procedures on shoulder
57		3
58	1395	Incision procedures on shoulder
59		2
60	1396	Biopsy of shoulder
		2
	1397	Synovectomy or debridement of shoulder
		2
	1398	Ostectomy of clavicle or scapula
		2
	1399	Amputation of shoulder
		3
	1400	Other excision on shoulder
		2
	1401	Reduction of fracture of clavicle or shoulder
		2
	1402	Reduction of dislocation of clavicle, scapula or shoulder
		2
	1403	Arthrodesis of shoulder
		2
	1404	Other repair procedures on shoulder
		2
	1405	Reconstruction procedures on shoulder
		3
	1406	Revision procedures on shoulder
		3

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3	1408 Immobilisation of fracture of humerus	2
4	1409 Other application, insertion or removal procedures on humerus or elbow	2
5		
6		
7	1410 Incision procedures on humerus or elbow	2
8	1411 Biopsy of elbow	2
9		
10	1412 Other excision procedures on humerus or elbow	2
11	1413 Closed reduction of fracture of humerus or elbow	2
12	1414 Open reduction of fracture of humerus or elbow	3
13		
14	1415 Closed reduction of dislocation of humerus or elbow	2
15	1416 Open reduction of dislocation of humerus or elbow	3
16	1417 Bone graft to humerus	3
17		
18	1418 Other repair procedures on humerus or elbow	2
19	1419 Revision procedures on humerus or elbow	2
20		
21	1421 Immobilisation of fracture of shaft and distal radius or ulna	2
22		
23	1423 Incision of fascia of forearm	2
24	1424 Incision of radius or ulna	2
25		
26	1425 Other incision procedures on forearm	2
27	1426 Excision procedures on forearm	2
28	1427 Closed reduction of fracture of radius	2
29	1428 Closed reduction of fracture of ulna or olecranon	2
30		
31	1429 Open reduction of fracture of radius	3
32	1430 Open reduction of fracture of ulna or olecranon	3
33		
34	1431 Reduction of fracture of shaft of radius and ulna	2
35	1432 Open reduction of fracture of shaft of radius or ulna with dislocation	3
36		
37	1433 Reduction of dislocation of radius or ulna	2
38	1434 Reduction of separated epiphysis of radius or ulna	2
39		
40	1435 Bone graft to forearm	3
41	1436 Other repair procedures on forearm	3
42		
43	1438 Other procedures on forearm	2
44	1439 Application, insertion or removal procedures on hand or wrist	2
45		
46	1440 Incision procedures on muscle, tendon or fascia of hand	2
47		
48	1441 Incision procedures on bone of hand	2
49	1442 Incision procedures on joint of hand	2
50	1443 Incision procedures on wrist	2
51		
52	1444 Biopsy of wrist	2
53	1445 Synovectomy of joint of hand	2
54	1446 Synovectomy of tendon of hand or wrist	2
55		
56	1447 Fasciectomy for Dupuytren's contracture	1
57	1448 Amputation of wrist, hand or digit	1
58	1449 Other excision procedures on bone of hand	2
59		
60	1450 Other excision procedures on hand	2

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3	1451 Other excision procedures on wrist	2
4	1452 Closed reduction of fracture of carpus	2
5	1453 Closed reduction of fracture of metacarpus of hand	2
6	1454 Closed reduction of phalanx of hand	2
7	1455 Open reduction of fracture of carpus	1
8	1456 Open reduction of fracture of metacarpus of hand	2
9	1457 Open reduction of fracture of phalanx of hand	2
10	1458 Closed reduction of dislocation of joint of hand	2
11	1459 Open reduction of dislocation of joint of hand	2
12	1460 Arthrodesis of hand	1
13	1461 Bone graft of wrist, metacarpus or phalanx of hand	1
14	1462 Arthroplasty of interphalangeal joint of hand	2
15	1463 Arthroplasty of metacarpophalangeal joint	2
16	1464 Other arthroplasty of phalangeal joint of hand	2
17	1465 Repair of ligament or capsule of phalangeal joint of hand	2
18	1466 Repair of tendon of hand	2
19	1467 Other repair procedures on hand	2
20	1468 Other repair procedures on wrist	2
21	1469 Reconstruction procedures on hand	1
22	1470 Reconstruction procedures on wrist	1
23	1471 Revision procedures on hand or finger	1
24	1472 Revision procedures on wrist	1
25	1473 Procedures for mallet finger	2
26	1474 Procedures for ganglion of hand or wrist	2
27	1476 Immobilisation or traction of fracture or dislocation of pelvis or hip	2
28	1478 Osteotomy of pelvis, hip or femur	4
29	1479 Fixation of fracture of pelvis or femur	3
30	1480 Release of hip contracture	3
31	1481 Other incision of hip	3
32	1482 Biopsy of hip	3
33	1483 Ostectomy of femur or pelvis	3
34	1484 Amputation of pelvis or hip	5
35	1485 Other excision procedures on pelvis or hip	4
36	1486 Reduction of fracture of pelvis or femur	3
37	1487 Reduction of dislocation of hip	2
38	1488 Bone graft to pelvis or hip	2
39	1489 Arthroplasty of hip	3
40	1490 Transplantation or transfer of tendon or muscle of pelvis or hip	3
41	1491 Other repair procedures on pelvis or hip	3
42	1492 Revision arthroplasty of hip	4
43	1493 Procedures for slipped capital femoral epiphysis	3
44		
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3	1495 Immobilisation of fracture of fibula, patella or tibia	2
4	1496 Other application, insertion or removal procedures on	2
5	knee or leg	
6	1497 Decompression fasciotomy of calf	2
7	1498 Release of knee contracture	2
8	1499 Osteotomy of distal femur, patella, tibia or fibula	3
9	1500 Internal fixation of fracture of femoral condyle	3
10	1501 Other incision procedures on knee	2
11	1502 Biopsy of knee	1
12	1503 Arthroscopic excision of knee	2
13	1504 Excision of bone of knee or leg	3
14	1505 Other excision procedures on knee or leg	3
15	1506 Reduction of dislocation of knee or patella	2
16	1507 Closed reduction of fracture of tibial plateau	2
17	1508 Open reduction of fracture of tibial plateau	3
18	1509 Closed reduction of fracture of shaft of tibia	2
19	1510 Open reduction of fracture of shaft of tibia	3
20	1511 Removal of loose body of knee with repair	2
21	1512 Arthrodesis of knee	3
22	1513 Bone graft to tibia	3
23	1514 Lateral release of knee with repair	2
24	1515 Resection of femur and tibia with repair	3
25	1516 Transfer of tendon, ligament or bone of knee or leg	2
26	1517 Arthroscopic meniscectomy of knee with repair	2
27	1518 Arthroplasty of knee	3
28	1519 Arthroplasty of knee with bone graft to femur or tibia	3
29	1520 Other repair procedures on knee or leg	2
30	1521 Internal fixation of fracture of femur or tibia with	3
31	reconstruction	
32	1522 Reconstruction procedures on knee	3
33	1523 Revision of total arthroplasty of knee with bone graft to	3
34	femur or tibia	
35	1524 Other revision procedures on knee	3
36	1526 Immobilisation procedures on ankle or foot	2
37	1528 Osteotomy of ankle or foot	3
38	1529 Other incision procedures on ankle	2
39	1530 Other incision procedures on foot	2
40	1531 Arthroscopic excision procedures on ankle	2
41	1532 Excision of bone of foot	1
42	1533 Amputation of ankle or foot	2
43	1534 Other excision procedures on ankle or foot	1
44	1536 Closed reduction of fracture of calcaneum, talus or	2
45	metatarsus	
46	1537 Closed reduction of fracture of ankle or toe	2
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1538	Open reduction of fracture of calcaneum, talus or metatarsus	3
1539	Open reduction of fracture of ankle or toe	3
1540	Closed reduction of dislocation of ankle or foot	2
1541	Open reduction of dislocation of ankle or foot	3
1542	Repair of tendon or ligament of ankle or foot	2
1543	Arthrodesis of ankle, foot or toe	1
1544	Other repair procedures on ankle or foot	1
1545	Reconstruction procedures on ankle or foot	1
1546	Procedures for talipes equinovarus	2
1547	Procedures for hallux valgus or hallux rigidus	2
1548	Procedures for other toe deformities	2
1550	Application of external fixation devices to other musculoskeletal sites	2
1552	Administration of agent into other musculoskeletal sites	1
1553	Aspiration of other musculoskeletal sites	1
1554	Other application, insertion or removal procedures on other musculoskeletal sites	1
1555	Incision procedures on joint of other musculoskeletal sites	2
1556	Incision procedures on bone of other musculoskeletal sites	2
1557	Incision procedures on tendon or tendon sheath of other musculoskeletal sites	2
1558	Incision of fascia of other musculoskeletal sites	2
1559	Incision procedures on other musculoskeletal sites	2
1560	Biopsy of other musculoskeletal sites	2
1561	Excision procedures on joint of other musculoskeletal sites	2
1562	En bloc resection of lesion of soft tissue affecting long bones	3
1563	Other excision procedures on bone of other musculoskeletal sites	2
1564	Excision procedures on tendon of other musculoskeletal sites	1
1565	Excision procedures on muscle of other musculoskeletal sites	1
1566	Excision procedures on other musculoskeletal sites	2
1567	Reduction procedures on other musculoskeletal sites	2
1568	Suture of other musculoskeletal sites	2
1569	Graft of other musculoskeletal sites	2
1570	En bloc resection of lesion of bone with repair of other musculoskeletal sites	3
1571	Other repair procedures on bone of other musculoskeletal sites	2
1572	Other repair procedures on tendon of other musculoskeletal sites	2
1573	Other repair procedures on muscle of other musculoskeletal sites	2



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4	1574 Other repair procedures of other musculoskeletal sites	2
5	1575 En bloc resection of lesion of soft tissue affecting long bones with reconstruction	4
6		
7	1576 Other reconstruction procedures on other musculoskeletal sites	3
8		
9	1578 Limb reconstruction	3
10		
11	1579 Other procedures for other musculoskeletal sites	2
12	1603 Removal of foreign body from skin and subcutaneous tissue	1
13		
14	1604 Other application, insertion or removal procedures on skin and subcutaneous tissue	1
15		
16	1605 Removal of foreign body from skin and subcutaneous tissue with incision	1
17		
18	1606 Incision and drainage of skin and subcutaneous tissue	1
19		
20	1607 Release of skin and subcutaneous tissue	1
21		
22	1630 Excision of ulcer or sinus of skin and subcutaneous tissue	2
23	1631 Excision of fingernail	1
24	1632 Excision of toenail	1
25	1633 Excision of sweat glands	2
26		
27	1634 Other excision procedures on skin and subcutaneous tissue	2
28		
29	1635 Repair of wound of skin and subcutaneous tissue	1
30		
31	1636 Repair of nail	1
32	1640 Allograft, xenograft or synthetic skin graft	2
33	1641 Split skin graft to granulating burn site	2
34	1642 Other split skin graft to granulating area	2
35	1643 Split skin graft to burn of specific sites	2
36	1644 Split skin graft to burn of other sites	2
37		
38	1645 Other split skin graft, small	2
39		
40	1646 Other split skin graft, extensive	2
41	1647 Split skin graft, inlay	2
42		
43	1648 Full thickness skin graft to burn	2
44	1649 Other full thickness skin graft	2
45	1650 Dermis graft	2
46		
47	1651 Local skin flap, simple and small, single stage	2
48	1652 Local skin flap, large or complicated, single stage	2
49		
50	1653 Distant skin flap, direct	2
51	1654 Distant skin flap, indirect	1
52	1655 Other repair procedures on skin and subcutaneous tissue	2
53	1656 Revision of burn scar or contracture	2
54		
55	1657 Revision of other scar of skin	2
56	1658 Revision of skin flap	2
57		
58	1659 Procedures for pilonidal sinus or cyst	2
59	1660 Other procedures on skin and subcutaneous tissue	2
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4	1661 Insertion, removal or adjustment of tissue expander or implant	2
5	1662 Excision, eyelid	2
6	1663 Excision, ear	1
7	1664 Excision, lip	2
8	1665 Excision, tongue	2
9	1666 Liposuction and lipectomy	2
10	1667 Excision of lymphoedematous tissue	2
11	1668 Dermofat or fat graft	2
12	1669 Composite graft	2
13	1670 Fascia graft	2
14	1671 Myocutaneous flap	1
15	1672 Muscle flap	1
16	1673 Island flap	2
17	1674 Free flap	1
18	1675 Facelift and browlift	2
19	1676 Graft for symblepharon	2
20	1677 Repair of blepharoptosis	2
21	1678 Repair of ear	2
22	1679 Rhinoplasty	2
23	1680 Other repair of nose	2
24	1681 Repair of pharynx	2
25	1682 Contour reconstruction	2
26	1683 Contour restoration	2
27	1684 Reconstruction of eyelid and ear	2
28	1685 Reconstruction of lip or mouth	2
29	1686 Revision of free flap and associated procedures	2
30	1687 Revision of other plastic procedures on soft tissue	2
31	1688 Reoperation to correct previous ptosis repair of eyelid	2
32	1689 Procedures for cleft lip	2
33	1690 Procedures for cleft palate	2
34	1691 Procedures for cleft lip and anterior palate	2
35	1692 Procedures for facial nerve paralysis	2
36	1693 Excision of arteriovenous malformation [AVM]	2
37	1694 Microsurgical repair for restoration of continuity of blood vessel of distal extremity or digit	3
38	1695 Microsurgical anastomosis of blood vessel	3
39	1696 Microsurgical graft of blood vessel	3
40	1697 Fixation of transcutaneous abutment (osseointegration procedure)	2
41	1698 Implantation of titanium fixture (osseointegration procedure)	2
42	1699 Resection of mandible	3
43	1700 Resection of maxilla	3
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1701 Resection of other facial bone	3
1702 Genioplasty	3
1703 Osteotomy or ostectomy of zygoma	3
1704 Osteotomy or ostectomy of zygoma with internal fixation	3
1705 Osteotomy or ostectomy of mandible or maxilla	3
1706 Osteotomy or ostectomy of mandible or maxilla with internal fixation	3
1707 Osteotomy or ostectomy of mandible or maxilla, procedures in combination	3
1708 Osteotomy or ostectomy of mandible or maxilla with internal fixation, procedures in combination	3
1709 Midfacial osteotomies	2
1710 Frontal bone advancement	3
1711 Correction of skull deformity	4
1712 Other repair of skull or facial bone	3
1713 Reconstruction of mandible	3
1714 Reconstruction of maxilla	3
1715 Reconstruction of zygoma	3
1716 Reconstruction of orbital cavity	3
1717 Reconstruction of other skull and facial bones	3
1718 Other procedures for craniostenosis	3
Examination procedures on breast	1
Application, insertion or removal procedures on breast	2
Incision procedures on breast	2
Biopsy of breast	2
Excision of lesion of breast	2
Subcutaneous mastectomy	2
Simple mastectomy	3
Other excision procedures on breast	2
Augmentation mammoplasty	3
Reduction mammoplasty	3
Other repair procedures on breast	3
Reconstruction procedures on breast	3
Reconstruction procedures on nipple and areola	2
Procedures involving removal or adjustment of breast prosthesis or tissue expander	2
Other procedures on breast	2

## Data management Plan

Persistent opioid use and opioid-related harm after hospital admissions for surgery and trauma in New Zealand

Principal investigator	Jiayi Gong School of Pharmacy University of Auckland <a href="mailto:Jgon014@auckland.ac.nz">Jgon014@auckland.ac.nz</a>
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6 Version: 4 (15/06/2020)  
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9 Initial version: v1 (24/04/2020)  
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12 Project start date: 01/10/2020  
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15 Project end date: ongoing  
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### 38 Project abstract:

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41 Opioid use has increased exponentially on a global scale for the management of non-cancer related  
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43 pain. There are wide concerns regarding the contribution of hospitalisation and death related to  
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45 persistent opioid use leading to misuse of opioids in many western countries such as the United  
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47 States (US), Canada, United Kingdom (UK), New Zealand (NZ), and Australia. Hospital admissions  
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49 related to trauma and surgery have been identified to be a contributing factor to increasing opioid  
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51 use both within NZ and internationally. We aim to find the incidence of persistent opioid use post  
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53 hospital admissions related to surgery and trauma, and the health outcomes related to persistent  
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55 opioid use such as hospitalisation and mortality related to opioid use. We also aim to identify  
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60 predictors that may lead to persistent opioid use and related adverse health outcomes in the NZ

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3 population. This is a retrospective population-based cohort study using linked, routinely collected  
4 health data for all patients who have had surgery in hospital and those admitted to hospital with  
5 trauma in NZ, between 2006 to 2019. Linked data include surgery performed in hospital, emergency  
6 department presentation, medication dispensing, comorbidity (M3 index), mortality and other  
7 related demographics factor. We will calculate the crude incidence rates of adverse outcomes  
8 related to both persistent and non-persistent opioid use. To compute the rates, we will divide the  
9 total number of adverse outcome events by total follow-up time. Additionally, using a multivariable  
10 logistic regression model, we will examine the association between potential predictors and  
11 persistent opioid use after surgery/trauma. Multivariable Cox regression models will be used to  
12 estimate the risk of all-cause mortality, opioid related adverse outcomes, and hospitalisation  
13 associated with persistent use of opioids up to one-year post hospital discharge after surgery and  
14 trauma for all patients.  
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### 31 Field of Research (As per Australian and NZ standard research 32 classification) 33 34 35

36  
37 111503 Clinical Pharmacy and Pharmacy Practice  
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40 111706 Epidemiology  
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43 110301 Anaesthesiology  
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45  
46 110323 Surgery  
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48  
49 110305 Emergency Medicine  
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### 51 Registration details: 52 53

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55 ANZCTR: TBC  
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## Funding Agencies:

Auckland Academic Health Alliance

University of Auckland- Senior Health Research Scholarship

## Ethics and Privacy:

### **Ethics approval:**

The study was exempt from a Health and Disability Ethics Committee (HDEC) review, it was granted ethics approval by the Auckland Regional Ethics Committee (AHREC) with subsequent locality approval from Auckland District Health Board (ADHB)

AHREC approval: AH1159

Locality approval no.: 8753

### **Ethical issues:**

This is a clinical audit study. Only deidentified data will be used in this study with encryption generated by the ministry of health. The requirement for informed consent has been waived, as this is a retrospective database study and no participants will be actively recruited. Ensuring patient and practitioner confidentiality is paramount to our data analysis approach.

### **Data Privacy and Security issues:**

The original dataset will have the patients' National Health Index (NHI) encrypted by the Ministry of Health and at no time will any co-investigators be able to access directly identifiable data. However, there is the possibility of patients been re-identified through the linkage of data from different data sets and the indirect identifiers contained in the values from the datasets. For example, a patient could be identified from a combination of variables including date of birth, demographic data,



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3 hospital admission date, relevant procedure code, medication dispensing and possible dates of  
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5 death or subsequent hospitalisations.  
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## 8 9 Relevant policy

10  
11 The University of Auckland Research Code of Conduct (particularly section 5.4)

12  
13  
14 National Ethical Standards for Health and Disability Research and Quality Improvement (particularly  
15  
16 12.1-12.17, 12.26-12.39, 18.16-18.22).  
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19  
20 Privacy Act 1993 (particularly Part 2)

21  
22 Health Information Privacy Code 1994

23  
24 Health Act 1956 (particularly Sections 22C, 22H)

25  
26 Health (Retention of Health Information) Regulations 1996

27  
28 Health Information Privacy Code 1994 (particularly Rules (2)(g)(iii) and (1)(e)(iii))  
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## 34 35 Responsibilities and resources

### 36 37 **Data management staff:**

38  
39 Jiayi Gong (PhD candidate), Amy Chan (primary supervisor), Alan Merry (Co-supervisor) and Peter  
40  
41 Jones (Co-supervisor) take main responsibility for the management and analysis of the data.  
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### 46 47 **Required resources:**

48  
49 Secure storage managed by the University of Auckland  
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## 52 53 Data organisation

### 54 55 **Description of Digital data:**

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- Deidentified data from National Minimum Dataset (NMDS) related to hospital admissions

- Deidentified data from NMDS related to surgery and procedures
- Deidentified data from National Non-Admitted Patient Collection (NNPAC) related to emergency department admissions
- Deidentified data from Accident Compensation Corporation (ACC) related to emergency department admissions
- Deidentified data from Pharmaceutical collection related to medication dispensing
- Deidentified data from National Health Index (NHI) related socioeconomic and demographic information
- Deidentified data from Primary Health Organisation (PHO) related to PHO enrolment information
- Deidentified data from the Mortality collection related to cause and dates of death

#### **Description of non-digital data**

- Password to access deidentified data file

#### **Collection/Creation method**

All data will be requested from the NZ Ministry of Health and be stored in its original form in multiple files on a secured drive at the University of Auckland.

Data linkage will be completed by an experienced professional to be determined and he/she will need to sign a confidentiality agreement.

#### **Data organisation:**

The server has a main drive where data in active use will be stored.

Directory schematic of drive arrangement

Data:

- Raw

- Deidentified raw data

#### Documents:

- Protocol
- Data Management Plan
- Ethics
  - AHREC
  - Institutional approval

#### Reports:

- Generated and written reports

#### Other relevant subfolders include:

- Vault:
  - Data no longer in use, with much slower read speed
- Archive:
  - Data archive to comply with storage requirements- slowest read speed

#### Data storage and backup

Digital data will be stored on appropriate failure-robust School of Pharmacy, University of Auckland managed storage system. The server will have password protected access, with access only granted to the research team via the University of Auckland UPI. The password will be held by Jiayi Gong (PhD Candidate) and Amy Chan (PhD primary supervisor). Non-digital data will be stored in a locked cabinet in an access-controlled area of the School of Pharmacy. The keys will be kept by Amy Chan and the School of Pharmacy administrative team. Amy Chan is the primary supervisor and co-investigator for this research and she is a senior clinical research fellow at the School of Pharmacy, University of Auckland.

- Any data collected non-digitally e.g. via paper forms will be scanned electronically and stored digitally

## Sharing and Access Control

### Description of sensitive data

Encrypted patient data, which may allow indirect identifiers to identify patients.

### Access Control and Security measures

The linked data will be stored in a secure password protected storage site on the University of Auckland server, with no copies made and access restricted to the research team. Linked data may be copied to password protected computers used by investigators for the purpose of analysis. It will be securely deleted as soon as reasonably possible when the assigned task is completed.

### Description of accompanying metadata

A file named readme.md will be stored in each directory describing the directories and files therein (including variables from respective dataset dictionary).

### Coverage of Data

Patients admitted to any hospital in New Zealand, due to surgery or a trauma event and subsequently filled an opioid prescription on discharge. See protocol (pg. 5-6) for inclusion/exclusion criteria.

### Temporal extent of data

01/01/2006 to 01/01/2019

## Data publication and reporting

### Data ownership:

Data will be owned by the University, as per the University of Auckland Research Code of Conduct Section 5.4

**Data publication**

No approval has been granted by the ethics committee to share research data from the project outside of the research team. The research team may consider publication of metadata.

**Data retention period**

Data will be retained for at least 10 years on appropriate University managed storage as per Health Information Privacy Code.

**Method of disposal**

If the data needs to be destroyed, it will be done so securely in concordance with University of Auckland protocols.

**Archiving and preservation Plan**

Standard University of Auckland data preservation policies will be followed

**The RECORD statement – checklist of items, extended from the STROBE statement, that should be reported in observational studies using routinely collected health data.**

	Item No.	STROBE items	Location in manuscript where items are reported	RECORD items	Location in manuscript where items are reported
<b>Title and abstract</b>					
	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found		RECORD 1.1: The type of data used should be specified in the title or abstract. When possible, the name of the databases used should be included.  RECORD 1.2: If applicable, the geographic region and timeframe within which the study took place should be reported in the title or abstract.  RECORD 1.3: If linkage between databases was conducted for the study, this should be clearly stated in the title or abstract.	1  2  2
<b>Introduction</b>					
Background rationale	2	Explain the scientific background and rationale for the investigation being reported			4
Objectives	3	State specific objectives, including any prespecified hypotheses			5
<b>Methods</b>					
Study Design	4	Present key elements of study design early in the paper			5, 6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection			5-8

Participants	6	<p>(a) <i>Cohort study</i> - Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up</p> <p><i>Case-control study</i> - Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls</p> <p><i>Cross-sectional study</i> - Give the eligibility criteria, and the sources and methods of selection of participants</p> <p>(b) <i>Cohort study</i> - For matched studies, give matching criteria and number of exposed and unexposed</p> <p><i>Case-control study</i> - For matched studies, give matching criteria and the number of controls per case</p>		<p>RECORD 6.1: The methods of study population selection (such as codes or algorithms used to identify subjects) should be listed in detail. If this is not possible, an explanation should be provided.</p> <p>RECORD 6.2: Any validation studies of the codes or algorithms used to select the population should be referenced. If validation was conducted for this study and not published elsewhere, detailed methods and results should be provided.</p> <p>RECORD 6.3: If the study involved linkage of databases, consider use of a flow diagram or other graphical display to demonstrate the data linkage process, including the number of individuals with linked data at each stage.</p>	<p>5, 6</p> <p>7</p> <p>N/A</p>
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable.		RECORD 7.1: A complete list of codes and algorithms used to classify exposures, outcomes, confounders, and effect modifiers should be provided. If these cannot be reported, an explanation should be provided.	Supplementary section and page 7
Data sources/ measurement	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group			6-8



1 2 3 4	Bias	9	Describe any efforts to address potential sources of bias		7-9
5 6 7 8 9	Study size	10	Explain how the study size was arrived at		N/A
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34	Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why		8,9
35 36 37 38 39 40 41 42 43 44	Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) <i>Cohort study</i> - If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> - If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> - If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses		8,9
45 46 47	Data access and cleaning methods		..	RECORD 12.1: Authors should describe the extent to which the investigators had access to the database population used to create the study population.	9

				RECORD 12.2: Authors should provide information on the data cleaning methods used in the study.	Supplementary section- data management plan
Linkage		..		RECORD 12.3: State whether the study included person-level, institutional-level, or other data linkage across two or more databases. The methods of linkage and methods of linkage quality evaluation should be provided.	Supplementary section- data management plan
<b>Results</b>					
Participants	13	(a) Report the numbers of individuals at each stage of the study ( <i>e.g.</i> , numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed) (b) Give reasons for non-participation at each stage. (c) Consider use of a flow diagram		RECORD 13.1: Describe in detail the selection of the persons included in the study ( <i>i.e.</i> , study population selection) including filtering based on data quality, data availability and linkage. The selection of included persons can be described in the text and/or by means of the study flow diagram.	N/A
Descriptive data	14	(a) Give characteristics of study participants ( <i>e.g.</i> , demographic, clinical, social) and information on exposures and potential confounders (b) Indicate the number of participants with missing data for each variable of interest (c) <i>Cohort study</i> - summarise follow-up time ( <i>e.g.</i> , average and total amount)			N/A
Outcome data	15	<i>Cohort study</i> - Report numbers of outcome events or summary measures over time <i>Case-control study</i> - Report numbers in each exposure			N/A

		category, or summary measures of exposure <i>Cross-sectional study</i> - Report numbers of outcome events or summary measures			
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period			N/A
Other analyses	17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses			N/A
<b>Discussion</b>					
Key results	18	Summarise key results with reference to study objectives			N/A
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias		RECORD 19.1: Discuss the implications of using data that were not created or collected to answer the specific research question(s). Include discussion of misclassification bias, unmeasured confounding, missing data, and changing eligibility over time, as they pertain to the study being reported.	9
Interpretation	20	Give a cautious overall interpretation of results considering objectives,			N/A

		limitations, multiplicity of analyses, results from similar studies, and other relevant evidence			
Generalisability	21	Discuss the generalisability (external validity) of the study results			N/A
<b>Other Information</b>					
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based			10
Accessibility of protocol, raw data, and programming code		..		RECORD 22.1: Authors should provide information on how to access any supplemental information such as the study protocol, raw data, or programming code.	Supplementary section included

\*Reference: Benchimol EI, Smeeth L, Guttman A, Harron K, Moher D, Petersen I, Sørensen HT, von Elm E, Langan SM, the RECORD Working Committee. The REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) Statement. *PLoS Medicine* 2015; in press.

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# BMJ Open

## Persistent opioid use and opioid-related harm after hospital admissions for surgery and trauma in New Zealand: A Population-based Cohort Study

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2020-044493.R1
Article Type:	Protocol
Date Submitted by the Author:	24-Dec-2020
Complete List of Authors:	Gong, Jiayi; The University of Auckland Faculty of Medical and Health Sciences, School of Pharmacy; Auckland City Hospital, Pharmacy Merry, Alan; The University of Auckland Faculty of Medical and Health Sciences, Dept of Anaesthesiology; Auckland City Hospital, Department of Anaesthesia and Perioperative Medicine Beyene, Kebede; The University of Auckland Faculty of Medical and Health Sciences, School of Pharmacy Campbell, Doug; The University of Auckland Faculty of Medical and Health Sciences, Department of Anaesthesiology; Auckland City Hospital, Department of Anaesthesia and Perioperative Medicine Frampton, Chris; University of Otago Christchurch, Department of Psychological Medicine Jones, Peter; The University of Auckland Faculty of Medical and Health Sciences, Department of Surgery McCall, John; The University of Auckland Faculty of Medical and Health Sciences, Department of Surgery Moore, Matthew; The University of Auckland Faculty of Medical and Health Sciences, Department of Anaesthesiology Chan, Amy; The University of Auckland Faculty of Medical and Health Sciences, School of Pharmacy; Auckland City Hospital
<b>Primary Subject Heading</b>:	Epidemiology
Secondary Subject Heading:	Anaesthesia
Keywords:	Pain management < ANAESTHETICS, EPIDEMIOLOGY, ORTHOPAEDIC & TRAUMA SURGERY, PAEDIATRIC SURGERY, SURGERY, ACCIDENT & EMERGENCY MEDICINE

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# Study Protocol:

# Persistent opioid use and opioid-related harm after hospital admissions for surgery and trauma in New Zealand: A Population-based Cohort Study

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Word count: 4077 (excl. abstracts, figs, references, declarations)

## Abstract

### Introduction:

Opioid use has increased globally for the management of chronic non-cancer-related pain. There are concerns regarding the misuse of opioids leading to persistent opioid use and subsequent hospitalisation and deaths in developed countries. Hospital admissions related to surgery or trauma have been identified as contributing to the increasing opioid use internationally. There are minimal data on persistent opioid use and opioid-related harm in NZ, and how hospital admission for surgery or trauma contributes to this. We aim to describe rates and identify predictors of persistent opioid use among opioid-naïve individuals following hospital discharge for surgery or trauma.

### Methods and analysis:

This is a population-based, retrospective cohort study using linked data from national health administrative databases for opioid-naïve patients who have had surgery or trauma in NZ between January 2006 to December 2019. Linked data will be used to identify variables of interest including all types of hospital surgeries in NZ, all trauma hospital admissions, opioid dispensing, comorbidities, and sociodemographic variables. The primary outcome of this study will be the prevalence of persistent opioid use. Secondary outcomes will include mortality, opioid-related harms, and hospitalisation. We will compare the secondary outcomes between persistent and non-persistent opioid user groups. To compute rates, we will divide the total number of outcome events by total follow-up time. Multivariable logistic regression will be used to identify predictors of persistent opioid use. Multivariable Cox regression models will be used to estimate the risk of opioid-related harms and hospitalisation as well as all-cause mortality among the study cohort in a year following hospital discharge for surgery or trauma.

### Ethics and Dissemination:

This study has been approved by the Auckland Health Research Ethics Committee (AHREC- AH1159). Results will be reported in accordance with the Reporting of studies Conducted using Observational Routinely collected health data statement (RECORD).

## Article Summary

### Strength and Limitations of the study

- This will be the first study in New Zealand to examine the relationship between hospital admission for surgery or trauma and the incidence of persistent opioid use.
- The study will include 14 years of opioid usage data, making this one of the largest opioid usage studies to date (2006 to 2019).
- A limitation of the study lies in its use of retrospective secondary data, which has limited control over confounders.

## Background:

Opioids are widely prescribed in hospitals for acute, chronic non-cancer and cancer-related pain. However, in the last decade, opioid addiction and dependency have contributed substantially towards hospitalisation and death globally, especially in the United States (US).<sup>1</sup> Mortality related to opioid overdose accounts for nearly 530 deaths per week in the US.<sup>1</sup> In New Zealand (NZ), a study in 2017 showed from 2008 to 2012, a total of 325 deaths were primarily ascribed to opioid use.<sup>2</sup> Of these, 179 deaths were from unintentional overdose and may be preventable.<sup>2</sup> No studies have examined recent trends in NZ. In NZ, five strong opioids and a total of 33 different formulations are licensed for prescribing in pain management: 14 for morphine, 9 for oxycodone, 5 for fentanyl, 4 for methadone and 1 for pethidine. Three weak opioids and a total of 9 different formulations are available for prescribing: 5 for tramadol, 3 for codeine and 1 for dihydrocodeine.

The NZ Health Quality & Safety Commission (HQSC) in 2016<sup>3</sup> reports that opioid use has increased in NZ with 16.6 per 1000 people compared to 14.4 per 1000 in 2011. The rate of persistent opioid use, defined by the HQSC as use of six weeks or longer, has not changed between 2011 to 2016 and is around 2 per 1000 patients. The report also showed that almost half of the patients dispensed a strong opioid had a hospital admission in the week prior to opioid prescribing in the community.

Internationally, persistent opioid use is generally defined as opioid use for 90 days or longer.<sup>4</sup> Studies from the US and Canada have indicated the rate of persistent opioid use beyond 90 days to be between 0.1% to 8.2% in the context of pain management after surgery and trauma.<sup>5</sup> In the acute setting, higher rates of opioid prescribing by emergency physicians has also been linked to subsequent long-term opioid use in the US (Odds Ratio (OR) 1.30, 95% CI 1.23, 1.37,  $p < 0.001$ ).<sup>6</sup>

Hospital admissions may act as drivers for subsequent persistent opioid use in the community setting. NZ data shows that younger people (under 24 years of age) were more likely to have a hospital admission prior to the dispensing of a strong opioid than older people (80 years and over)— rates opioid dispensing were 7 per 10 people in younger people vs 3.7 per 10 in those above 80.<sup>3</sup> This usage rate may be due to clinicians' perception that opioids are generally safer in younger patients because they are more likely to have normal metabolic functions. However, studies have suggested that addictive behaviour tends to be overrepresented in younger patients (18 to 29 years old),<sup>7,8</sup> mainly concerning other substances of abuse such as cannabis and cocaine. Our study will examine persistent opioid use and opioid-related harm across all age groups, to describe how these rates may change across ages.

Outcomes related to persistent opioid use have also been poorly evaluated both in NZ and elsewhere. A recent study published by a Swedish group showed that post-trauma patients with persistent opioid use carry an excess risk of mortality, even after adjustment for age, sex, somatic comorbidity, psychiatric morbidity, substance abuse, injury severity and admissions to intensive care (Hazard Ratio (HR) 1.82, 95% CI 1.34, 2.48,  $p < 0.001$ ).<sup>9</sup> There are few mortality data in NZ related to persistent opioid use, despite the presence of national databases recording health outcomes.

In NZ, the opportunity for population-based cohort studies is unique in several ways. Firstly, NZ has a single universal healthcare system; the government covers 80% of the cost of healthcare. All NZ citizens, permanent residents, and certain work visa holders have access to free or low-cost physician services, hospital care, and prescription medicines.<sup>10</sup> Physician services are private businesses that set their consultation fee, but the fees are set by the government and cannot exceed a certain limit.

1  
2  
3 Patients enrolled in a specific physician service will have a lower cost per visit, as the government  
4 would partially fund the visit.<sup>10</sup> Most physician services are free for patients 13 years or under. Most  
5 prescription medicines are fully funded by the government, with the patient having to co-pay only a  
6 dispensing fee of NZ\$5 per item to the pharmacy.<sup>11</sup> Secondly, all patients accessing the health and  
7 disability system will be assigned a unique identifier code, in both private and public funded hospitals,  
8 called the National Health Index (NHI) number.<sup>12</sup> The Ministry of Health (MOH) uses the NHI number  
9 in an encrypted form so that data can be used for statistical purposes to report on the health of the NZ  
10 population.<sup>12</sup> This then allows for linkage of data across different datasets for research, e.g. hospital  
11 admissions, medication dispensing, and mortality can be linked. Thirdly, it is possible to track all  
12 admissions to public and private hospitals. This permits the calculation of an emerging measure  
13 called Days Alive and Out of Hospital (DAOH). DAOH is a composite outcome that integrates several  
14 clinically significant outcomes, including mortality, hospital length-of-stay, and hospital readmission.<sup>13</sup>  
15 It is sensitive to any complication of surgery that prolongs an admission, leads to a readmission or  
16 results in death. Fourthly, data on ethnicity are routinely collected by the MOH. NZ has a large  
17 indigenous population (Māori) who experience substantial disadvantages in health status and  
18 outcomes compared with the non-Māori population.<sup>14</sup> A recent study assessing the use of non-opioid  
19 analgesia between ethnicities in NZ showed a significant disparity in outcome between Māori and  
20 non-Māori patients, with Māori patients having more in adverse events, with a relative risk 2.54 (95%  
21 CI 2.23-2.90).<sup>15</sup> The likely risk of persistent opioid use and subsequent opioid-related harm in NZ  
22 may also be distributed unequally across ethnic groups. The NZ healthcare system is obligated to  
23 address these inequities under the *protection* principle of the *Treaty of Waitangi*.<sup>16</sup>

24  
25 Thus, we aim to determine the patterns of opioid use and opioid-related harm in NZ following  
26 discharge from hospital for surgery or trauma over 14 years from 1<sup>st</sup> of January 2006 to 31<sup>st</sup> of  
27 December 2019. Specifically, in this study, we aim to determine the rates of persistent opioid use  
28 post-discharge from the hospital and evaluate outcomes including opioid dependence, opioid-related  
29 overdose, opioid-related hospitalisation and mortality. We will also measure DAOH at 365 days  
30 (DAOH<sub>365</sub>), as an outcome that will be used for measuring the quality of perioperative care and  
31 postoperative recovery.<sup>13</sup> We will also identify the predictors of these outcomes.

## 32 33 34 35 Methods and Analysis:

### 36 37 Study design and setting

38 This will be a population-based retrospective cohort study involving residents of NZ using linked,  
39 routinely collected health data. We plan to start data collection and analysis by 1<sup>st</sup> of March 2021 and  
40 complete the study within 12 months.

### 41 42 Sources of data

43 The study will use several national administrative health databases, which can be linked via an  
44 encrypted, unique patient identifier known as the National Health Index (NHI).<sup>12</sup> To examine  
45 hospitalisations data, we will use the National Minimum Data Set (NMDS).<sup>17</sup> The NMDS is a national  
46 registry of all inpatient admissions reported to the MOH. The NMDS includes information on dates of  
47 hospital stay, diagnoses, and medical procedures. All medical procedures are coded according to the  
48 Australasian Classification of Health Interventions (ACHI).<sup>18</sup> In NMDS, primary and secondary  
49 diagnoses are coded according to the International classification of diseases 10th edition – Australian  
50 modified version (ICD-10AM). The NMDS captures 99 percent of all operations performed in NZ.<sup>19</sup>  
51 The National Non-Admitted Patients Collection (NNPAC) is the national database used to capture  
52 information on patients who presented to the emergency department (ED) and spent less than three  
53 hours in a hospital. This database will be linked with data from the Accident Compensation  
54 Corporation (ACC) to identify patients admitted to an NZ hospital with trauma but did not require  
55 prolonged hospital admission.<sup>20</sup> ACC is NZ's Crown entity responsible for administering the country's  
56 no-fault accidental injury compensation scheme.<sup>21</sup> The Mortality Collection (MORT) is a national  
57 database that classifies the underlying cause of death for all deaths registered in NZ. MORT uses the  
58  
59  
60

1  
2  
3 ICD-10AM classification for mortality coding.<sup>22</sup> Mortality related outcomes will be retrieved from this  
4 database.

5  
6 Data on opioid dispensing and other medicines prescribed to patients receiving opioids will be  
7 obtained from the Pharmaceutical Collection (Pharms). Pharms is a data warehouse of information  
8 related to pharmaceutical subsidies and contains claim and payment information from pharmacists for  
9 subsidised dispensing.<sup>23</sup> The Pharms database contains information on all prescriptions dispensed by  
10 community pharmacies in NZ since 1998, according to local codes akin to the Anatomical Therapeutic  
11 Chemical classification system (ATC codes). The database includes medication name, quantity, days  
12 of supply, formulation, date of refill, route of administration, and codes identifying the therapeutic  
13 category of the medication. Medicines dispensed in hospitals are not included in the database.  
14 Patients meeting the inclusion criteria will be determined from the NMDS and NNPAC plus ACC then  
15 matched with their respective opioid dispensing data from Pharms via their respective encrypted NHI.

16  
17 Other databases that we will access include the NHI and Primary Health Organisation (PHO)  
18 enrolment. These datasets will be used to retrieve information relevant to the patient, including  
19 demographic, gender, age, ethnicity, and social-economic status.<sup>24</sup>

## 20 21 Study Cohort

22  
23 The study design is illustrated in Figure 1.<sup>25</sup> The study population includes all opioid-naïve patients (of  
24 any age) who had a surgical procedure or presented to the hospital with trauma in one of NZ's 39  
25 public hospitals between the 1<sup>st</sup> of January 2006 to 31<sup>st</sup> of December 2019. Surgical patients will be  
26 defined as all individuals in the NMDS assigned a surgical procedure and associated anaesthetic  
27 code via the ACHI. Trauma patients with a hospital stay of greater than three hours will be identified  
28 using ICD-10AM codes for trauma in the NMDS dataset. Individuals with less than three hours of  
29 admission will only be registered on NNPAC. Thus their data will likely require linkage of ACC  
30 database via ACC injury codes and claimant number to obtain event details.

31  
32 The date of hospital discharge following the initial surgical or traumatic event and exposed to opioids  
33 will be considered as the index date. For patients with more than one admission for surgical  
34 procedures or trauma during the study period, only the first admission will be included in the study  
35 cohort. Individuals will be considered opioid-naïve if they do not have dispensing records for any  
36 opioid medications in 180 days before the index date. We will exclude the following types of patients:  
37 1) those who have evidence of a surgical procedure or traumatic event in 365 days prior to the index  
38 date; and 2) those with evidence of opioid use disorders (e.g. overdose, misuse or dependence) or  
39 opioid prescriptions in 180 days prior to the index date. Patients who underwent multiple procedures  
40 in 24 hours will be examined separately as their likely risk of persistent opioid use may be different  
41 from other patients.

42  
43 We will follow-up all patients who meet the study inclusion criteria for a maximum of 365 days, or until  
44 subsequent hospital admission for surgery or trauma, the last opioid dispensing claims date,  
45 occurrence of the outcomes of interest, or death from any cause, whichever comes first- see Figure 1  
46 for study design.

47  
48 Postoperative prescribing of opioids is generally guided by the Australian and New Zealand College of  
49 Anaesthetists (ANZCA) guidelines.<sup>26</sup> Multimodal analgesia is utilised instead of mainly opioid-based  
50 analgesia to improve pain control and reduce opioid consumption and adverse effects.<sup>26</sup>

51  
52 *See supplementary section for surgical procedures and ICD-10AM codes for trauma-related*  
53 *admissions.*

## 54 Outcome Assessment

55  
56 The primary outcome will be persistent use of opioids after trauma or surgery. As in previous studies of  
57 opioid use,<sup>27 28</sup> persistent opioid use will be defined as continuous pharmacy claim for one or more  
58 opioid prescription 91 days to 365 days after the index date. Patients who continuously filled one or  
59 more opioid prescriptions within 90 days after the index date but did not thereafter will be considered  
60 as non-persistent opioid users. Characteristics of persistent and non-persistent opioid users will be



1  
2  
3 compared to identify predictors of persistent opioid use. Our secondary outcomes will include total  
4 duration of persistent opioid use from the index date, opioid-related fatal overdose, all-cause mortality,  
5 opioid dependency, opioid misuse, and hospitalisation related to opioid overdose and toxicity during the  
6 follow-up period. We will also measure DAOH<sub>365</sub>.  
7

8 Mortality due to opioid overdose will be defined as the presence of a date of death and opioid overdose  
9 as the cause of death as recorded in the MORT database via ICD-10AM codes. These episodes of  
10 related harm will be identified during patients' subsequent admission after the index date.  
11

12 *See the supplementary section for secondary outcome-related ICD-10AM.*  
13

## 14 Opioid Exposure Assessment

15 The primary exposure in this study is the receipt of a new opioid prescription after a surgical or traumatic  
16 event. All patients who filled at least one opioid prescription within 7 days of discharge will be considered  
17 exposed to prescription opioids and will be included in the study cohort. The 7-day grace period  
18 assumes that an opioid prescription filled by an opioid-naïve individual during this period is likely to be  
19 used to treat acute pain after surgery or trauma, and any opioid use after 7 days is unlikely to be related  
20 to the surgery or trauma event. Opioid use will be assessed by date of dispensing, dose, frequency,  
21 days or quantity supplied, and frequency (where available) of dispensing to infer the duration of use.  
22

23 Of the different opioid formulations available in NZ, only topical (fentanyl only) and oral preparations  
24 will be included. Patients discharged with parenteral products will be excluded. The indication for  
25 parenteral opioids is unlikely related to postoperative pain management but more likely for other  
26 indications such as palliation.  
27

28 To account for patients being on different strong opioids with variable potency, patients daily opioid  
29 dose will be standardised by converting the prescribed dose to oral morphine equivalence (OME) in  
30 milligrams to account for overall opioid exposures relative to morphine, per formula below- see  
31 supplementary material for OME conversion factors:<sup>29 30</sup>  
32

$$33 \text{ OME} = \text{Pack Strength} \times \text{OME conversion factor} \times \text{Quantity dispensed}$$

34 i.e. If 30 capsules of oxycodone 5 mg were dispensed, this would equate to an OME of 225 mg  
35

36 Cessation of opioid use will be defined as a pause of medication supply for more than 45 days from  
37 the last dispensing. This is because the maximum legal period of supply for opioids in NZ is 30 days.  
38 To account for any leftover of supply a further 15 days will be included.  
39

## 40 Covariates of persistent opioid use and opioid-related harm

41 We will aim to identify predictors of persistent opioid use and other secondary outcomes of interest,  
42 including opioid-related mortality. Various predictors have been investigated previously, including age,  
43 type of surgery, length of stay for the index surgery or trauma event, surgical speciality (cardiac,  
44 vascular, digestive, thoracic, neurosurgery, musculoskeletal, urinary and other), multiple surgeries in  
45 one day, complexity and urgency of surgery.<sup>31 32</sup> These will be collected via the NMDS in addition to  
46 ethnicity, gender, socioeconomic status, social deprivation score (via NZ Deprivation Index-NZDep).<sup>33</sup>  
47 The NZDep is an area-based measure of socioeconomic deprivation in New Zealand. The urgency of  
48 the surgery will be categorised as elective or acute. The operative complexity will be categorised  
49 using the Johns Hopkins five-category classification, where each procedure will be given an operation  
50 severity grade from one to five.<sup>34</sup> The method of identifying all procedures performed in NZ hospitals  
51 is consistent with a previously published paper involving current co-investigators on postoperative  
52 mortality risk.<sup>19</sup>  
53

54 Other comorbidities will be collected that have been shown in the literature to be predictors of  
55 persistent opioid use<sup>5 31 32</sup> such as depression (ICD-10AM codes: F32 -F33), anxiety (F40-F48),  
56 dementia (F00-F03), schizophrenia and related psychotic conditions (F20-F29), bipolar disorder  
57 (F31), alcohol and nicotine dependence (F10.20- F10.29, F17.200- F17.299), substance use (F10-  
58 F16, F18-F19, F55), mood disorder (F30-F39), other mental health conditions (F04-F09, F51-F53,  
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3 F59, F63, F68, F69, F930-F932, F99), and presence of chronic pain in a year prior to index date. For  
4 each patient included in the cohort, the M3 index (M3I) score and the American Society of  
5 Anesthesiologists (ASA) physical status classification system<sup>35</sup> will be used as a measure of  
6 comorbidity using information from any inpatient or outpatient contact the five years before the index  
7 date.<sup>36</sup> M3I score will be computed from a list of 61 health conditions based on the presence/absence  
8 of previous diagnostic codes (see the supplementary section for the specific health conditions). We  
9 will use the ASA score on each patients' NMDS record at the time of surgery. Additionally, we will  
10 adjust for the year of cohort entry in multivariable models assessing the relationship between  
11 explanatory variables and outcomes of interest.  
12

13 To assess concurrent medications use, we will examine patient's medications at baseline and in 6  
14 months prior to the index date using the Pharms database. Concomitant medications that are  
15 potential predictors for persistent opioid use include non-opioid analgesia, including paracetamol,  
16 pregabalin, gabapentin, benzodiazepines, antipsychotics, mood stabilisers and antidepressants.  
17 Additionally, information on non-steroidal anti-inflammatories (NSAIDs) dispensing will be collected as  
18 these have been shown to predict persistent opioid use.<sup>30 37</sup>  
19

## 20 Data analysis

21 Descriptive statistics will be used to describe baseline characteristics and the outcomes of interest.  
22 Continuous variables will be described using the mean and standard deviation or median and  
23 interquartile range as appropriate, depending on data distribution. Categorical variables will be  
24 described using frequency distributions and percentages. Kolmogorov–Smirnov and Shapiro–Wilk tests  
25 of normality will be used to assess the distribution of continuous variables. Parametric and non-  
26 parametric bivariate tests (e.g. Student's t-test, Mann-Whitney U test or  $\chi^2$  test) will be used to compare  
27 the characteristics of individuals who may or may not exhibit persistent opioid use after surgery or  
28 trauma.  
29

30 A multivariable logistic regression model will be used to examine the association between potential  
31 predictors and persistent opioid use after surgery/trauma. Odds ratios with 95% confidence intervals  
32 will be reported for each predictor. All predictor variables will be included simultaneously in the  
33 multivariable regression model. Multicollinearity between variables will be assessed using variance  
34 inflation factors and tolerance.  
35

36 We will calculate the crude rate of each outcome of interest for both persistent and non-persistent opioid  
37 user groups. To compute the rates, we will divide the total number of outcome events by total follow-up  
38 time. These will be reported as cases per 1000 person-days with confidence intervals derived from a  
39 Poisson or negative binomial distribution as appropriate. Cox multivariate regression models will be  
40 used to estimate the risk of all-cause mortality, opioid-related harms, and hospitalisation associated  
41 with persistent use of opioids in the 365 days after the index date for all patients. Hazard ratios and  
42 95% confidence intervals will be reported. The proportional hazards assumption of the Cox model will  
43 be tested using log-minus-log plots, and C-statistics will be used to identify the C-index of the  
44 multivariable Cox regression models. The Kaplan–Meier method will be used to summarise survival  
45 time for persistent and non-persistent opioid users. A two-sided p-value < 0.05 will be considered  
46 statistically significant for all statistical tests. We will make appropriate corrections to allow for multiple  
47 statistical tests. We will undertake all analyses using the R statistical software package (R v4.0.2).  
48  
49

## 50 Sub-group analysis

51 We will repeat the primary analyses by stratifying across three age groups (<18, 18–44, 45–64, ≥65  
52 years) to examine whether the strength of the predictors for persistent opioid use and secondary  
53 outcomes vary across age. We will also assess whether the findings of the primary analysis are  
54 consistent across subgroups defined according to sex, ethnicity (Māori vs non-Māori), different opioids,  
55 urgency of surgery (elective vs non-elective) or surgery complexity via operation severity (grade one-  
56 five).  
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## Sensitivity analysis

To assess the robustness of our primary analyses, we will conduct several sensitivity analyses. As noted, our primary analysis will include all patients in the cohort, regardless of whether they survived up to 90 days after the index date. In a sensitivity analysis, we will repeat the primary analyses after restricting the cohort to only those who survived at least 90 days after the index date. To explore the effect of our definition of opioid cessation, we will repeat the analysis using a pause in medication supply of 30 days or more instead of 45 days or more, as the definition of cessation of opioid use. Given the uncertainties related to the length of the look-back time window for opioid exposure, we will test our definition of opioid-naivety by evaluating exposure with 365 instead of 180 days. Moreover, we will repeat the analysis by changing the definition of persistent opioid use to 61 to 365 days after the index date.

## Missing value analysis

We will run Little's Missing Completely at Random (MCAR) test to assess whether missing values in the final datasets are MCAR.<sup>38</sup> If the data are MCAR, multiple imputations with chained equations will be conducted to impute missing values. We will use the 'mice' function in the R software package to perform multiple imputations and the subsequent analysis. We will perform up to five imputations to generate five datasets, and the average of the five values will replace each missing value in each of the five datasets.

## Patient and public involvement

The study was presented at a Māori hui (gathering), Taia Te Hauora, to discuss study with Māori research advisors on study's Māori responsiveness. Our team includes Dr Matthew Moore (Ngāti Rangiwewehi, Rangitāne ki Manawatū) and the ethics approval process included consultation with a Māori research advisor external to our team. The consultation included information on how best to disseminate study results to Māori.

## Discussion

To our knowledge, this study will result in the most extensive collection of data over the longest period that examines the contribution of surgery or trauma to persistent opioid use and related adverse outcomes explicitly. As NZ has a unique mixture of ethnicities, including an indigenous Māori population, our study will have a particular focus in line with our obligations under the *Treaty of Waitangi* to assess outcomes related to Māori.<sup>16</sup>

The definition of persistent opioid use has varied in the literature. A recent systematic review found 29 definitions of persistent opioid use.<sup>39</sup> A 100-fold difference in the rate of persistent opioid has been reported due to the use of different definitions.<sup>39</sup> The review supports our interpretation of persistent opioid use. Continuous opioid use was shown to be a more accurate representation of persistent opioid use than single dispensing of opioids within a set period (90-180 days) and a better predictor of subsequent harm.<sup>39</sup>

Our study's main limitation is its reliance on the information collected and coded in administrative datasets. Opioid consumption is extrapolated from pharmacy dispensing data, so medication consumption is not guaranteed. We will not have access to the indication for the continuation of opioid prescribing. Other limitations will include a follow-up period for secondary outcomes of only 365 days. We believe that 365 days would be an adequate time frame for events to occur related to opioid prescribed from the index event date. Although our study extends over a long time period, there have been relatively few changes to prescribing guidelines and opioid availability in New Zealand during this period. The only significant changes that have occurred were the introduction of oxycodone in 2005 and topical fentanyl patch in 2010.<sup>40</sup>



We aim to capture the effect of introducing these two products to the New Zealand market and the effect on prescribing of other opioids, e.g. Morphine. We chose a start date of 1<sup>st</sup> of January 2006 because data for pharmacy dispensing and hospital admissions are more reliable from this date.

We plan to use the M3I over other recognised comorbidity indices such as Charlson or Elixhauser due to its superior prognostic performance in the NZ population.<sup>36</sup> We will also use ASA for comorbidity as it is readily available on the NMDS, but we will assess which score performs the best. As our study is registry-based, we will not have access to each patient's perioperative anaesthetic assessments for the most accurate ASA classification.

## Ethics and Dissemination

### Data storage, retention and access

The Research team will not, at any time receive identifying data for any individual in the cohort as the data obtained from the Ministry of Health will be de-identified via encrypted NHIs. Data will be stored in a password-protected folder on the University of Auckland server, managed by the School of Pharmacy's pharmacoepidemiology research group. Data to be stored up to 10 years by the University of Auckland according to the Health Information Privacy Act<sup>41</sup>. Data governance will be as per the National Ethical Standards for Health and Disability Research 2019<sup>42</sup>. Only the primary and co-investigators will be allowed access to data, and data will be stored in a digital de-identified form.

*Refer to Data Management Plan in the supplementary material*

### Dissemination

The findings of this research will be relevant to multiple groups of people, include hospital policy stakeholders, surgeons, anaesthetists, ED physicians and other clinicians who have an interest in acute pain management and subsequent complications. We plan to disseminate our findings at scientific conferences and in high impact peer-reviewed journals that are read by a wide range of users. We plan to have an end of study hui to engage with Māori health users to disseminate study results. As the study uses routinely collected health data, results will be reported per the Reporting of studies Conducted using Observational Routinely-collected health Data statement (RECORD).<sup>43</sup>

**Figure 1. Study design diagram with cohort entry criteria including windows of time for exclusion assessment , opioid washout, covariate assessment, baseline characteristics assessment and follow-up period.**

**Acknowledgement:** We would like to thank Mr Luke Boyle for the provision of procedure codes and complexity categorisation.

**Contributors:** This study idea was conceived and designed by JG, PJ, AC, DC, AFM. JG, PJ, AC, AFM, MM, KAB, DC, CF and JM provided input to the study design and research questions. JG, KAB, CF developed the statistical plan. JG and AC obtained ethics approval for the study. JG completed the first draft of the manuscript. All authors reviewed and approved the final draft.

**Funding:** This publication was supported by the Auckland Academic Health Alliance (AAHA) grant number 8753.

**Competing interest:** JG receives grants from Auckland Academic Health Alliance (AAHA) and scholarship from the University of Auckland. KB reports grants from A+ charitable trust, New Zealand Pharmacy Education and Research Foundation, outside this submitted work, and U21 Health Sciences Research Development Fund. AC reports consultancy fees from Janssen-Cilag, and from Spoonful of Sugar Ltd, a UCL-Business spin-out company, and grants from Innovate UK, A+ charitable trust (Auckland District Health Board), and Maurice and Phyllis Paykel trust, outside this submitted work. DC reports receiving grants from the ADHB Research Trust, the Australian and New

Zealand College of Anaesthetists, the Auckland Academic Health Alliance, the Auckland Medical Research Foundation and the Neurological Foundation of New Zealand.

**Patient consent:** Ethics approval includes a waiver of the requirement for patient consent.

**Ethics Approval:** The study has been approved by the Auckland Health Research Ethics Committee (AHREC), Ref: AH1159.

**Provenance and peer review:** Peer reviewed for ethical and funding approval prior to submission by the AAHA grant committee.

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## Reference

1. US centres for Disease Control and Prevention. Drug overdose deaths in the United States hit record numbers in 2014: US centres for Disease Control and Prevention; 2014 [cited 2020 1st January]. Available from: <http://www.cdc.gov/drugoverdose/epidemic/> accessed 1st January 2020.
2. Shipton EE, Shipton AJ, Williman JA, et al. Deaths from Opioid Overdosing: Implications of Coroners' Inquest Reports 2008-2012 and Annual Rise in Opioid Prescription Rates: A Population-Based Cohort Study. *Pain and therapy* 2017;6(2):203-15. doi: 10.1007/s40122-017-0080-7 [published Online First: 2017/09/10]
3. Health Quality and Safety Commission New Zealand. Atlas of Healthcare Variation- opioids: HQSC New Zealand; 2017 [cited 2019 27th August]. Available from: <https://www.hqsc.govt.nz/our-programmes/health-quality-evaluation/projects/atlas-of-healthcare-variation/opioids/>.
4. Schug SA, Lavand'homme P, Barke A, et al. The IASP classification of chronic pain for ICD-11: chronic postsurgical or posttraumatic pain. *Pain* 2019;160(1):45-52. doi: 10.1097/j.pain.0000000000001413 [published Online First: 2018/12/27]
5. Stark N, Kerr S, Stevens J. Prevalence and predictors of persistent post-surgical opioid use: a prospective observational cohort study. *Anaesthesia and intensive care* 2017;45(6):700-06. doi: 10.1177/0310057x1704500609 [published Online First: 2017/11/16]
6. Barnett ML, Olenski AR, Jena AB. Opioid-Prescribing Patterns of Emergency Physicians and Risk of Long-Term Use. *New England Journal of Medicine* 2017;376(7):663-73. doi: 10.1056/NEJMsa1610524

- 1  
2  
3 7. Lopez-Quintero C, Hasin DS, de Los Cobos JP, et al. Probability and predictors of remission from  
4 life-time nicotine, alcohol, cannabis or cocaine dependence: results from the National Epidemiologic  
5 Survey on Alcohol and Related Conditions. *Addiction* 2011;106(3):657-69. doi: 10.1111/j.1360-  
6 0443.2010.03194.x [published Online First: 2010/11/17]  
7  
8  
9  
10  
11 8. Argyriou E, Um M, Carron C, et al. Age and impulsive behavior in drug addiction: A review of past  
12 research and future directions. *Pharmacol Biochem Behav* 2018;164:106-17. doi:  
13 10.1016/j.pbb.2017.07.013 [published Online First: 2017/08/06]  
14  
15  
16  
17 9. von Oelreich E, Eriksson M, Brattstrom O, et al. Risk factors and outcomes of chronic opioid use  
18 following trauma. *The British journal of surgery* 2020;107(4):413-21. doi: 10.1002/bjs.11507  
19 [published Online First: 2020/02/08]  
20  
21  
22  
23 10. New Zealand (NZ) Ministry of Health. New Zealand health system: Ministry of Health NZ; 2018  
24 [cited 2020 1st May]. Available from: <https://www.health.govt.nz/new-zealand-health-system>.  
25  
26  
27 11. Pharmac. Costs of medicines: Pharmac; 2020 [cited 2020 5th June]. Available from:  
28 <https://www.pharmac.govt.nz/medicines/medicines-information/costs-of-medicines/>.  
29  
30  
31  
32 12. New Zealand (NZ) Ministry of Health. The National Health Index (NHI) number: Ministry of Health  
33 NZ; [cited 2019 22nd December]. Available from: [https://www.health.govt.nz/our-work/health-](https://www.health.govt.nz/our-work/health-identity/national-health-index)  
34 [identity/national-health-index](https://www.health.govt.nz/our-work/health-identity/national-health-index).  
35  
36  
37  
38 13. Jerath A, Austin PC, Wijeyesundera DN. Days Alive and Out of Hospital: Validation of a Patient-  
39 centered Outcome for Perioperative Medicine. *Anesthesiology* 2019;131(1):84-93. doi:  
40 10.1097/ALN.0000000000002701 [published Online First: 2019/05/17]  
41  
42  
43  
44 14. Davis P, Lay-Yee R, Dyal L, et al. Quality of hospital care for Māori patients in New Zealand:  
45 retrospective cross-sectional assessment. *The Lancet* 2006;367(9526):1920-25. doi: 10.1016/s0140-  
46 6736(06)68847-8  
47  
48  
49  
50 15. Tomlin A, Woods DJ, Lambie A, et al. Ethnic inequality in non-steroidal anti-inflammatory drug-  
51 associated harm in New Zealand: A national population-based cohort study. *Pharmacoepidemiol*  
52 *Drug Saf* 2020 doi: 10.1002/pds.5028 [published Online First: 2020/06/02]  
53  
54  
55  
56 16. Treaty of Waitangi [English version], 1840.  
57  
58  
59 17. New Zealand (NZ) Ministry of Health. The National Minimum Dataset (NMDS): Ministry of Health  
60 NZ; [cited 2019 19th August]. Available from: <http://www.health.govt.nz/nz->

1  
2  
3 [healthstatistics/national-collections-and-surveys/collections/national-minimum-dataset-hospital-](#)  
4 [events.](#)  
5

6  
7  
8 18. The Australian Consortium for Classification Development (ACCD). The Australian Classification of  
9 Health Interventions (ACHI) 2019 [cited 2020 20th May].  
10

11  
12 19. Campbell D, Boyle L, Soakell-Ho M, et al. National risk prediction model for perioperative  
13 mortality in non-cardiac surgery. *The British journal of surgery* 2019;106(11):1549-57. doi:  
14 10.1002/bjs.11232 [published Online First: 2019/08/07]  
15  
16

17  
18 20. New Zealand (NZ) Ministry of Health. National Non-Admitted Patients Collection (NNPAC):  
19 Ministry of Health NZ; [cited 2019 30th December]. Available from: [https://www.health.govt.nz/nz-](https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-collection)  
20  [22  \[24  \\[26  \\\[28  \\\\[30  \\\\\[32  \\\\\\[34  \\\\\\\[36  \\\\\\\\[38  \\\\\\\\\[40  \\\\\\\\\\[42  \\\\\\\\\\\[44  \\\\\\\\\\\\[46  \\\\\\\\\\\\\[48  \\\\\\\\\\\\\\[50  \\\\\\\\\\\\\\\[52  \\\\\\\\\\\\\\\\[54  \\\\\\\\\\\\\\\\\[56  \\\\\\\\\\\\\\\\\\[58  \\\\\\\\\\\\\\\\\\\[60 \\\\\\\\\\\\\\\\\\\\[collection.\\\\\\\\\\\\\\\\\\\\]\\\\\\\\\\\\\\\\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/><a href=\\\\\\\\\\\\\\\\\\\\)\\\\\\\\\\\\\\\\\\\]\\\\\\\\\\\\\\\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>59 <a href=\\\\\\\\\\\\\\\\\\\)\\\\\\\\\\\\\\\\\\]\\\\\\\\\\\\\\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>57 <a href=\\\\\\\\\\\\\\\\\\)\\\\\\\\\\\\\\\\\]\\\\\\\\\\\\\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>55 <a href=\\\\\\\\\\\\\\\\\)\\\\\\\\\\\\\\\\]\\\\\\\\\\\\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>53 <a href=\\\\\\\\\\\\\\\\)\\\\\\\\\\\\\\\]\\\\\\\\\\\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>51 <a href=\\\\\\\\\\\\\\\)\\\\\\\\\\\\\\]\\\\\\\\\\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>49 <a href=\\\\\\\\\\\\\\)\\\\\\\\\\\\\]\\\\\\\\\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>47 <a href=\\\\\\\\\\\\\)\\\\\\\\\\\\]\\\\\\\\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>45 <a href=\\\\\\\\\\\\)\\\\\\\\\\\]\\\\\\\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>43 <a href=\\\\\\\\\\\)\\\\\\\\\\]\\\\\\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>41 <a href=\\\\\\\\\\)\\\\\\\\\]\\\\\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>39 <a href=\\\\\\\\\)\\\\\\\\]\\\\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>37 <a href=\\\\\\\\)\\\\\\\]\\\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>35 <a href=\\\\\\\)\\\\\\]\\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>33 <a href=\\\\\\)\\\\\]\\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>31 <a href=\\\\\)\\\\]\\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>29 <a href=\\\\)\\\]\\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>27 <a href=\\\)\\]\\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>25 <a href=\\)\]\(https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>23 <a href=\)](https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-</a><br/>21 <a href=)

21  
22  
23 21. (ACC) ACC. Who we are: Accident Compensation Corporation (ACC); [cited 2020 21st July].  
24 Available from: [https://www.acc.co.nz/about-us/who-we-are/what-we-do/?smooth-scroll=content-](https://www.acc.co.nz/about-us/who-we-are/what-we-do/?smooth-scroll=content-after-navs)  
25 [after-navs.](https://www.acc.co.nz/about-us/who-we-are/what-we-do/?smooth-scroll=content-after-navs)  
26  
27

28  
29  
30 22. New Zealand (NZ) Ministry of Health. The Mortality Collection: Ministry of Health NZ; [cited  
31 2019 13th March]. Available from: [https://www.health.govt.nz/nz-health-statistics/national-](https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/mortality-collection)  
32 [collections-and-surveys/collections/mortality-collection.](https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/mortality-collection)  
33  
34

35  
36  
37 23. New Zealand (NZ) Ministry of Health. Pharmaceutical Collection dataset: Ministry of Health NZ;  
38 [cited 2019 27th August]. Available from: [https://minhealthnz.shinyapps.io/datapharm/.](https://minhealthnz.shinyapps.io/datapharm/)  
39  
40

41  
42 24. New Zealand (NZ) Ministry of Health. The Primary Health Organisation Enrolment Collection  
43 (PHO): Ministry of Health NZ; [cited 2019 30th December]. Available from:  
44 [https://www.health.govt.nz/nz-health-statistics/national-collections-and-](https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/primary-health-organisation-enrolment-collection)  
45 [surveys/collections/primary-health-organisation-enrolment-](https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/primary-health-organisation-enrolment-collection)  
46 [collection.](https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/primary-health-organisation-enrolment-collection)  
47  
48

49  
50 25. Schneeweiss S, Rassen JA, Brown JS, et al. Graphical Depiction of Longitudinal Study Designs in  
51 Health Care Databases. *Annals of internal medicine* 2019;170(6):398-406. doi: 10.7326/m18-3079  
52 [published Online First: 2019/03/12]  
53  
54

55  
56 26. Schug SA, Palmer GM, Scott DA, et al. Acute pain management: scientific evidence, fourth  
57 edition, 2015. *Med J Aust* 2016;204(8):315-7. doi: 10.5694/mja16.00133 [published Online First:  
58 2016/04/30]  
59  
60

- 1  
2  
3 27. Dunn KM, Saunders KW, Rutter CM, et al. Opioid prescriptions for chronic pain and overdose: a  
4 cohort study. *Annals of internal medicine* 2010;152(2):85-92. doi: 10.7326/0003-4819-152-2-  
5 201001190-00006 [published Online First: 2010/01/20]  
6  
7  
8  
9 28. Braden JB, Russo J, Fan MY, et al. Emergency department visits among recipients of chronic  
10 opioid therapy. *Archives of internal medicine* 2010;170(16):1425-32. doi:  
11 10.1001/archinternmed.2010.273 [published Online First: 2010/09/15]  
12  
13  
14  
15 29. New Zealand Formulary. Opioid analgesics- Switching opioids: New Zealand Formulary; 2020  
16 [cited 2020 27th May]. Available from: [https://nzf.org.nz/nzf\\_70672#nzf\\_70708](https://nzf.org.nz/nzf_70672#nzf_70708).  
17  
18  
19 30. Lalic S, Gisev N, Bell JS, et al. Predictors of persistent prescription opioid analgesic use among  
20 people without cancer in Australia. *Br J Clin Pharmacol* 2018;84(6):1267-78. doi: 10.1111/bcp.13556  
21 [published Online First: 2018/02/17]  
22  
23  
24  
25 31. Brummett CM, Waljee JF, Goesling J, et al. New Persistent Opioid Use After Minor and Major  
26 Surgical Procedures in US Adults. *JAMA Surg* 2017;152(6):e170504. doi:  
27 10.1001/jamasurg.2017.0504 [published Online First: 2017/04/14]  
28  
29  
30  
31 32. Clarke H, Soneji N, Ko DT, et al. Rates and risk factors for prolonged opioid use after major  
32 surgery: population based cohort study. *BMJ* 2014;348:g1251. doi: 10.1136/bmj.g1251 [published  
33 Online First: 2014/02/13]  
34  
35  
36  
37 33. Atkinson J SC, Crampton P. NZDep2013 Index of Deprivation. *University of Otago, Dunedin* 2014  
38  
39  
40 34. Pasternak LR. Preanesthesia Evaluation of the Surgical Patient. *ASA Refresher Courses in*  
41 *Anesthesiology* 1996;24:205-19. doi: 10.1097/00126869-199624000-00016  
42  
43  
44 35. American Society of Anesthesiologists. ASA Physical Status Classification System: American  
45 Society of Anesthesiologists; 2019 [cited 2020 1st June]. Available from:  
46 <https://www.asahq.org/standards-and-guidelines/asa-physical-status-classification-system>.  
47  
48  
49  
50 36. Stanley J, Sarfati D. The new measuring multimorbidity index predicted mortality better than  
51 Charlson and Elixhauser indices among the general population. *Journal of clinical epidemiology*  
52 2017;92:99-110. doi: 10.1016/j.jclinepi.2017.08.005 [published Online First: 2017/08/29]  
53  
54  
55  
56 37. Rhon DI, Snodgrass SJ, Cleland JA, et al. Predictors of chronic prescription opioid use after  
57 orthopedic surgery: derivation of a clinical prediction rule. *Perioper Med (Lond)* 2018;7:25. doi:  
58 10.1186/s13741-018-0105-8 [published Online First: 2018/11/28]  
59  
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2  
3 38. Roderick JAL. A Test of Missing Completely at Random for Multivariate Data with Missing Values.  
4 *Journal of the American Statistical Association* 1988;83:1198-202. doi:  
5 10.1080/01621459.1988.10478722  
6  
7  
8  
9 39. Jivraj NK, Raghavji F, Bethell J, et al. Persistent Postoperative Opioid Use: A Systematic Literature  
10 Search of Definitions and Population-based Cohort Study. *Anesthesiology* 2020;132(6):1528-39. doi:  
11 10.1097/ALN.0000000000003265 [published Online First: 2020/04/04]  
12  
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14  
15 40. Pharmac. Application tracker: Pharmac; 2020 [cited 2020 16th December]. Available from:  
16 <https://connect.pharmac.govt.nz/apptracker/s/>.  
17  
18  
19 41. Privacy Commissioner. Health Information Privacy Code 1994: Privacy Commissioner; 2013 [cited  
20 2020 19th April]. Available from: [https://www.privacy.org.nz/the-privacy-act-and-codes/codes-of-](https://www.privacy.org.nz/the-privacy-act-and-codes/codes-of-practice/health-information-privacy-code-1994/)  
21 [practice/health-information-privacy-code-1994/](https://www.privacy.org.nz/the-privacy-act-and-codes/codes-of-practice/health-information-privacy-code-1994/).  
22  
23  
24  
25 42. National Ethics Advisory Committee. National Ethical Standards for Health and Disability, and  
26 Quality Improvement: Ministry of Health of NZ; 2019 [cited 2020 20th Feb]. Available from:  
27 [https://neac.health.govt.nz/publications-and-resources/neac-publications/national-ethical-](https://neac.health.govt.nz/publications-and-resources/neac-publications/national-ethical-standards-health-and-disability)  
28 [standards-health-and-disability](https://neac.health.govt.nz/publications-and-resources/neac-publications/national-ethical-standards-health-and-disability).  
29  
30  
31  
32  
33 43. Benchimol EI, Smeeth L, Guttman A, et al. The REporting of studies Conducted using  
34 Observational Routinely-collected health Data (RECORD) Statement. *PLOS Medicine*  
35 2015;12(10):e1001885. doi: 10.1371/journal.pmed.1001885  
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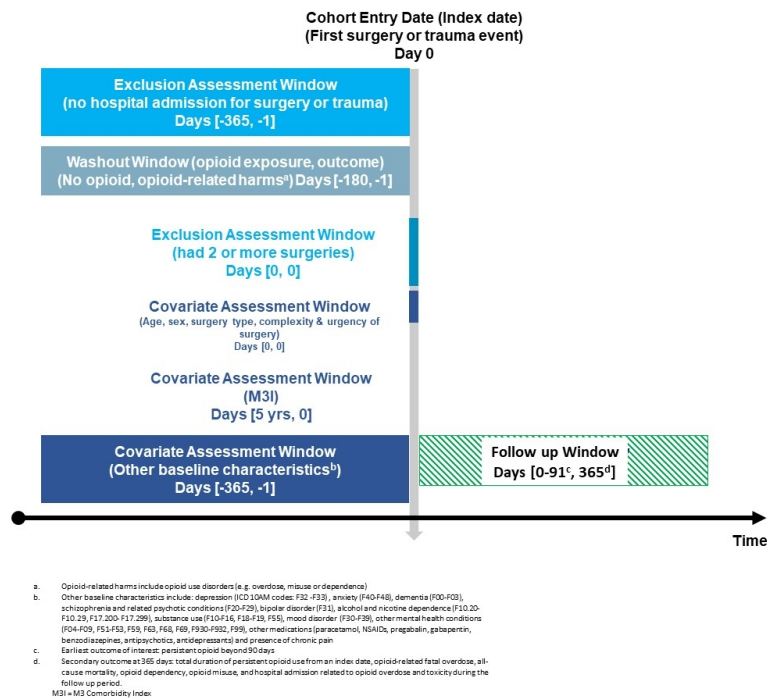


Figure 1. Study design

338x317mm (96 x 96 DPI)



# Opioid study- supplementary section

## Opioid related harm- ICD-10AM codes

Outcome	ICD-10AM code
Mental and behavioural disorders due to use of opioids	F11
Mental and behavioural disorders due to use of opioids, acute intoxication	F110
Mental and behavioural disorders due to use of opioids, harmful use	F111
Mental and behavioural disorders due to use of opioids, dependence syndrome	F112
Mental and behavioural disorders due to use of opioids, withdrawal state	F113
Mental and behavioural disorders due to use of opioids, withdrawal state with delirium	F114
Mental and behavioural disorders due to use of opioids, psychotic disorder	F115
Mental and behavioural disorders due to use of opioids, amnesic syndrome	F116
Mental and behavioural disorders due to use of opioids, residual and late-onset psychotic disorder	F117
Mental and behavioural disorders due to use of opioids, other mental and behavioural disorders	F118
Mental and behavioural disorders due to use of opioids, unspecified mental and behavioural disorder	F119
Neonatal withdrawal symptoms from maternal use of drugs of addiction	P961
Poisoning by opium	T400
Poisoning by heroin	T401
Poisoning by other opioids	T402
Poisoning by methadone	T403
Poisoning by other synthetic narcotics	T404
Poisoning by cocaine	T405
Poisoning by other and unspecified narcotics	T406
Opioids and related analgesics causing adverse effect in therapeutic use	Y450

## Trauma admissions- ICD-10AM codes

Site of Trauma	ICD-10AM code
Head	S00- S09
Neck	S10- S19
Thorax	S20- S29
Abdomen/Lower back, Pelvis	S30- S39
Shoulder/Upper arm	S40- S49
Elbow/Forearm	S50- S59
Wrist/Hand	S60- S69
Hip/Thigh	S70- S79
Knee/Lower leg	S80- S89
Ankle/Foot	S90- S99
Multiple	T00- T07
Unspecified part of trunk, limb, or body region	T08- T14



## M3 Index variables

Condition	Beta coefficient: log (HR) (95% CI)
AIDS	0.45 (-0.18 to 1.08)
Alcohol abuse	0.58 (0.47 to 0.68)
Anemia deficiency	0.18 (0.12 to 0.24)
Anxiety and behavioural disorders	0.12 (0.04 to 0.21)
Aortic and other aneurysms	0.26 (0.14 to 0.38)
Bone disorders	0.13 (0.03 to 0.24)
Bowel disease inflammatory	0.09 (0.03 to 0.14)
Breast Cancer	0.41 (0.26 to 0.56)
Cardiac Arrhythmia	0.17 (0.13 to 0.21)
Cardiac valve	0.26 (0.19 to 0.32)
Cerebrovascular disease	0.10 (0.04 to 0.16)
Chronic pulmonary	0.63 (0.58 to 0.67)
Chronic renal	0.33 (0.28 to 0.39)
Coagulopathy and other blood disorders	0.27 (0.22 to 0.31)
Colorectal cancer	0.37 (0.26 to 0.49)
Congestive heart failure	0.54 (0.49 to 0.59)
Connective tissue disease	0.29 (0.18 to 0.40)
Dementia	1.02 (0.97 to 1.07)
Diabetes (complicated)	0.27 (0.22 to 0.32)
Diabetes (uncomplicated)	0.30 (0.17 to 0.43)
Drug abuse	0.56 (0.38 to 0.74)
Endocrine disorder	0.11 (0.03 to 0.20)
Epilepsy	0.59 (0.47 to 0.72)
Eye problem long term	0.18 (0.12 to 0.24)
Gastrointestinal ulcer or upper GI disease	0.15 (0.07 to 0.23)
Gynecological cancers	0.71 (0.47 to 0.94)
Hepatitis, chronic viral	0.57 (0.42 to 0.72)
Hypertension uncomplicated	0.12 (0.06 to 0.17)
Immune system disorder	0.40 (0.18 to 0.61)
Inner ear disorder	0.06 (-0.02 to 0.14)
Joint or spinal disorder	0.10 (0.02 to 0.18)
Liver disease (Moderate or severe)	0.47 (0.36 to 0.59)
Lung cancer	1.97 (1.85 to 2.09)
Lymphomas and leukaemia	1.19 (1.08 to 1.30)
Major psychiatric disorder	0.21 (0.13 to 0.29)
Malignant melanoma	0.34 (0.21 to 0.47)
Malnutrition and other nutritional disorders	0.33 (0.25 to 0.41)
Mental and behavioural disorders due to brain damage	0.04 (-0.17 to 0.24)
Mental retardation	1.41 (1.21 to 1.60)
Metabolic disorder	0.01 (-0.05 to 0.06)
Metastatic cancer	2.47 (2.42 to 2.51)
Muscular peripheral nerve disorders	0.21 (0.11 to 0.31)
Myocardial infarction	0.20 (0.14 to 0.25)
Obesity	0.25 (0.16 to 0.34)
Osteoporosis (uncomplicated)	0.08 (-0.06 to 0.23)
Other cancers	1.10 (1.02 to 1.18)

Other neurologic disorders (excl. epilepsy)	0.56 (0.50 to 0.63)
Paralysis	0.28 (0.21 to 0.36)
Peripheral vascular disease	0.35 (0.28 to 0.42)
Prostate cancer	0.43 (0.33 to 0.53)
Pulmonary circulation disorders	0.40 (0.31 to 0.48)
Sleep disorder	0.25 (0.12 to 0.37)
Upper gastrointestinal cancer	1.94 (1.82 to 2.07)
Urinary tract problem (chronic)	0.05 (-0.05 to 0.15)
Venous insufficiency	0.21 (0.06 to 0.36)

## Medication and Form ID code

Form ID	Chemical	Formulation
183101	Morphine sulphate	Tab long-acting 10 mg
183102	Morphine sulphate	Tab long-acting 30 mg
183103	Morphine sulphate	Tab long-acting 60 mg
183104	Morphine sulphate	Tab long-acting 100 mg
183119	Morphine sulphate	Cap long-acting 100 mg
183120	Morphine sulphate	Tab immediate-release 10 mg
183121	Morphine sulphate	Tab immediate-release 20 mg
183122	Morphine sulphate	Cap long-acting 10 mg
183126	Morphine sulphate	Cap long-acting 30 mg
183127	Morphine sulphate	Cap long-acting 60 mg
183001	Morphine hydrochloride	Oral liq 1 mg per ml
183002	Morphine hydrochloride	Oral liq 2 mg per ml
183003	Morphine hydrochloride	Oral liq 5 mg per ml
183004	Morphine hydrochloride	Oral liq 10 mg per ml
382225	Oxycodone hydrochloride	Cap immediate-release 5 mg
382226	Oxycodone hydrochloride	Cap immediate-release 10 mg
382227	Oxycodone hydrochloride	Cap immediate-release 20 mg
382228	Oxycodone hydrochloride	Tab controlled-release 10 mg
382229	Oxycodone hydrochloride	Tab controlled-release 20 mg
382230	Oxycodone hydrochloride	Tab controlled-release 40 mg
382231	Oxycodone hydrochloride	Tab controlled-release 80 mg
382232	Oxycodone hydrochloride	Tab controlled-release 5 mg
382233	Oxycodone hydrochloride	Oral liq 5 mg per 5 ml
380132	Fentanyl	Transdermal patch, matrix 100 mcg per hour
380133	Fentanyl	Patch 12.5 mcg per hour
380134	Fentanyl	Patch 25 mcg per hour
380135	Fentanyl	Patch 50 mcg per hour
380136	Fentanyl	Patch 75 mcg per hour
380137	Fentanyl	Patch 100 mcg per hour
133201	Codeine phosphate	Tab 15 mg
133202	Codeine phosphate	Tab 30 mg
133203	Codeine phosphate	Tab 60 mg

242701	Dihydrocodeine tartrate	Tab long-acting 60 mg
390625	Tramadol hydrochloride	Cap 50 mg
390626	Tramadol hydrochloride	Tab sustained-release 100 mg
390627	Tramadol hydrochloride	Tab sustained-release 150 mg
390628	Tramadol hydrochloride	Tab sustained-release 200 mg
195301	Pethidine hydrochloride	Tab 50 mg
195302	Pethidine hydrochloride	Tab 100 mg
179501	Methadone hydrochloride	Tab 5 mg
179505	Methadone hydrochloride	Oral liq 2 mg per ml
179506	Methadone hydrochloride	Oral liq 5 mg per ml
179507	Methadone hydrochloride	Oral liq 10 mg per ml

### Oral Morphine Equivalence conversion factors

Opioid name	Route of administration	Conversion factor
Morphine	Oral	1
Oxycodone	Oral	1.5
Fentanyl	Transdermal	7200*
Methadone	Oral	4.7
Pethidine	Oral	0.4
Dihydrocodeine	Oral	0.1
Codeine	Oral	0.1
Tramadol	Oral	0.1

Usual conversion for transdermal for fentanyl to oral morphine is 100:1, but given the patches dosing are mcg/hr for \*24 over 3 days

### Concurrent medication and Form ID code

Form ID	Chemical	Formulation
181501	Metoclopramide hydrochloride with paracetamol	Tab 5 mg with paracetamol 500 mg
192902	Paracetamol	Oral liq 120 mg per 5 ml
192903	Paracetamol	Oral liq 250 mg per 5 ml
192904	Paracetamol	Suppos 125 mg
192905	Paracetamol	Suppos 250 mg
192906	Paracetamol	Suppos 500 mg
192908	Paracetamol	Tab 500 mg - blister pack
192925	Paracetamol	Tab 500 mg - bottle pack
193101	Paracetamol with codeine	Tab paracetamol 500 mg with codeine phosphate 8 mg
279805	Ibuprofen	Oral liq 20 mg per ml
279801	Ibuprofen	Tab 200 mg
279802	Ibuprofen	Tab 400 mg
279803	Ibuprofen	Tab 600 mg
279804	Ibuprofen	Tab long-acting 800 mg
140109	Diclofenac sodium	Suppos 100 mg

140106	Diclofenac sodium	Suppos 12.5 mg
140107	Diclofenac sodium	Suppos 25 mg
140108	Diclofenac sodium	Suppos 50 mg
140111	Diclofenac sodium	Tab 50 mg dispersible
140101	Diclofenac sodium	Tab EC 25 mg
140102	Diclofenac sodium	Tab EC 50 mg
140112	Diclofenac sodium	Tab long-acting 100 mg
140103	Diclofenac sodium	Tab long-acting 75 mg
278209	Naproxen	Tab 250 mg
278211	Naproxen	Tab 500 mg
278206	Naproxen	Tab long-acting 1 g
278205	Naproxen	Tab long-acting 750 mg
169708	Ketoprofen	Cap long-acting 100 mg
169703	Ketoprofen	Cap long-acting 200 mg
176901	Mefenamic acid	Cap 250 mg
391225	Meloxicam	Tab 7.5 mg
408125	Celecoxib	Cap 100 mg
408126	Celecoxib	Cap 200 mg
219301	Sulindac	Tab 100 mg
219302	Sulindac	Tab 200 mg
253601	Tenoxicam	Tab 20 mg
184901	Nefopam hydrochloride	Tab 30 mg
409727	Pregabalin	Cap 150 mg
409725	Pregabalin	Cap 25 mg
409728	Pregabalin	Cap 300 mg
409726	Pregabalin	Cap 75 mg
106225	Gabapentin	Cap 100 mg
106201	Gabapentin	Cap 300 mg
106202	Gabapentin	Cap 400 mg
106026	Gabapentin (Neurontin)	Tab 600 mg
139701	Diazepam	Tab 2 mg
139702	Diazepam	Tab 5 mg
173004	Lorazepam	Tab 1 mg
173002	Lorazepam	Tab 2.5 mg
222425	Temazepam	Tab 10 mg
186501	Nitrazepam	Tab 5 mg
173101	Lormetazepam	Tab 1 mg
229501	Triazolam	Tab 125 mcg
229502	Triazolam	Tab 250 mcg
263203	Alprazolam	Tab 1 mg
263201	Alprazolam	Tab 250 mcg
263202	Alprazolam	Tab 500 mcg
131603	Clonazepam	Oral drops 2.5 mg per ml
131602	Clonazepam	Tab 2 mg

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4	131601	Clonazepam	Tab 500 mcg
5	191101	Oxazepam	Tab 10 mg
6	191102	Oxazepam	Tab 15 mg
7	119301	Citalopram hydrobromide	Tab 20 mg
8	119025	Citalopram hydrobromide (Celapram)	Tab 20 mg
9	392625	Escitalopram	Tab 10 mg
10	392626	Escitalopram	Tab 20 mg
11	263601	Fluoxetine hydrochloride	Cap 20 mg
12	263602	Fluoxetine hydrochloride	Tab dispersible 20 mg, scored
13	600901	Paroxetine	Tab 20 mg
14	392726	Sertraline	Tab 100 mg
15	392725	Sertraline	Tab 50 mg
16	105901	Amitriptyline	Tab 10 mg
17	105902	Amitriptyline	Tab 25 mg
18	105903	Amitriptyline	Tab 50 mg
19	131501	Clomipramine hydrochloride	Tab 10 mg
20	131502	Clomipramine hydrochloride	Tab 25 mg
21	143702	Dosulepin [Dothiepin] hydrochloride	Cap 25 mg
22	143701	Dosulepin [Dothiepin] hydrochloride	Tab 75 mg
23	143801	Doxepin hydrochloride	Cap 10 mg
24	143802	Doxepin hydrochloride	Cap 25 mg
25	143803	Doxepin hydrochloride	Cap 50 mg
26	164201	Imipramine hydrochloride	Tab 10 mg
27	164202	Imipramine hydrochloride	Tab 25 mg
28	187601	Nortriptyline hydrochloride	Tab 10 mg
29	187602	Nortriptyline hydrochloride	Tab 25 mg
30	176001	Maprotiline hydrochloride	Tab 25 mg
31	176002	Maprotiline hydrochloride	Tab 75 mg
32	195501	Phenelzine sulphate	Tab 15 mg
33	228501	Tranlycypromine sulphate	Tab 10 mg
34	263802	Moclobemide	Tab 150 mg
35	263803	Moclobemide	Tab 300 mg
36	390125	Mirtazapine	Tab 30 mg
37	390126	Mirtazapine	Tab 45 mg
38	378526	Venlafaxine	Cap 150 mg
39	378527	Venlafaxine	Cap 37.5 mg
40	378525	Venlafaxine	Cap 75 mg
41	378530	Venlafaxine	Tab 150 mg
42	378531	Venlafaxine	Tab 225 mg
43	378528	Venlafaxine	Tab 37.5 mg
44	378529	Venlafaxine	Tab 75 mg
45	389225	Bupropion hydrochloride	Tab modified release 150 mg
46	128301	Chlorpromazine hydrochloride	Tab 10 mg
47	128304	Chlorpromazine hydrochloride	Tab 100 mg
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128302	Chlorpromazine hydrochloride	Tab 25 mg
158304	Haloperidol	Oral liq 2 mg per ml
158302	Haloperidol	Tab 1.5 mg
158303	Haloperidol	Tab 5 mg
158301	Haloperidol	Tab 500 mcg
253003	Haloperidol decanoate	Inj 100 mg per ml, 1 ml
253001	Haloperidol decanoate	Inj 50 mg per ml, 1 ml
195002	Pericyazine	Tab 10 mg
195001	Pericyazine	Tab 2.5 mg
601205	Prochlorperazine	Suppos 25 mg
601201	Prochlorperazine	Tab 3 mg buccal
601202	Prochlorperazine	Tab 5 mg
229801	Trifluoperazine hydrochloride	Tab 1 mg
229802	Trifluoperazine hydrochloride	Tab 2 mg
229803	Trifluoperazine hydrochloride	Tab 5 mg
199025	Pimozide	Tab 4 mg
380325	Zuclopenthixol decanoate	Inj 200 mg per ml, 1 ml
389825	Zuclopenthixol hydrochloride	Tab 10 mg
388428	Amisulpride	Oral liq 100 mg per ml
388425	Amisulpride	Tab 100 mg
388426	Amisulpride	Tab 200 mg
388427	Amisulpride	Tab 400 mg
387825	Aripiprazole	Tab 10 mg
387826	Aripiprazole	Tab 15 mg
387827	Aripiprazole	Tab 20 mg
387828	Aripiprazole	Tab 30 mg
387829	Aripiprazole	Tab 5 mg
387830	Aripiprazole	Tablet 5 mg
107827	Clozapine	Suspension 50 mg per ml
107802	Clozapine	Tab 100 mg
107826	Clozapine	Tab 200 mg
107801	Clozapine	Tab 25 mg
107825	Clozapine	Tab 50 mg
114015	Olanzapine	Inj 210 mg vial
114016	Olanzapine	Inj 300 mg vial
114017	Olanzapine	Inj 405 mg vial
114002	Olanzapine	Tab 10 mg
114003	Olanzapine	Tab 2.5 mg
114001	Olanzapine	Tab 5 mg
114028	Olanzapine	Tab orodispersible 10 mg
114027	Olanzapine	Tab orodispersible 5 mg
118302	Quetiapine	Tab 100 mg
118303	Quetiapine	Tab 200 mg
118301	Quetiapine	Tab 25 mg

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4	118325	Quetiapine	Tab 300 mg
5	101126	Risperidone	Inj 25 mg vial
6	101127	Risperidone	Inj 37.5 mg vial
7	101128	Risperidone	Inj 50 mg vial
8	101105	Risperidone	Oral liq 1 mg per ml
9	101125	Risperidone	Tab 0.5 mg
10	101101	Risperidone	Tab 1 mg
11	101102	Risperidone	Tab 2 mg
12	101103	Risperidone	Tab 3 mg
13	101104	Risperidone	Tab 4 mg
14	101129	Risperidone	Tab orodispersible 0.5 mg
15	101130	Risperidone	Tab orodispersible 1 mg
16	101131	Risperidone	Tab orodispersible 2 mg
17	402528	Paliperidone	Inj 100 mg syringe
18	402529	Paliperidone	Inj 150 mg syringe
19	402525	Paliperidone	Inj 25 mg syringe
20	402526	Paliperidone	Inj 50 mg syringe
21	402527	Paliperidone	Inj 75 mg syringe
22	387325	Ziprasidone	Cap 20 mg
23	387326	Ziprasidone	Cap 40 mg
24	387327	Ziprasidone	Cap 60 mg
25	387328	Ziprasidone	Cap 80 mg
26	153203	Flupenthixol decanoate	Inj 100 mg per ml, 1 ml
27	153201	Flupenthixol decanoate	Inj 20 mg per ml, 1 ml
28	153202	Flupenthixol decanoate	Inj 20 mg per ml, 2 ml
29	153304	Fluphenazine decanoate	Inj 100 mg per ml, 1 ml
30	153301	Fluphenazine decanoate	Inj 12.5 mg per 0.5 ml, 0.5 ml
31	153302	Fluphenazine decanoate	Inj 25 mg per ml, 1 ml
32	153303	Fluphenazine decanoate	Inj 25 mg per ml, 2 ml
33	246604	Lithium carbonate	Cap 250 mg
34	246601	Lithium carbonate	Tab 250 mg
35	246602	Lithium carbonate	Tab 400 mg
36	246603	Lithium carbonate	Tab long-acting 400 mg
37	121703	Carbamazepine	Oral liq 20 mg per ml
38	121704	Carbamazepine	Tab 200 mg
39	121706	Carbamazepine	Tab 400 mg
40	121705	Carbamazepine	Tab long-acting 200 mg
41	121707	Carbamazepine	Tab long-acting 400 mg
42	216604	Sodium valproate	Oral liq 200 mg per 5 ml
43	216601	Sodium valproate	Tab 100 mg
44	216602	Sodium valproate	Tab 200 mg EC
45	216603	Sodium valproate	Tab 500 mg EC
46	100228	Lamotrigine	Tab dispersible 100 mg
47	100230	Lamotrigine	Tab dispersible 2 mg
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100226	Lamotrigine	Tab dispersible 25 mg
100225	Lamotrigine	Tab dispersible 5 mg
100227	Lamotrigine	Tab dispersible 50 mg
130801	Clobazam	Tab 10 mg

## Procedure list and complexity category- Adapted from 11<sup>th</sup> edition of Australasian Classification of Health Interventions (ACHI)

Procedure	Operation severity
1 Examination of skull, meninges or brain	3
2 Cranial tap or puncture	3
3 Insertion of intracranial cerebrospinal fluid devices	3
4 Removal of intracranial cerebrospinal fluid devices	3
5 Irrigation, insertion or removal of intracranial cerebrospinal fluid shunt	3
6 Other application, insertion or removal procedures on skull, meninges or brain	3
7 Incisional exploration of meninges or brain	4
8 Intracranial drainage	5
9 Intracranial decompression	5
10 Postoperative reopening of craniotomy or craniectomy site	5
11 Destruction of intracranial aneurysm or other vascular lesion	5
12 Biopsy of brain or meninges	4
13 Excision of lesion of skull	3
14 Removal of intracranial haematoma or abscess	5
15 Removal of intracranial lesion	5
16 Other intracranial excision	5
17 Skull base surgery for lesion	5
19 Ventriculostomy	4
20 Repair of dura of brain	4
21 Extracranial to intracranial bypass	5
22 Other repair of meninges or brain	5
23 Cranioplasty	4
24 Revision of intracranial cerebrospinal fluid shunt	4
25 Procedures for skull fracture	4
27 Functional intracranial stereotactic procedure	4
28 Other procedures on skull, meninges or brain	4
29 Examination of spinal canal and spinal cord structures	4
30 Lumbar puncture	2
31 Application, insertion or removal procedures on vertebra or intervertebral disc	3
32 Epidural injection	2
33 Epidural infusion	2
34 Caudal injection	2



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3	35 Caudal infusion	2
4	36 Spinal injection	2
5	37 Spinal infusion	2
6	38 Spinal blood patch	2
7	39 Insertion of spinal catheter, infusion device or pump	2
8	40 Removal of spinal catheter, infusion device or pump	2
9	41 Insertion and removal of spinal cerebrospinal fluid drain	3
10	42 Insertion and removal of spinal cerebrospinal fluid shunt	3
11	43 Insertion, replacement or removal of epidural electrodes	2
12	45 Cordotomy or myelotomy	4
13	46 Decompression of cervical spinal cord	3
14	47 Decompression of thoracic and thoracolumbar spinal cord	3
15	48 Decompression of lumbar spinal canal	3
16	49 Other incision procedures on spinal canal or spinal cord structures	3
17	50 Biopsy of spinal cord or spinal meninges	3
18	51 Discectomy for recurrent disc lesion	3
19	52 Other discectomy	3
20	53 Removal of spinal lesion	3
21	54 Other excision procedures on spinal canal or spinal cord structures	3
22	55 Repair of spinal canal or spinal cord structures	3
23	56 Revision procedures on spinal canal or spinal cord structures	3
24	58 Functional spinal stereotactic procedure	3
25	59 Other procedures on spinal canal or spinal cord structures	3
26	60 Administration of anaesthetic agent around cranial nerve	2
27	61 Administration of neurolytic agent into cranial nerve	2
28	62 Administration of agent into posterior primary rami of spinal nerve	2
29	63 Administration of anaesthetic agent around other peripheral nerve	2
30	64 Administration of neurolytic agent into other peripheral nerve	2
31	65 Administration of therapeutic agent around sympathetic nervous system	2
32	66 Administration of neurolytic agent into sympathetic nervous system	2
33	67 Insertion, replacement or removal of peripheral nerve electrodes	2
34	68 Exploration of brachial plexus	2
35	69 Incision of optic nerve meninges	3
36	70 Trigeminal gangliotomy	2
37	71 Percutaneous neurotomy of primary posterior rami of spinal nerve	2
38	72 Percutaneous neurotomy of other peripheral nerve	2
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73	Division of intracranial nerve	2
74	Division of peripheral nerve	2
75	Decompression of intracranial nerve	4
76	Release of carpal and tarsal tunnel	2
77	Other neurolysis of peripheral nerve and nerve trunk	2
78	Destruction of nerve	2
79	Biopsy of nerve	2
80	Removal of lesion of nerve	2
81	Surgical sympathectomy	2
82	Other peripheral neurectomy	2
83	Repair of nerve or nerve trunk	2
84	Secondary repair of nerve or nerve trunk	2
85	Reoperation for previous sympathectomy	2
86	Other procedures on nerves	2
110	Application, insertion or removal procedures on thyroid or parathyroid gland	3
111	Incision procedures on thyroid	3
112	Biopsy of parathyroid or thyroid gland	2
113	Parathyroidectomy	3
114	Subtotal thyroidectomy	3
115	Total thyroidectomy	3
116	Other excision procedures on thyroid or parathyroid gland	3
117	Other procedures on thyroid or parathyroid gland	3
118	Biopsy of adrenal gland	3
119	Adrenalectomy	4
121	Other procedures on adrenal gland	4
122	Excision procedures on pineal gland	4
123	Other procedures on pineal gland	4
124	Biopsy of pituitary gland	4
125	Other excision procedures on pituitary gland	4
126	Other procedures on pituitary gland	4
127	Biopsy of thymus	3
128	Removal of thymus	3
129	Other procedures on thymus	3
160	Examination procedures on eyeball	1
161	Excision procedures on eyeball	2
162	Repair of perforating wound of eyeball	2
163	Other repair procedures on eyeball	2
164	Secondary procedures after removal of eyeball	2
165	Other procedures on eyeball	2
166	Application, insertion or removal procedures on cornea	2
167	Incision procedures on cornea	2
168	Destruction procedures on cornea	2

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3	169 Biopsy of cornea	2
4	170 Keratectomy	2
5	171 Excision of lesion of limbus	2
6	172 Other excision procedures on cornea	2
7	173 Keratoplasty	2
8	174 Other repair procedures on cornea	2
9	175 Reoperation procedures on cornea	2
10	176 Other procedures on cornea	2
11	177 Application, insertion or removal procedures on sclera	2
12	178 Incision procedures on sclera	2
13	179 Destruction procedures on sclera	2
14	180 Biopsy of sclera	2
15	181 Other excision procedures on sclera	2
16	182 Repair procedures on sclera	2
17	183 Revision procedures on sclera	2
18	184 Other procedures on sclera	2
19	185 Application, insertion or removal procedures on iris, ciliary body or anterior chamber	2
20	186 Division of synechiae	2
21	187 Other incision procedures on iris, ciliary body or anterior chamber	2
22	188 Destruction procedures on iris, ciliary body or anterior chamber	2
23	189 Excision procedures on iris, ciliary body or anterior chamber	2
24	190 Repair procedures on iris, ciliary body or anterior chamber	2
25	191 Procedures for glaucoma	2
26	192 Other procedures on iris, ciliary body or anterior chamber	2
27	193 Insertion of intraocular lens prosthesis	2
28	194 Replacement or removal of artificial lens	2
29	195 Intracapsular crystalline lens extraction	2
30	196 Extracapsular crystalline lens extraction by aspiration alone	2
31	197 Extracapsular crystalline lens extraction by phacoemulsification	2
32	198 Extracapsular crystalline lens extraction by mechanical phacofragmentation	2
33	199 Other extracapsular crystalline lens extraction	2
34	200 Other extraction of crystalline lens	2
35	201 Removal of after cataract	2
36	202 Other application, insertion or removal procedures on lens	2
37	203 Other procedures on lens	2
38	204 Aspiration of aqueous or vitreous	2
39	205 Other application, insertion or removal procedures on aqueous or vitreous	2
40	206 Destruction procedures on aqueous or vitreous	2
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207 Vitrectomy	2
208 Other procedures on vitreous	2
209 Application, insertion or removal procedures on retina, choroid or posterior chamber	2
210 Incision procedures on retina, choroid or posterior chamber	2
211 Destruction procedures on retina, choroid or posterior chamber	1
212 Repair of retinal detachment	1
213 Revision procedures on retina, choroid or posterior chamber	1
214 Other procedures on retina, choroid or posterior chamber	1
215 Excision procedures on extraocular muscle	2
216 Strabismus repair	2
217 Other repair of extraocular muscle	2
218 Revision procedures on extraocular muscle	2
219 Reoperation procedures on extraocular muscle	2
220 Other procedures on extraocular muscle or tendon	2
221 Application, insertion or removal procedures on orbit	2
222 Orbitotomy	2
223 Other incision procedures on orbit	2
224 Orbitotomy with biopsy or excision	2
225 Exenteration of orbit	2
226 Other excision procedures on orbit	2
227 Orbitotomy with removal and replacement of bone	2
228 Other repair procedures on orbit	2
229 Other procedures on orbit	2
230 Application, insertion or removal procedures on eyelid	2
231 Incision procedures on eyelid	2
232 Biopsy of eyelid	2
233 Other excision procedures on eyelid	2
234 Graft to eyelid	2
235 Canthoplasty	2
236 Other repair procedures on eyelid	2
237 Reconstruction procedure on eyelid	2
238 Procedures for correction of trichiasis	2
239 Procedures for ectropion or entropion	2
240 Other procedures on eyelid	2
241 Probing of lacrimal passages	2
242 Insertion, replacement or removal of nasolacrimal tube	2
243 Other application, insertion or removal procedures on lacrimal system	2
244 Incision procedures on lacrimal system	2
245 Destruction procedures on lacrimal system	2
246 Excision procedures on lacrimal system	2

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3	247 Repair procedures on lacrimal system	2
4	248 Reoperation procedures on lacrimal passages	2
5	249 Procedures for establishment of lacrimal patency	2
6	250 Other procedures on lacrimal system	2
7	251 Application, insertion or removal procedures on conjunctiva	2
8	252 Incision procedures on conjunctiva	2
9	253 Destruction procedures on conjunctiva	2
10	254 Excision procedures on conjunctiva	2
11	255 Repair procedures on conjunctiva	2
12	256 Other procedures on conjunctiva	2
13	300 Examination procedures on external ear	1
14	301 Application, insertion or removal procedures on external ear	2
15	302 Incision procedures on auditory canal	2
16	303 Excision procedures on external ear	2
17	304 Repair procedures on external ear	2
18	305 Reconstruction procedures on external ear	2
19	306 Other procedures on external ear	2
20	307 Examination procedures on eardrum or middle ear	1
21	308 Application, insertion or removal procedures on eardrum or middle ear	1
22	309 Myringotomy	1
23	310 Other incision procedures on eardrum or middle ear	1
24	311 Destruction procedures on eardrum or middle ear	2
25	312 Excision procedures on eardrum or middle ear	2
26	313 Myringoplasty	2
27	314 Other repair procedures on eardrum or middle ear	2
28	315 Reconstruction procedures on eardrum or middle ear	2
29	316 Other procedures on eardrum or middle ear	2
30	317 Excision procedures on ossicles of ear	2
31	318 Repair procedures on ossicles of ear	2
32	319 Reconstruction procedures on ossicles of ear	2
33	320 Other procedures on ossicles of ear	2
34	321 Application, insertion or removal procedures on mastoid or temporal bone	2
35	322 Incision procedures on mastoid or temporal bone	2
36	323 Mastoidectomy	2
37	324 Other excision procedures on mastoid or temporal bone	2
38	325 Repair procedures on mastoid or temporal bone	2
39	326 Reconstruction procedures on mastoid or temporal bone	2
40	327 Revision procedures on mastoid or temporal bone	2
41	328 Other procedures on mastoid or temporal bone	2
42	329 Application, insertion or removal procedures on inner ear	2
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3	330 Incision procedures on inner ear	2
4	331 Excision procedures on inner ear	2
5	332 Repair procedures on inner ear	2
6	333 Other procedures on inner ear	2
7		
8	370 Examination procedures on nose	1
9		
10	371 Application, insertion or removal procedures on nose	1
11	372 Incision procedures on nose	1
12		
13	373 Arrest of nasal haemorrhage	2
14	374 Other destruction procedures on nose	2
15		
16	375 Biopsy of nasal cavity	2
17	376 Excision procedures on nasal turbinates	2
18	377 Removal of intranasal lesion	2
19		
20	378 Other excision procedures on nose	2
21	379 Repair of nasal septum	2
22	380 Other repair procedures on nose	2
23		
24	381 Other procedures on nose	2
25	382 Application, insertion or removal procedures on nasal sinuses	2
26		
27	383 Incision procedures on nasal sinuses	2
28		
29	384 Biopsy of nasal sinuses	2
30	385 Intranasal removal of polyp from nasal sinuses	2
31	386 Other excision procedures on nasal sinuses	2
32		
33	387 Maxillary antrostomy	2
34	388 Other repair procedures on nasal sinuses	2
35	389 Other procedures on nasal sinuses	2
36		
37	390 Incision procedures on tongue	2
38	391 Destruction procedures on tongue	2
39	392 Excision procedures on tongue	2
40		
41	393 Repair procedures on tongue	2
42	394 Other procedures on tongue	2
43		
44	395 Incision procedures on salivary gland or duct	2
45	396 Destruction procedures on salivary gland or duct	2
46	397 Excision procedures on salivary gland or duct	2
47		
48	398 Repair procedures on salivary gland or duct	2
49	399 Other procedures on salivary gland or duct	2
50	400 Application, insertion or removal procedures on mouth, palate or uvula	2
51		
52	401 Incision procedures on mouth, palate or uvula	2
53	402 Biopsy of oral cavity or soft palate	2
54		
55	403 Excision of lesion of mouth or palate	2
56		
57	404 Other excision procedures on mouth, palate or uvula	2
58	405 Uvulopalatopharyngoplasty	2
59		
60	406 Other repair procedures on mouth, palate or uvula	2

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4	407 Revision procedures on mouth, palate or uvula	2
5	408 Other procedures on mouth, palate or uvula	2
6	409 Incision procedures on tonsils or adenoids	2
7	410 Destruction procedures on tonsils or adenoids	2
8		
9	411 Biopsy of tonsils or adenoids	2
10	412 Tonsillectomy or adenoidectomy	2
11	413 Other excision procedures on tonsils or adenoids	2
12		
13	414 Other repair procedures on tonsils or adenoids	2
14	415 Other procedures on tonsils or adenoids	2
15	416 Examination procedures on pharynx	1
16	417 Application, insertion or removal procedures on pharynx	2
17	418 Incision procedures on pharynx	2
18	419 Destruction procedures on pharynx	2
19		
20	420 Pharyngectomy	3
21	421 Other excision procedures on pharynx	3
22		
23	422 Other procedures on pharynx	2
24		
25	520 Examination procedures on larynx	1
26	521 Application, insertion or removal procedures on larynx	2
27	522 Incision procedures on larynx	2
28	523 Laryngoscopy with excision	2
29	524 Laryngectomy	4
30	525 Other excision procedures on larynx	2
31		
32	526 Laryngoplasty	3
33	527 Laryngofissure	3
34	528 Other repair procedures on larynx	3
35	529 Reconstruction procedures on larynx	4
36		
37	530 Reoperation procedures on larynx	3
38	531 Other procedures on larynx	2
39		
40	532 Examination procedures on trachea	1
41	533 Application, insertion or removal procedures on trachea	2
42	534 Excision procedures on trachea	2
43	535 Cricothyrostomy	3
44	536 Tracheostomy	3
45	537 Resection of endotracheal lesion with repair	3
46	538 Resection of endotracheal stricture with repair	3
47	539 Other repair procedures on trachea	4
48	540 Reconstruction procedures on trachea	5
49	541 Revision procedures on trachea	5
50	542 Other procedures on trachea	3
51	543 Examination procedures on bronchus	1
52	544 Bronchoscopy with biopsy or removal of foreign body	2
53	545 Other excision procedures on bronchus	2
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4	546 Repair procedures on bronchus	5
5	547 Other procedures on bronchus	3
6	548 Application, insertion or removal procedures on lung or pleura	2
7		
8	549 Incision procedures on lung or pleura	3
9		
10	550 Biopsy of lung or pleura	3
11	551 Partial resection of lung	5
12	552 Lobectomy of lung	5
13	553 Pneumonectomy	5
14	554 Other excision procedures on lung or pleura	5
15	555 Transplantation of lung	5
16	556 Other repair procedures on lung or pleura	5
17	557 Revision procedures on lung or pleura	5
18	558 Other procedures on lung or pleura	5
19	559 Examination procedures on chest wall, mediastinum or diaphragm	4
20	560 Application, insertion or removal procedures on chest wall, mediastinum or diaphragm	4
21	561 Incision procedures on chest wall, mediastinum or diaphragm	4
22	562 Destruction procedures on chest wall, mediastinum or diaphragm	4
23	563 Excision procedures on chest wall, mediastinum or diaphragm	4
24	564 Repair of pectus carinatum or excavatum	4
25	565 Thoracoplasty	4
26	566 Other repair procedures on chest wall, mediastinum or diaphragm	5
27	567 Other procedures on chest wall, mediastinum or diaphragm	4
28	568 Airway management	2
29	569 Ventilatory support	2
30	570 Noninvasive ventilatory support	2
31	600 Incision procedures on atrium	5
32	601 Destruction procedures on atrium	5
33	602 Excision procedures on atrium	5
34	603 Repair procedures on atrium	5
35	604 Reconstruction procedures on atrium	5
36	605 Revision procedures on atrium	5
37	606 Other procedures on atrium	5
38	607 Examination procedures on ventricle	5
39	608 Application, insertion or removal procedures on ventricle	5
40	609 Destruction procedures on ventricle	5
41	610 Ventricular myectomy	5
42	611 Excision of ventricular aneurysm	5
43	612 Other excision procedures on ventricle	5
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3	613 Baffle or conduit procedures	5
4	614 Other repair procedures on ventricle	5
5	615 Other procedures on ventricle	5
6	616 Excision procedures on septum	5
7	617 Closure of atrial septal defect	5
8	618 Closure of ventricular septal defect	5
9	619 Other repair procedures on septum	5
10	620 Other procedures on septum	5
11	621 Incision procedures on aortic valve	5
12	622 Repair of aortic valve	5
13	623 Replacement of aortic valve	5
14	624 Other procedures on aortic valve	5
15	625 Incision procedures on mitral valve	5
16	626 Repair of mitral valve	5
17	627 Mitral valve annuloplasty	5
18	628 Replacement of mitral valve	5
19	629 Reconstruction procedures on mitral valve	5
20	630 Other procedures on mitral valve	5
21	631 Incision procedures on tricuspid valve	5
22	632 Repair of tricuspid valve	5
23	633 Tricuspid valve annuloplasty	5
24	634 Replacement of tricuspid valve	5
25	635 Other procedures on tricuspid valve	5
26	636 Incision procedures on pulmonary valve	5
27	637 Repair or replacement of pulmonary valve	5
28	638 Other procedures on pulmonary valve	5
29	639 Incision procedures on myocardium	5
30	640 Excision procedures on myocardium	5
31	641 Repair procedures on myocardium	5
32	642 Myocardial preservation	5
33	643 Drainage of heart	5
34	644 Other incision procedures on pericardium	4
35	645 Biopsy of pericardium	4
36	646 Other excision procedures on pericardium	5
37	647 Insertion of temporary transvenous electrode for cardiac pacemaker or defibrillator	3
38	648 Insertion of permanent transvenous electrode for cardiac pacemaker or defibrillator	3
39	649 Insertion of other electrode or patch for cardiac pacemaker or defibrillator	3
40	650 Insertion of cardiac pacemaker generator	3
41	653 Insertion of cardiac defibrillator generator	3
42	654 Adjustment, replacement or removal of electrode for cardiac pacemaker or defibrillator	3
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655 Adjustment, replacement or removal of cardiac pacemaker generator	3
656 Adjustment, replacement or removal of cardiac defibrillator generator	3
657 Other application, insertion or removal procedures on other sites of heart	3
659 Removal of donor heart or lung	999
660 Transplantation of heart or lung	5
661 Other repair procedures on other sites of heart	5
662 Reconstruction procedures on other sites of heart	5
663 Revision procedures on other sites of heart	5
664 Reoperation procedures on other sites of heart	5
665 Electrophysiological studies [EPS]	2
666 Other procedures on other sites of heart	5
667 Cardiac catheterisation	2
668 Coronary angiography	2
669 Excision procedures on coronary arteries	5
670 Transluminal coronary angioplasty	2
671 Transluminal coronary angioplasty with stenting	2
672 Coronary artery bypass - saphenous vein graft	5
673 Coronary artery bypass - other vein graft	5
674 Coronary artery bypass - left internal mammary artery [LIMA] graft	5
675 Coronary artery bypass - right internal mammary artery [RIMA] graft	5
676 Coronary artery bypass - radial artery graft	5
677 Coronary artery bypass - epigastric artery graft	5
678 Coronary artery bypass - other artery graft	5
679 Coronary artery bypass - other material graft	5
680 Reoperation procedures on coronary arteries	5
681 Other procedures on coronary arteries	5
682 Application, insertion or removal procedures on aorta	5
684 Repair of ascending thoracic aorta	5
685 Repair of aortic arch and ascending thoracic aorta	5
686 Repair of descending thoracic aorta	5
687 Replacement of ascending thoracic aorta	5
688 Replacement of aortic arch and ascending thoracic aorta	5
689 Replacement of descending thoracic aorta	5
690 Closure of patent ductus arteriosus	5
691 Closure of cardiac collateral vessel	5
693 Repair procedures on aorta	5
694 Arterial catheterisation	2
695 Exploration of artery	3
696 Other incision procedures on artery	3

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3	697 Interruption of artery	3
4	698 Other destruction procedures on artery	3
5	699 Biopsy of peripheral artery	2
6	700 Endarterectomy	4
7	701 Endarterectomy to prepare site for anastomosis	4
8	702 Arterial embolectomy or thrombectomy	4
9	703 Embolectomy or thrombectomy of an arterial bypass graft	4
10	704 Arterial atherectomy	4
11	705 Resection of lesion of carotid artery	4
12	706 Resection of recurrent lesion of carotid artery	4
13	707 Patch graft of artery	4
14	708 Direct closure of artery	4
15	709 Repair of artery by anastomosis	4
16	710 Repair of artery by interposition graft	4
17	711 Arterial bypass graft using vein	4
18	712 Arterial bypass graft using synthetic material	4
19	713 Arterial bypass graft using composite, sequential or crossover graft	4
20	714 Repair of aneurysm of neck, intra-abdominal area or extremities	4
21	715 Replacement of aneurysm with graft	4
22	716 Repair of aorto-enteric fistula	5
23	717 Repair procedures on pulmonary artery for congenital heart disease	5
24	718 Other repair procedures on arteries	4
25	719 Intraoperative arteriography	2
26	720 Other procedures on arteries	3
27	721 Application of external stent to vein	3
28	722 Injection of varicose veins	2
29	723 Other application, insertion or removal procedures on veins	2
30	724 Exploration of vein	2
31	725 Other incision procedures on veins	2
32	726 Interruption of vein	2
33	727 Interruption of sapheno-femoral or sapheno-popliteal junction varicose veins	2
34	728 Other destruction procedures on veins	2
35	729 Venous thrombectomy	2
36	730 Procurement of vein	2
37	731 Patch graft of vein	2
38	732 Direct closure of vein	2
39	733 Repair of vein by anastomosis	2
40	734 Repair of vein by interposition graft	2
41	735 Venous bypass graft using vein or synthetic material	2
42	736 Other repair procedures on veins	2
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4	737 Reoperation procedures on veins	2
5	738 Venous catheterisation	2
6	739 Other procedures on veins	2
7	740 Examination procedures on other vascular sites	2
8		
9	741 Surgical peripheral arterial or venous catheterisation	2
10	742 Other application, insertion or removal procedures on	2
11	other vascular sites	
12	743 Destruction of vascular lesions	3
13		
14	744 Laser photocoagulation of cutaneous vascular lesion	2
15	745 Interruption of feeding vessels of arteriovenous fistula	2
16	746 Other destruction procedures on vascular sites	2
17		
18	747 Biopsy of blood vessel	2
19	748 Excision of vascular anomaly	2
20		
21	750 Excision of arteriovenous fistula of neck	3
22	751 Excision of arteriovenous fistula of limb	3
23	752 Excision of arteriovenous fistula of abdomen	3
24	753 Other excision procedures on vascular sites	3
25		
26	754 Transluminal balloon angioplasty	2
27	758 Peripheral laser angioplasty	1
28		
29	759 Repair of arteriovenous fistula of neck	4
30	760 Repair of arteriovenous fistula of extremity	4
31	761 Repair of arteriovenous fistula of abdomen	4
32		
33	762 Other repair procedures on vascular sites	4
34	763 Reoperation procedures on other vascular sites	4
35	764 Procedures for external arteriovenous shunt	4
36	765 Procedures for surgically created arteriovenous fistula	4
37		
38	766 Vascular access device	2
39	768 Transcatheter embolisation of blood vessels	2
40		
41	777 Other procedures on arteries and veins	2
42	800 Biopsy of bone marrow	2
43	801 Other excision procedures on bone marrow	2
44	802 Bone marrow/stem cell transplantation	2
45	803 Other procedures on bone marrow	2
46	804 Incision procedures on lymphatic structure	2
47	805 Biopsy of lymphatic structure	2
48		
49	806 Excision procedures on lymph node of neck	2
50	807 Excision of internal mammary lymph node	2
51		
52	808 Excision procedures on lymph node of axilla	2
53	809 Excision procedures on lymph node of groin	2
54		
55	810 Excision procedures on lymph nodes for gynaecological	3
56	malignancy	
57	811 Excision procedures on lymph node of other sites	2
58		
59	812 Other procedures on lymphatic structures	2
60		

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3	813 Incision procedures on spleen	4
4	814 Biopsy of spleen	4
5	815 Other excision procedures on spleen	4
6	816 Repair of spleen	4
7	817 Other procedures on spleen	4
8		
9	850 Oesophagoscopy	1
10		
11	851 Endoscopic administration of agent into lesion of oesophagus	2
12		
13	852 Removal of foreign body from oesophagus	2
14		
15	853 Other application, insertion or removal procedures on oesophagus	2
16		
17	854 Oesophagogastric myotomy	3
18		
19	855 Other incision procedures on oesophagus	3
20		
21	856 Destruction procedures on oesophagus	4
22		
23	857 Resection of oesophagus, paediatric	5
24		
25	858 Oesophagectomy by abdominal and thoracic mobilisation	5
26		
27	859 Oesophagectomy by abdominal and cervical mobilisation	5
28		
29	860 Oesophagectomy by abdominal and transthoracic mobilisation	5
30		
31	861 Other excision procedures on oesophagus	5
32		
33	862 Dilation of oesophagus	2
34		
35	863 Oesophagogastric myotomy and repair, laparoscopic	3
36		
37	864 Oesophagogastric myotomy and repair, abdominal	4
38		
39	865 Oesophagogastric myotomy and repair, thoracic	5
40		
41	866 Repair of oesophageal atresia	5
42		
43	867 Other repair procedures on oesophagus	5
44		
45	868 Reconstruction procedures on oesophagus	5
46		
47	869 Other procedures on oesophagus	5
48		
49	870 Application, insertion or removal procedures on stomach	3
50		
51	871 Gastrotomy	3
52		
53	872 Vagotomy	3
54		
55	873 Other incision procedures on stomach	3
56		
57	874 Destruction procedures on stomach	4
58		
59	875 Partial gastrectomy	4
60		
	876 Partial gastrectomy following previous procedure for peptic ulcer disease	4
	877 Selective vagotomy with partial gastrectomy	4
	878 Selective vagotomy with partial gastrectomy following previous procedure for peptic ulcer disease	4
	879 Other gastrectomy	4
	880 Other excision procedures on stomach	4
	881 Gastrostomy or gastro-enterostomy	4
	882 Endoscopic dilation of gastric stricture	2
	883 Pyloroplasty	3

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3	884 Other vagotomy with repair	3
4	886 Fundoplasty	3
5	887 Other repair procedures on stomach	3
6	888 Reconstruction procedures on stomach	4
7	889 Procedures for morbid obesity	4
8	890 Other procedures on stomach	4
9	891 Exploration of small intestine	4
10	892 Application, insertion or removal procedures on small intestine	4
11	893 Enterotomy	4
12	894 Other incision procedures on small intestine	4
13	895 Resection of small intestine	4
14	896 Other excision procedures on small intestine	4
15	897 Stomas of small intestine	4
16	898 Reduction procedures on small intestine	4
17	899 Closure of stoma of small intestine	4
18	900 Repair of small intestine	4
19	901 Other repair procedures on small intestine	4
20	902 Revision of stoma and ileostomy reservoir	4
21	903 Other procedures on small intestine	4
22	904 Rigid sigmoidoscopy	1
23	905 Fibreoptic colonoscopy	1
24	906 Application, insertion or removal procedures on large intestine	3
25	907 Incision procedures on large intestine	3
26	908 Destruction procedures on large intestine	3
27	909 Biopsy of large intestine	2
28	910 Rigid sigmoidoscopy with excision	2
29	911 Fibreoptic colonoscopy with excision	2
30	913 Colectomy	4
31	914 Other excision procedures on large intestine	4
32	915 Other stomas of large intestine	4
33	916 Reduction procedures on large intestine	4
34	917 Other repair of large intestine	4
35	918 Revision procedures on large intestine	4
36	924 Procedures for exomphalos	4
37	925 Other procedures on large intestine	4
38	926 Appendicectomy	3
39	927 Other procedures on appendix	3
40	928 Examination procedures on rectum or anus	1
41	929 Application, insertion or removal procedures on rectum or anus	1
42	930 Incision procedures on rectum or anus	2
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3	931 Destruction procedures on rectum or anus	2
4	932 Rectal or anal biopsy	2
5	933 Excision of lesion or tissue of rectum or anus	1
6	934 Rectosigmoidectomy or proctectomy	4
7	935 Anterior resection of rectum	4
8	936 Total proctocolectomy	4
9	937 Other excision procedures on rectum or anus	4
10	938 Anoplasty or anorectoplasty	4
11	939 Repair of cloacal exstrophy	4
12	940 Other repair procedures on rectum or anus	4
13	941 Procedures for haemorrhoids	2
14	942 Other procedures on rectum or anus	2
15	951 Application, insertion or removal procedures on liver	3
16	952 Incision procedures on liver	4
17	953 Excision procedures on liver	4
18	954 Repair procedures on liver	5
19	955 Procedures for hydatid cyst of liver	4
20	956 Other procedures on liver	4
21	957 Examination of gallbladder or biliary tract	2
22	958 Stenting of biliary tract	2
23	959 Endoscopic and percutaneous removal of calculus	2
24	960 Removal and replacement of biliary stent	2
25	961 Other application, insertion or removal procedures on gallbladder or bile ducts	2
26	962 Destruction procedures on biliary tract and gallbladder	2
27	963 Incision of gallbladder, biliary tract or sphincter of Oddi	2
28	964 Biopsy of gallbladder, bile ducts or sphincter of Oddi	2
29	965 Cholecystectomy	3
30	966 Resection of hepatic duct or porta hepatis	4
31	967 Resection of choledochal cyst	3
32	968 Other excision procedures on gallbladder, bile ducts or sphincter of Oddi	2
33	969 Stoma of gallbladder or bile duct	2
34	970 Roux-en-Y bypass	4
35	971 Other repair of sphincter of Oddi, gallbladder or biliary tract	4
36	972 Procedures for portal hypertension	4
37	973 Other procedures on gallbladder or biliary tract	4
38	974 Examination of pancreas	3
39	975 Application, insertion or removal procedures on pancreas	3
40	976 Incision procedures on pancreas	3
41	977 Biopsy of pancreas	3
42	978 Pancreatectomy	4
43	979 Other excision procedures on pancreas or pancreatic duct	4
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4	980 Anastomosis of pancreas	4
5	981 Other repair procedures on pancreas	4
6	982 Other procedures on pancreas	4
7	983 Application, insertion or removal procedures on abdomen, peritoneum or omentum	4
8		
9	984 Laparoscopy	2
10		
11	985 Laparotomy	4
12	986 Division of abdominal adhesions	3
13		
14	987 Other incision procedures on abdomen, peritoneum or omentum	3
15		
16	988 Biopsy of abdomen, peritoneum or omentum	2
17	989 Other excision procedures on abdomen, peritoneum or omentum	3
18		
19	990 Repair of inguinal hernia	2
20		
21	991 Repair of femoral hernia	2
22		
23	992 Repair of umbilical, epigastric or linea alba hernia	2
24		
25	993 Repair of incisional hernia	3
26		
27	994 Repair of parastomal hernia	3
28		
29	996 Repair of other abdominal wall hernia	2
30		
31	997 Repair of incarcerated, obstructed or strangulated hernia	3
32		
33	998 Repair of diaphragmatic hernia	4
34		
35	1000 Other repair procedures on abdomen, peritoneum or omentum	4
36		
37	1001 Revision procedures on abdomen, peritoneum or omentum	4
38		
39	1002 Procedures for hydatid cyst of peritoneum or abdominal organs	4
40		
41	1003 Procedures for gastroschisis	4
42		
43	1004 Other procedures on abdomen, peritoneum or omentum	4
44		
45	1005 Panendoscopy	1
46		
47	1006 Panendoscopy with removal of foreign body	2
48		
49	1007 Panendoscopy with destruction	2
50		
51	1008 Panendoscopy with excision	2
52		
53	1009 Repair procedures on other and multiple sites of digestive system	3
54		
55	1011 Other procedures on digestive system	2
56		
57	1040 Examination procedures on kidney	2
58		
59	1041 Manipulation or extraction of calculus of kidney	2
60		
	1042 Other application, insertion or removal procedures on kidney	2
	1043 Percutaneous nephroscopy	2
	1044 Nephrolithotomy with removal of calculi	2
	1045 Other incision procedures on kidney	2
	1046 Destruction procedures on kidney	3
	1047 Biopsy of kidney	3

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3	1048 Partial nephrectomy	4
4	1049 Complete nephrectomy	4
5	1050 Complete nephrectomy for transplantation	4
6	1051 Complete nephrectomy for removal of transplanted kidney	4
7	1052 Complete nephrectomy complicated by previous surgery on same kidney	4
8	1053 Radical nephrectomy	4
9	1054 Nephroureterectomy	4
10	1055 Other excision procedures on kidney	2
11	1056 Nephrostomy or pyelostomy	3
12	1057 Pyeloplasty	3
13	1058 Kidney transplantation	4
14	1059 Other repair procedures on kidney	2
15	1060 Haemodialysis	1
16	1061 Peritoneal dialysis	1
17	1062 Procedures for establishment or maintenance of peritoneal dialysis	2
18	1063 Other interventions for renal dialysis	1
19	1064 Other procedures on kidney	1
20	1065 Examination procedures on ureter	1
21	1066 Endoscopic ureteric catheterisation	2
22	1067 Endoscopic insertion, replacement or removal of ureteric stent	2
23	1068 Endoscopic manipulation or extraction of ureteric calculus	2
24	1069 Other application, insertion or removal procedures on ureter	2
25	1070 Exploration of ureter	2
26	1071 Ureterolysis	2
27	1072 Ureterolithotomy	2
28	1073 Other incision procedures on ureter	2
29	1074 Destruction procedures on ureter	2
30	1075 Biopsy of ureter	2
31	1076 Ureterectomy	2
32	1077 Other excision procedures on ureter	2
33	1078 Ureterolysis with repositioning of ureter	2
34	1079 Repair of divided ureter	2
35	1080 Transplantation of ureter into skin	3
36	1081 Transplantation of ureter into other ureter	3
37	1082 Transplantation of ureter into intestine	3
38	1084 Reimplantation of ureter into bladder	3
39	1085 Reimplantation of ureter into bladder with repair	3
40	1086 Other repair procedures on ureter	3
41	1087 Revision procedures on ureter	3
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3	1088 Other procedures on ureter	3
4	1089 Examination procedures on bladder	1
5	1090 Urinary catheterisation	1
6	1091 Implantation or removal of electronic bladder stimulator	2
7	1092 Other application, insertion or removal procedures on bladder	1
8	1093 Cystotomy	2
9	1094 Cystolithotomy	2
10	1095 Other incision procedures on bladder	2
11	1096 Destruction procedures on bladder	2
12	1097 Endoscopic destruction of bladder lesion or tissue	2
13	1098 Biopsy of bladder	2
14	1099 Removal of foreign body from bladder	2
15	1100 Endoscopic resection of bladder lesion or tissue	2
16	1101 Endoscopic resection of bladder neck	2
17	1102 Cystectomy	3
18	1103 Other excision procedures on bladder	2
19	1104 Repair of ruptured bladder	3
20	1105 Closure of fistula of bladder	3
21	1106 Repair of bladder exstrophy	3
22	1107 Enlargement of bladder	2
23	1108 Other repair procedures on bladder	2
24	1109 Procedures for male stress incontinence	2
25	1110 Procedures for female stress incontinence	2
26	1111 Other procedures on bladder	1
27	1112 Examination procedures on urethra	1
28	1113 Insertion, replacement or removal of artificial urinary sphincter	2
29	1114 Other application, insertion or removal procedures on urethra	2
30	1115 Incision procedures on urethra	2
31	1116 Destruction procedures on urethra	2
32	1117 Biopsy of urethra	2
33	1118 Other excision procedures on urethra	2
34	1119 Closure of fistula of urethra	2
35	1120 Repair of laceration of urethra	2
36	1121 Urethroplasty	2
37	1122 Other repair procedures on urethra	2
38	1123 Reconstruction procedures on urethra	2
39	1124 Revision procedures on urethra	2
40	1125 Other procedures on urethra	2
41	1126 Destruction procedures on other sites of urinary system	2
42	1127 Incision procedures on other sites of urinary system	2
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4	1128	Excision procedures on other sites of urinary system	2
5	1129	Other procedures on urinary system	2
6	1162	Destruction of tissue of prostate	2
7	1163	Closed biopsy of prostate or seminal vesicle	2
8	1164	Open biopsy of prostate or seminal vesicle	3
9	1165	Transurethral prostatectomy	3
10	1166	Other closed prostatectomy	3
11	1167	Open prostatectomy	4
12	1168	Other excision procedures on prostate or seminal vesicle	3
13	1169	Repair procedures on prostate or seminal vesicle	3
14	1170	Other procedures on prostate or seminal vesicle	3
15	1171	Application, insertion or removal procedures on scrotum or tunica vaginalis	2
16	1172	Exploration of scrotum	2
17	1173	Exploration of scrotal contents with biopsy	2
18	1174	Other excision procedures on scrotum or tunica vaginalis	2
19	1175	Repair procedures on scrotum or tunica vaginalis	2
20	1176	Other procedures on scrotum or tunica vaginalis	2
21	1177	Application, insertion or removal procedures on testis, vas deferens, epididymis or spermatic cord	2
22	1178	Incision procedures on testis, vas deferens, epididymis or spermatic cord	2
23	1179	Destruction procedures on testis, vas deferens, epididymis or spermatic cord	2
24	1180	Biopsy of testis, vas deferens, epididymis or spermatic cord	2
25	1181	Excision of lesion of testis, epididymis or spermatic cord	2
26	1182	Excision of spermatic cord	2
27	1183	Vasectomy and epididymectomy	2
28	1184	Orchidectomy	1
29	1185	Vasovasostomy and vasoepididymostomy	1
30	1186	Orchidopexy for undescended testis	2
31	1187	Other repair procedures on testis, vas deferens, epididymis or spermatic cord	1
32	1188	Revision procedures on testis, vas deferens, epididymis or spermatic cord	2
33	1189	Other procedures on testis, vas deferens, epididymis or spermatic cord	2
34	1190	Examination procedures on penis	1
35	1191	Insertion or removal of artificial erection device	2
36	1192	Other application, insertion or removal procedures on penis	2
37	1193	Decompression of priapism	2
38	1194	Other incision procedures on penis	2
39	1195	Destruction procedures on penis	2
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3	1196	Excision procedures on penis
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5	1197	Correction of chordee of penis
6		
7	1198	Repair of hypospadias
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9	1199	Repair of epispadias
10		
11	1200	Other repair procedures on penis
12		
13	1201	Revision of artificial erection device
14		
15	1202	Other procedures on penis
16		
17	1203	Other procedures on male genital organs
18		
19	1240	Application, insertion or removal procedures on ovary
20		
21	1241	Incision procedures on ovary
22		
23	1242	Biopsy of ovary
24		
25	1243	Oophorectomy
26		
27	1244	Other excision procedures on ovary
28		
29	1245	Transposition of ovary
30		
31	1246	Other repair procedures on ovary
32		
33	1247	Other procedures on ovary
34		
35	1248	Application, insertion or removal procedures on fallopian tube
36		
37	1249	Incision procedures on fallopian tube
38		
39	1250	Biopsy of fallopian tube
40		
41	1251	Salpingectomy
42		
43	1252	Salpingo-oophorectomy
44		
45	1253	Salpingoplasty
46		
47	1254	Anastomosis of fallopian tube
48		
49	1255	Other repair procedures on fallopian tube
50		
51	1256	Procedures for management of ectopic pregnancy
52		
53	1257	Procedures for female sterilisation
54		
55	1258	Other procedures on fallopian tube
56		
57	1259	Examination procedures on uterus
58		
59	1260	Insertion or removal of intrauterine device
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	1261	Other application, insertion or removal procedures on uterus
	1262	Incision procedures on uterus
	1263	Destruction procedures on uterus
	1264	Biopsy of endometrium
	1265	Curettage and evacuation of uterus
	1266	Excision of lesion of uterus
	1268	Abdominal hysterectomy
	1269	Vaginal hysterectomy
	1270	Other excision procedures on uterus
	1271	Uterine suspension procedures
	1272	Reconstruction procedures on uterus and supporting structures

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3	1273 Other procedures on uterus	2
4	1274 Application, insertion or removal procedures on cervix	2
5	1275 Destruction procedures on cervix	2
6	1276 Excision procedures on cervix	2
7	1277 Repair procedures on cervix	2
8	1278 Other procedures on cervix	2
9	1279 Examination procedures on vagina	1
10	1280 Incision procedures on vagina	2
11	1281 Destruction procedures on vagina	2
12	1282 Excision procedures on vagina	2
13	1283 Repair of prolapse of uterus, pelvic floor or enterocele	3
14	1284 Repair of vaginal fistula	3
15	1285 Vaginal suspension procedures	3
16	1286 Other repair procedures on vagina	2
17	1287 Reconstruction procedures on vagina	2
18	1288 Other procedures on vagina	2
19	1289 Destruction procedures on vulva or perineum	2
20	1290 Incision procedures on vulva or perineum	2
21	1291 Biopsy of vulva or perineum	2
22	1292 Vulvectomy	2
23	1293 Other excision procedures on vulva, perineum or clitoris	2
24	1294 Repair procedures on vulva or perineum	2
25	1295 Other procedures on vulva or perineum	2
26	1296 Examination procedures on other gynaecological sites	1
27	1297 Procedures for reproductive medicine	2
28	1298 Procedures for anomalies of genitalia	2
29	1299 Other procedures on female genital organs	2
30	1340 Caesarean section	3
31	1344 Postpartum suture	2
32	1345 Postpartum evacuation of uterus	2
33	1346 Correction of inverted uterus	3
34	1347 Other postpartum procedures	2
35	1360 Application, insertion or removal procedures of head	2
36	1361 External fixation of mandible	2
37	1362 Exploration of temporomandibular joint	2
38	1363 Other incision procedures on maxilla or mandible	2
39	1364 Excision procedures on maxilla, mandible or temporomandibular joint	2
40	1365 Reduction of fracture of nasal bone	2
41	1366 Reduction of fracture of mandible or maxilla	2
42	1367 Reduction of fracture of mandibular or maxillary alveolar ridge	2
43	1368 Reduction of fracture of zygomatic bone	2
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3	1369 Reduction of temporomandibular joint	2
4	1370 Reduction of fracture or dislocation of other facial bone	2
5		
6	1371 Repair procedures on maxilla, mandible or	2
7	temporomandibular joint	
8	1373 Application, insertion or removal procedures of neck or	2
9	thorax	
10		
11	1374 Incision procedures on neck or thorax	2
12	1375 Ostectomy of rib	2
13	1376 Other excision procedures on neck or thorax	2
14	1377 Reduction of fracture/dislocation of neck or thorax	3
15	1378 Repair procedures on neck or thorax	3
16	1379 Reoperation procedures on neck or thorax	3
17		
18	1381 Immobilisation of fracture or dislocation of spine	3
19	1382 Biopsy of intervertebral disc and vertebra	3
20	1383 Excision of vertebra	3
21		
22	1384 En bloc resection of lesion of soft tissue involving sacrum	4
23	or spine	
24	1385 Other excision procedures on spine (vertebral column)	4
25	1386 Manipulation of spine	2
26	1387 Closed reduction of fracture/dislocation of spine	3
27	1388 Open reduction of fracture/dislocation of spine	4
28	1389 Spinal fusion	4
29	1390 Internal fixation of spine	4
30	1393 Other spinal procedures	3
31	1394 Application, insertion or removal procedures on shoulder	3
32	1395 Incision procedures on shoulder	2
33	1396 Biopsy of shoulder	2
34	1397 Synovectomy or debridement of shoulder	2
35	1398 Ostectomy of clavicle or scapula	2
36	1399 Amputation of shoulder	3
37	1400 Other excision on shoulder	2
38	1401 Reduction of fracture of clavicle or shoulder	2
39	1402 Reduction of dislocation of clavicle, scapula or shoulder	2
40	1403 Arthrodesis of shoulder	2
41	1404 Other repair procedures on shoulder	2
42	1405 Reconstruction procedures on shoulder	3
43	1406 Revision procedures on shoulder	3
44	1408 Immobilisation of fracture of humerus	2
45	1409 Other application, insertion or removal procedures on	2
46	humerus or elbow	
47	1410 Incision procedures on humerus or elbow	2
48	1411 Biopsy of elbow	2
49	1412 Other excision procedures on humerus or elbow	2
50	1413 Closed reduction of fracture of humerus or elbow	2
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3	1414 Open reduction of fracture of humerus or elbow	3
4	1415 Closed reduction of dislocation of humerus or elbow	2
5	1416 Open reduction of dislocation of humerus or elbow	3
6	1417 Bone graft to humerus	3
7	1418 Other repair procedures on humerus or elbow	2
8	1419 Revision procedures on humerus or elbow	2
9	1421 Immobilisation of fracture of shaft and distal radius or ulna	2
10	1423 Incision of fascia of forearm	2
11	1424 Incision of radius or ulna	2
12	1425 Other incision procedures on forearm	2
13	1426 Excision procedures on forearm	2
14	1427 Closed reduction of fracture of radius	2
15	1428 Closed reduction of fracture of ulna or olecranon	2
16	1429 Open reduction of fracture of radius	3
17	1430 Open reduction of fracture of ulna or olecranon	3
18	1431 Reduction of fracture of shaft of radius and ulna	2
19	1432 Open reduction of fracture of shaft of radius or ulna with dislocation	3
20	1433 Reduction of dislocation of radius or ulna	2
21	1434 Reduction of separated epiphysis of radius or ulna	2
22	1435 Bone graft to forearm	3
23	1436 Other repair procedures on forearm	3
24	1438 Other procedures on forearm	2
25	1439 Application, insertion or removal procedures on hand or wrist	2
26	1440 Incision procedures on muscle, tendon or fascia of hand	2
27	1441 Incision procedures on bone of hand	2
28	1442 Incision procedures on joint of hand	2
29	1443 Incision procedures on wrist	2
30	1444 Biopsy of wrist	2
31	1445 Synovectomy of joint of hand	2
32	1446 Synovectomy of tendon of hand or wrist	2
33	1447 Fasciectomy for Dupuytren's contracture	1
34	1448 Amputation of wrist, hand or digit	1
35	1449 Other excision procedures on bone of hand	2
36	1450 Other excision procedures on hand	2
37	1451 Other excision procedures on wrist	2
38	1452 Closed reduction of fracture of carpus	2
39	1453 Closed reduction of fracture of metacarpus of hand	2
40	1454 Closed reduction of phalanx of hand	2
41	1455 Open reduction of fracture of carpus	1
42	1456 Open reduction of fracture of metacarpus of hand	2
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3	1457 Open reduction of fracture of phalanx of hand	2
4	1458 Closed reduction of dislocation of joint of hand	2
5	1459 Open reduction of dislocation of joint of hand	2
6	1460 Arthrodesis of hand	1
7	1461 Bone graft of wrist, metacarpus or phalanx of hand	1
8	1462 Arthroplasty of interphalangeal joint of hand	2
9	1463 Arthroplasty of metacarpophalangeal joint	2
10	1464 Other arthroplasty of phalangeal joint of hand	2
11	1465 Repair of ligament or capsule of phalangeal joint of hand	2
12	1466 Repair of tendon of hand	2
13	1467 Other repair procedures on hand	2
14	1468 Other repair procedures on wrist	2
15	1469 Reconstruction procedures on hand	1
16	1470 Reconstruction procedures on wrist	1
17	1471 Revision procedures on hand or finger	1
18	1472 Revision procedures on wrist	1
19	1473 Procedures for mallet finger	2
20	1474 Procedures for ganglion of hand or wrist	2
21	1476 Immobilisation or traction of fracture or dislocation of pelvis or hip	2
22	1478 Osteotomy of pelvis, hip or femur	4
23	1479 Fixation of fracture of pelvis or femur	3
24	1480 Release of hip contracture	3
25	1481 Other incision of hip	3
26	1482 Biopsy of hip	3
27	1483 Ostectomy of femur or pelvis	3
28	1484 Amputation of pelvis or hip	5
29	1485 Other excision procedures on pelvis or hip	4
30	1486 Reduction of fracture of pelvis or femur	3
31	1487 Reduction of dislocation of hip	2
32	1488 Bone graft to pelvis or hip	2
33	1489 Arthroplasty of hip	3
34	1490 Transplantation or transfer of tendon or muscle of pelvis or hip	3
35	1491 Other repair procedures on pelvis or hip	3
36	1492 Revision arthroplasty of hip	4
37	1493 Procedures for slipped capital femoral epiphysis	3
38	1495 Immobilisation of fracture of fibula, patella or tibia	2
39	1496 Other application, insertion or removal procedures on knee or leg	2
40	1497 Decompression fasciotomy of calf	2
41	1498 Release of knee contracture	2
42	1499 Osteotomy of distal femur, patella, tibia or fibula	3
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3	1500 Internal fixation of fracture of femoral condyle	3
4	1501 Other incision procedures on knee	2
5	1502 Biopsy of knee	1
6	1503 Arthroscopic excision of knee	2
7	1504 Excision of bone of knee or leg	3
8	1505 Other excision procedures on knee or leg	3
9	1506 Reduction of dislocation of knee or patella	2
10	1507 Closed reduction of fracture of tibial plateau	2
11	1508 Open reduction of fracture of tibial plateau	3
12	1509 Closed reduction of fracture of shaft of tibia	2
13	1510 Open reduction of fracture of shaft of tibia	3
14	1511 Removal of loose body of knee with repair	2
15	1512 Arthrodesis of knee	3
16	1513 Bone graft to tibia	3
17	1514 Lateral release of knee with repair	2
18	1515 Resection of femur and tibia with repair	3
19	1516 Transfer of tendon, ligament or bone of knee or leg	2
20	1517 Arthroscopic meniscectomy of knee with repair	2
21	1518 Arthroplasty of knee	3
22	1519 Arthroplasty of knee with bone graft to femur or tibia	3
23	1520 Other repair procedures on knee or leg	2
24	1521 Internal fixation of fracture of femur or tibia with reconstruction	3
25	1522 Reconstruction procedures on knee	3
26	1523 Revision of total arthroplasty of knee with bone graft to femur or tibia	3
27	1524 Other revision procedures on knee	3
28	1526 Immobilisation procedures on ankle or foot	2
29	1528 Osteotomy of ankle or foot	3
30	1529 Other incision procedures on ankle	2
31	1530 Other incision procedures on foot	2
32	1531 Arthroscopic excision procedures on ankle	2
33	1532 Excision of bone of foot	1
34	1533 Amputation of ankle or foot	2
35	1534 Other excision procedures on ankle or foot	1
36	1536 Closed reduction of fracture of calcaneum, talus or metatarsus	2
37	1537 Closed reduction of fracture of ankle or toe	2
38	1538 Open reduction of fracture of calcaneum, talus or metatarsus	3
39	1539 Open reduction of fracture of ankle or toe	3
40	1540 Closed reduction of dislocation of ankle or foot	2
41	1541 Open reduction of dislocation of ankle or foot	3
42	1542 Repair of tendon or ligament of ankle or foot	2
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3	1543 Arthrodesis of ankle, foot or toe	1
4	1544 Other repair procedures on ankle or foot	1
5	1545 Reconstruction procedures on ankle or foot	1
6	1546 Procedures for talipes equinovarus	2
7	1547 Procedures for hallux valgus or hallux rigidus	2
8	1548 Procedures for other toe deformities	2
9		
10	1550 Application of external fixation devices to other musculoskeletal sites	2
11	1552 Administration of agent into other musculoskeletal sites	1
12	1553 Aspiration of other musculoskeletal sites	1
13	1554 Other application, insertion or removal procedures on other musculoskeletal sites	1
14	1555 Incision procedures on joint of other musculoskeletal sites	2
15	1556 Incision procedures on bone of other musculoskeletal sites	2
16	1557 Incision procedures on tendon or tendon sheath of other musculoskeletal sites	2
17	1558 Incision of fascia of other musculoskeletal sites	2
18	1559 Incision procedures on other musculoskeletal sites	2
19	1560 Biopsy of other musculoskeletal sites	2
20	1561 Excision procedures on joint of other musculoskeletal sites	2
21	1562 En bloc resection of lesion of soft tissue affecting long bones	3
22	1563 Other excision procedures on bone of other musculoskeletal sites	2
23	1564 Excision procedures on tendon of other musculoskeletal sites	1
24	1565 Excision procedures on muscle of other musculoskeletal sites	1
25	1566 Excision procedures on other musculoskeletal sites	2
26	1567 Reduction procedures on other musculoskeletal sites	2
27	1568 Suture of other musculoskeletal sites	2
28	1569 Graft of other musculoskeletal sites	2
29	1570 En bloc resection of lesion of bone with repair of other musculoskeletal sites	3
30	1571 Other repair procedures on bone of other musculoskeletal sites	2
31	1572 Other repair procedures on tendon of other musculoskeletal sites	2
32	1573 Other repair procedures on muscle of other musculoskeletal sites	2
33	1574 Other repair procedures of other musculoskeletal sites	2
34	1575 En bloc resection of lesion of soft tissue affecting long bones with reconstruction	4
35	1576 Other reconstruction procedures on other musculoskeletal sites	3
36	1578 Limb reconstruction	3
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4	1579 Other procedures for other musculoskeletal sites	2
5	1603 Removal of foreign body from skin and subcutaneous tissue	1
6		
7	1604 Other application, insertion or removal procedures on skin and subcutaneous tissue	1
8		
9	1605 Removal of foreign body from skin and subcutaneous tissue with incision	1
10		
11	1606 Incision and drainage of skin and subcutaneous tissue	1
12		
13	1607 Release of skin and subcutaneous tissue	1
14		
15	1630 Excision of ulcer or sinus of skin and subcutaneous tissue	2
16	1631 Excision of fingernail	1
17	1632 Excision of toenail	1
18	1633 Excision of sweat glands	2
19		
20	1634 Other excision procedures on skin and subcutaneous tissue	2
21		
22	1635 Repair of wound of skin and subcutaneous tissue	1
23		
24	1636 Repair of nail	1
25	1640 Allograft, xenograft or synthetic skin graft	2
26	1641 Split skin graft to granulating burn site	2
27	1642 Other split skin graft to granulating area	2
28		
29	1643 Split skin graft to burn of specific sites	2
30	1644 Split skin graft to burn of other sites	2
31	1645 Other split skin graft, small	2
32	1646 Other split skin graft, extensive	2
33		
34	1647 Split skin graft, inlay	2
35	1648 Full thickness skin graft to burn	2
36		
37	1649 Other full thickness skin graft	2
38	1650 Dermis graft	2
39	1651 Local skin flap, simple and small, single stage	2
40	1652 Local skin flap, large or complicated, single stage	2
41		
42	1653 Distant skin flap, direct	2
43		
44	1654 Distant skin flap, indirect	1
45	1655 Other repair procedures on skin and subcutaneous tissue	2
46	1656 Revision of burn scar or contracture	2
47		
48	1657 Revision of other scar of skin	2
49	1658 Revision of skin flap	2
50	1659 Procedures for pilonidal sinus or cyst	2
51		
52	1660 Other procedures on skin and subcutaneous tissue	2
53	1661 Insertion, removal or adjustment of tissue expander or implant	2
54		
55	1662 Excision, eyelid	2
56		
57	1663 Excision, ear	1
58	1664 Excision, lip	2
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60	1665 Excision, tongue	2

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3	1666 Liposuction and lipectomy	2
4	1667 Excision of lymphoedematous tissue	2
5	1668 Dermofat or fat graft	2
6	1669 Composite graft	2
7	1670 Fascia graft	2
8	1671 Myocutaneous flap	1
9	1672 Muscle flap	1
10	1673 Island flap	2
11	1674 Free flap	1
12	1675 Facelift and browlift	2
13	1676 Graft for symblepharon	2
14	1677 Repair of blepharoptosis	2
15	1678 Repair of ear	2
16	1679 Rhinoplasty	2
17	1680 Other repair of nose	2
18	1681 Repair of pharynx	2
19	1682 Contour reconstruction	2
20	1683 Contour restoration	2
21	1684 Reconstruction of eyelid and ear	2
22	1685 Reconstruction of lip or mouth	2
23	1686 Revision of free flap and associated procedures	2
24	1687 Revision of other plastic procedures on soft tissue	2
25	1688 Reoperation to correct previous ptosis repair of eyelid	2
26	1689 Procedures for cleft lip	2
27	1690 Procedures for cleft palate	2
28	1691 Procedures for cleft lip and anterior palate	2
29	1692 Procedures for facial nerve paralysis	2
30	1693 Excision of arteriovenous malformation [AVM]	2
31	1694 Microsurgical repair for restoration of continuity of blood vessel of distal extremity or digit	3
32	1695 Microsurgical anastomosis of blood vessel	3
33	1696 Microsurgical graft of blood vessel	3
34	1697 Fixation of transcutaneous abutment (osseointegration procedure)	2
35	1698 Implantation of titanium fixture (osseointegration procedure)	2
36	1699 Resection of mandible	3
37	1700 Resection of maxilla	3
38	1701 Resection of other facial bone	3
39	1702 Genioplasty	3
40	1703 Osteotomy or ostectomy of zygoma	3
41	1704 Osteotomy or ostectomy of zygoma with internal fixation	3
42	1705 Osteotomy or ostectomy of mandible or maxilla	3
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1706 Osteotomy or ostectomy of mandible or maxilla with internal fixation	3
1707 Osteotomy or ostectomy of mandible or maxilla, procedures in combination	3
1708 Osteotomy or ostectomy of mandible or maxilla with internal fixation, procedures in combination	3
1709 Midfacial osteotomies	2
1710 Frontal bone advancement	3
1711 Correction of skull deformity	4
1712 Other repair of skull or facial bone	3
1713 Reconstruction of mandible	3
1714 Reconstruction of maxilla	3
1715 Reconstruction of zygoma	3
1716 Reconstruction of orbital cavity	3
1717 Reconstruction of other skull and facial bones	3
1718 Other procedures for craniostenosis	3
Examination procedures on breast	1
Application, insertion or removal procedures on breast	2
Incision procedures on breast	2
Biopsy of breast	2
Excision of lesion of breast	2
Subcutaneous mastectomy	2
Simple mastectomy	3
Other excision procedures on breast	2
Augmentation mammoplasty	3
Reduction mammoplasty	3
Other repair procedures on breast	3
Reconstruction procedures on breast	3
Reconstruction procedures on nipple and areola	2
Procedures involving removal or adjustment of breast prosthesis or tissue expander	2
Other procedures on breast	2



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30 Data management Plan  
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Persistent opioid use and opioid-related harm after hospital admissions for surgery and trauma in New Zealand

Principal investigator	Jiayi Gong School of Pharmacy University of Auckland <a href="mailto:Jgon014@auckland.ac.nz">Jgon014@auckland.ac.nz</a>
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55 Version: 4 (15/06/2020)  
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58 Initial version: v1 (24/04/2020)  
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3 Project start date: 01/10/2020  
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6 Project end date: ongoing  
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### 30 Project abstract:

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33 Opioid use has increased exponentially on a global scale for the management of non-cancer related  
34 pain. There are wide concerns regarding the contribution of hospitalisation and death related to  
35 persistent opioid use leading to misuse of opioids in many western countries such as the United  
36 States (US), Canada, United Kingdom (UK), New Zealand (NZ), and Australia. Hospital admissions  
37 related to trauma and surgery have been identified to be a contributing factor to increasing opioid  
38 use both within NZ and internationally. We aim to find the incidence of persistent opioid use post  
39 hospital admissions related to surgery and trauma, and the health outcomes related to persistent  
40 opioid use such as hospitalisation and mortality related to opioid use. We also aim to identify  
41 predictors that may lead to persistent opioid use and related adverse health outcomes in the NZ  
42 population. This is a retrospective population-based cohort study using linked, routinely collected  
43 health data for all patients who have had surgery in hospital and those admitted to hospital with  
44 trauma in NZ, between 2006 to 2019. Linked data include surgery performed in hospital, emergency  
45 department presentation, medication dispensing, comorbidity (M3 index), mortality and other  
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3 related demographics factor. We will calculate the crude incidence rates of adverse outcomes  
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5 related to both persistent and non-persistent opioid use. To compute the rates, we will divide the  
6  
7 total number of adverse outcome events by total follow-up time. Additionally, using a multivariable  
8  
9 logistic regression model, we will examine the association between potential predictors and  
10  
11 persistent opioid use after surgery/trauma. Multivariable Cox regression models will be used to  
12  
13 estimate the risk of all-cause mortality, opioid related adverse outcomes, and hospitalisation  
14  
15 associated with persistent use of opioids up to one-year post hospital discharge after surgery and  
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17 trauma for all patients.  
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## 22 Field of Research (As per Australian and NZ standard research 23 classification) 24 25 26 27

28 111503 Clinical Pharmacy and Pharmacy Practice  
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31 111706 Epidemiology  
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34 110301 Anaesthesiology  
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36  
37 110323 Surgery  
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40 110305 Emergency Medicine  
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## 43 Registration details: 44 45

46 ANZCTR: TBC  
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## 50 Funding Agencies: 51 52

53 Auckland Academic Health Alliance  
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56 University of Auckland- Senior Health Research Scholarship  
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## Ethics and Privacy:

### **Ethics approval:**

The study was exempt from a Health and Disability Ethics Committee (HDEC) review, it was granted ethics approval by the Auckland Regional Ethics Committee (AHREC) with subsequent locality approval from Auckland District Health Board (ADHB)

AHREC approval: AH1159

Locality approval no.: 8753

### **Ethical issues:**

This is a clinical audit study. Only deidentified data will be used in this study with encryption generated by the ministry of health. The requirement for informed consent has been waived, as this is a retrospective database study and no participants will be actively recruited. Ensuring patient and practitioner confidentiality is paramount to our data analysis approach.

### **Data Privacy and Security issues:**

The original dataset will have the patients' National Health Index (NHI) encrypted by the Ministry of Health and at no time will any co-investigators be able to access directly identifiable data. However, there is the possibility of patients been re-identified through the linkage of data from different data sets and the indirect identifiers contained in the values from the datasets. For example, a patient could be identified from a combination of variables including date of birth, demographic data, hospital admission date, relevant procedure code, medication dispensing and possible dates of death or subsequent hospitalisations.

## Relevant policy

The University of Auckland Research Code of Conduct (particularly section 5.4)

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2  
3 National Ethical Standards for Health and Disability Research and Quality Improvement (particularly  
4  
5 12.1-12.17, 12.26-12.39, 18.16-18.22).

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8 Privacy Act 1993 (particularly Part 2)

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11 Health Information Privacy Code 1994

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14 Health Act 1956 (particularly Sections 22C, 22H)

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16  
17 Health (Retention of Health Information) Regulations 1996

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19  
20 Health Information Privacy Code 1994 (particularly Rules (2)(g)(iii) and (1)(e)(iii))

## 21 22 23 Responsibilities and resources

### 24 25 26 Data management staff:

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28  
29 Jiayi Gong (PhD candidate), Amy Chan (primary supervisor), Alan Merry (Co-supervisor) and Peter  
30  
31 Jones (Co-supervisor) take main responsibility for the management and analysis of the data.

### 32 33 34 Required resources:

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37 Secure storage managed by the University of Auckland

## 38 39 40 Data organisation

### 41 42 43 Description of Digital data:

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46 • Deidentified data from National Minimum Dataset (NMDS) related to hospital admissions
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49 • Deidentified data from NMDS related to surgery and procedures
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52 • Deidentified data from National Non-Admitted Patient Collection (NNPAC) related to  
53  
54 emergency department admissions
- 55  
56  
57 • Deidentified data from Accident Compensation Corporation (ACC) related to emergency  
58  
59 department admissions
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- Deidentified data from Pharmaceutical collection related to medication dispensing
- Deidentified data from National Health Index (NHI) related socioeconomic and demographic information
- Deidentified data from Primary Health Organisation (PHO) related to PHO enrolment information
- Deidentified data from the Mortality collection related to cause and dates of death

#### **Description of non-digital data**

- Password to access deidentified data file

#### **Collection/Creation method**

All data will be requested from the NZ Ministry of Health and be stored in its original form in multiple files on a secured drive at the University of Auckland.

Data linkage will be completed by an experienced professional to be determined and he/she will need to sign a confidentiality agreement.

#### **Data organisation:**

The server has a main drive where data in active use will be stored.

Directory schematic of drive arrangement

Data:

- Raw
  - Deidentified raw data

Documents:

- Protocol
- Data Management Plan
- Ethics

- AHREC
- Institutional approval

#### Reports:

- Generated and written reports

#### Other relevant subfolders include:

- Vault:
  - Data no longer in use, with much slower read speed
- Archive:
  - Data archive to comply with storage requirements- slowest read speed

#### Data storage and backup

Digital data will be stored on appropriate failure-robust School of Pharmacy, University of Auckland managed storage system. The server will have password protected access, with access only granted to the research team via the University of Auckland UPI. The password will be held by Jiayi Gong (PhD Candidate) and Amy Chan (PhD primary supervisor). Non-digital data will be stored in a locked cabinet in an access-controlled area of the School of Pharmacy. The keys will be kept by Amy Chan and the School of Pharmacy administrative team. Amy Chan is the primary supervisor and co-investigator for this research and she is a senior clinical research fellow at the School of Pharmacy, University of Auckland.

- Any data collected non-digitally e.g. via paper forms will be scanned electronically and stored digitally

## Sharing and Access Control

#### Description of sensitive data

Encrypted patient data, which may allow indirect identifiers to identify patients.

#### Access Control and Security measures



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2  
3 The linked data will be stored in a secure password protected storage site on the University of  
4  
5 Auckland server, with no copies made and access restricted to the research team. Linked data may  
6  
7 be copied to password protected computers used by investigators for the purpose of analysis. It will  
8  
9 be securely deleted as soon as reasonably possible when the assigned task is completed.  
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### 12 **Description of accompanying metadata**

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15 A file named readme.md will be stored in each directory describing the directories and files therein  
16  
17 (including variables from respective dataset dictionary).  
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### 20 **Coverage of Data**

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23 Patients admitted to any hospital in New Zealand, due to surgery or a trauma event and  
24  
25 subsequently filled an opioid prescription on discharge. See protocol (pg. 5-6) for inclusion/exclusion  
26  
27 criteria.  
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### 30 **Temporal extent of data**

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33 01/01/2006 to 01/01/2019  
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## 37 **Data publication and reporting**

### 38 **Data ownership:**

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41 Data will be owned by the University, as per the University of Auckland Research Code of Conduct  
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43 Section 5.4  
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### 47 **Data publication**

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50 No approval has been granted by the ethics committee to share research data from the project  
51  
52 outside of the research team. The research team may consider publication of metadata.  
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### 56 **Data retention period**

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3 Data will be retained for at least 10 years on appropriate University managed storage as per Health  
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5 Information Privacy Code.  
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#### 8 **Method of disposal** 9

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11 If the data needs to be destroyed, it will be done so securely in concordance with University of  
12  
13 Auckland protocols.  
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#### 16 **Archiving and preservation Plan** 17

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19 Standard University of Auckland data preservation policies will be followed  
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**The RECORD statement – checklist of items, extended from the STROBE statement, that should be reported in observational studies using routinely collected health data.**

	Item No.	STROBE items	Location in manuscript where items are reported	RECORD items	Location in manuscript where items are reported
<b>Title and abstract</b>					
	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found		RECORD 1.1: The type of data used should be specified in the title or abstract. When possible, the name of the databases used should be included.  RECORD 1.2: If applicable, the geographic region and timeframe within which the study took place should be reported in the title or abstract.  RECORD 1.3: If linkage between databases was conducted for the study, this should be clearly stated in the title or abstract.	1  2  2
<b>Introduction</b>					
Background rationale	2	Explain the scientific background and rationale for the investigation being reported			4
Objectives	3	State specific objectives, including any prespecified hypotheses			5
<b>Methods</b>					
Study Design	4	Present key elements of study design early in the paper			5, 6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection			5-8

Participants	6	<p>(a) <i>Cohort study</i> - Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up</p> <p><i>Case-control study</i> - Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls</p> <p><i>Cross-sectional study</i> - Give the eligibility criteria, and the sources and methods of selection of participants</p> <p>(b) <i>Cohort study</i> - For matched studies, give matching criteria and number of exposed and unexposed</p> <p><i>Case-control study</i> - For matched studies, give matching criteria and the number of controls per case</p>		<p>RECORD 6.1: The methods of study population selection (such as codes or algorithms used to identify subjects) should be listed in detail. If this is not possible, an explanation should be provided.</p> <p>RECORD 6.2: Any validation studies of the codes or algorithms used to select the population should be referenced. If validation was conducted for this study and not published elsewhere, detailed methods and results should be provided.</p> <p>RECORD 6.3: If the study involved linkage of databases, consider use of a flow diagram or other graphical display to demonstrate the data linkage process, including the number of individuals with linked data at each stage.</p>	<p>5, 6</p> <p>7</p> <p>N/A</p>
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable.		RECORD 7.1: A complete list of codes and algorithms used to classify exposures, outcomes, confounders, and effect modifiers should be provided. If these cannot be reported, an explanation should be provided.	Supplementary section and page 7
Data sources/ measurement	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group			6-8

1 2 3 4	Bias	9	Describe any efforts to address potential sources of bias		7-9
5 6 7 8 9	Study size	10	Explain how the study size was arrived at		N/A
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34	Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why		8,9
35 36 37 38 39 40 41 42 43 44	Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) <i>Cohort study</i> - If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> - If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> - If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses		8,9
45 46 47	Data access and cleaning methods		..	RECORD 12.1: Authors should describe the extent to which the investigators had access to the database population used to create the study population.	9

				RECORD 12.2: Authors should provide information on the data cleaning methods used in the study.	Supplementary section- data management plan
Linkage		..		RECORD 12.3: State whether the study included person-level, institutional-level, or other data linkage across two or more databases. The methods of linkage and methods of linkage quality evaluation should be provided.	Supplementary section- data management plan
<b>Results</b>					
Participants	13	(a) Report the numbers of individuals at each stage of the study ( <i>e.g.</i> , numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed) (b) Give reasons for non-participation at each stage. (c) Consider use of a flow diagram		RECORD 13.1: Describe in detail the selection of the persons included in the study ( <i>i.e.</i> , study population selection) including filtering based on data quality, data availability and linkage. The selection of included persons can be described in the text and/or by means of the study flow diagram.	N/A
Descriptive data	14	(a) Give characteristics of study participants ( <i>e.g.</i> , demographic, clinical, social) and information on exposures and potential confounders (b) Indicate the number of participants with missing data for each variable of interest (c) <i>Cohort study</i> - summarise follow-up time ( <i>e.g.</i> , average and total amount)			N/A
Outcome data	15	<i>Cohort study</i> - Report numbers of outcome events or summary measures over time <i>Case-control study</i> - Report numbers in each exposure			N/A

		category, or summary measures of exposure <i>Cross-sectional study</i> - Report numbers of outcome events or summary measures			
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period			N/A
Other analyses	17	Report other analyses done— e.g., analyses of subgroups and interactions, and sensitivity analyses			N/A
<b>Discussion</b>					
Key results	18	Summarise key results with reference to study objectives			N/A
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias		RECORD 19.1: Discuss the implications of using data that were not created or collected to answer the specific research question(s). Include discussion of misclassification bias, unmeasured confounding, missing data, and changing eligibility over time, as they pertain to the study being reported.	9
Interpretation	20	Give a cautious overall interpretation of results considering objectives,			N/A

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		limitations, multiplicity of analyses, results from similar studies, and other relevant evidence			
Generalisability	21	Discuss the generalisability (external validity) of the study results			N/A
<b>Other Information</b>					
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based			10
Accessibility of protocol, raw data, and programming code		..		RECORD 22.1: Authors should provide information on how to access any supplemental information such as the study protocol, raw data, or programming code.	Supplementary section included

\*Reference: Benchimol EI, Smeeth L, Guttman A, Harron K, Moher D, Petersen I, Sørensen HT, von Elm E, Langan SM, the RECORD Working Committee. The REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) Statement. *PLoS Medicine* 2015; in press.

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