The Registry of Senior Australians (ROSA)
South Australian Health and Medical Research Institute
PO Box 11060
Adelaide, South Australia 5001
Ph: +61 8 8128 4662
E: ROSA@sahmri.com

International and National Quality and Safety Indicators for Aged Care

Report for the Royal Commission into Aged Care Quality and Safety

APPENDICES

July 2020

Report prepared by The Registry of Senior Australians (ROSA) Research Team at the South Australian Health and Medical Research Institute (SAHMRI)

Gillian E Caughey, Catherine E Lang, Sarah C Bray, Max Moldovan,

Robert N Jorissen, Steve Wesselingh and Maria C Inacio

Table of Contents

Appendix 1

Summary of ROSA Outcome Monitoring System (OMS) Quality and Safety Indicators

Table 1.1: Summary of ROSA OMS Quality and Safety Indicators[1]

Indicator	Main Data source(s)	Coding	Numerator	Denominator	Exclusions/Stratification	Covariates
High Sedative Load	Medications (PBS)	PBS/ATC	Number of long-term residents who experienced high sedative load	Number of long-term residents	Stratified by dementia status	Age, sex, comorbidities
Antipsychotic Use	Medications (PBS)	PBS/ATC	Number of long-term residents who have been prescribed an antipsychotic	Number of long-term residents	Stratified by dementia status. Excluded residents with history of schizophrenia or Huntington's disease	Age, sex, comorbidities, dementia, prior use of antipsychotics
Chronic Opioid Use	Medications (PBS)	PBS/ATC	Number of long-term residents that are chronic opioid users. Chronic opioid use is defined as continuous opioid use for at least 90 days, or for 120 non-consecutive days	Number of long-term residents	Excluded residents with a history of cancer or in palliative care	Age, sex, comorbidities

Indicator	Main Data source(s)	Coding	Numerator	Denominator	Exclusions/Stratification	Covariates
Antibiotic Use	Medications (PBS)	PBS/ATC	Proportion of long-term residents dispensed an antibiotic	Number of long-term residents		Age, sex, comorbidities
Premature Mortality	Mortality records (NDI)	ICD-10-AM	Number of residents who died from premature causes, i.e. their main cause of death is 'external' and considered potentially avoidable	Number of residents		Age, sex, comorbidities
Falls	Hospital and mortality records (ISAAC, NSW APDC, VAED, NDI)	ICD-10-AM	Number of long-term residents who have experienced one or more falls resulting in requiring medical attention	Number of long-term residents		Age, sex, comorbidities, dementia, mobility

Indicator	Main Data source(s)	Coding	Numerator	Denominator	Exclusions/Stratification	Covariates
Fractures	Hospital, subsidised health encounters, mortality records (ISAAC, NSW APDC, VAED, MBS, NDI)	ICD-10-AM/MBS	Number of long-term residents with fractures	Number of long-term residents		Age, sex, comorbidities, dementia, mobility, osteoporosis
Medication-related Adverse Events	Hospital records (ISAAC, NSW APDC, VAED)	ICD-10-AM	Number of long-term residents with a medication-related hospitalisation/emergency department visit	Number of long-term residents		Age, sex, comorbidities
Weight Loss and Malnutrition	Hospital records (ISAAC, NSW APDC, VAED)	ICD-10-AM	Number of long-term residents with a hospitalisation/emergency department visit for/with malnutrition/weight loss diagnoses	Number of long-term residents		Age, sex, comorbidities

Indicator	Main Data source(s)	Coding	Numerator	Denominator	Exclusions/Stratification	Covariates
Delirium and/or Dementia Hospitalisations	Hospital records (ISAAC, NSW APDC, VAED)	ICD-10-AM	Number of long-term residents with dementia having a hospitalisation/emergency department visit for dementia or delirium	Number of long-term residents with dementia		Age, sex, comorbidities
Emergency Department Presentation	Hospital records (ISAAC, NSW APDC, VAED)	ICD-10-AM	Number of residents admitted to an emergency department within 30 days of entry/re-entry to care	Number of residents who re-entered after hospital discharge	Stratified by short vs long-term residents	Age, sex, history of hospitalisations, comorbidities, length of stay
Pressure Injury	Hospital records (ISAAC, NSW APDC, VAED)	ICD-10-AM	Number of long-term residents with a hospitalisation/emergency department visit for or with pressure injury diagnoses	Number of long-term residents	Stratified by high vs low risk of pressure injury residents	Age, sex, comorbidities

MBS, Medicare Benefits Schedule; PBS, Pharmaceutical Benefits Scheme; NDI, National Death Index; ISAAC, Integrated South Australian Activity Collection; EDDC, South Australian Emergency Department Data Collection; VAED, Victorian Admitted Episodes Dataset; NSW APDC, NSW Admitted Patient Data Collection. ATC= Anatomical Therapeutic Chemical Classification System. ICD-10-AM= International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification.

Appendix 2

ROSA Outcome Monitoring System Quality and Safety Indicators Technical Specifications

The Registry of Senior Australians (ROSA) has designed an outcome monitoring and bench-marking system to measure the safety and quality of services received by individuals obtaining aged care services in Australia.[1] This tool is required to efficiently evaluate service systems, examine unwarranted variation in care, and support the development of evidence-based quality improvement initiatives.

The ROSA Outcome Monitoring System (OMS) was developed from the synthesis of high-level evidence and recommendations by established Australian or international reporting programs and initiatives.[1-12] The specific indicators that are included in the current system leverage the linkage between the aged care and health care datasets that exist in ROSA.

An initial list of 23 potential quality and safety indicators were identified, which were reviewed by an Advisory Committee in April 2019 and a list of 12 indicators were prioritised for further development.

This document provides the detailed proposed technical specifications for the following 12 indicators that were identified as priorities for the ROSA OMS. These indicators are:

1. Sedative Load
2. Antipsychotic Use
3. Chronic Opioid Use
4. Antibiotic Use
5. Premature Mortality
6. Falls
7. Fractures
8. Medication-related Adverse Events
9. Weight Loss or Malnutrition
10. Delirium and/or Dementia
11. Emergency Department Presentation
12. Pressure Injury

Definitions

Aged Care Eligibility Assessment Program (ACAP) Minimum Dataset (MDS) V2.0:[13] All individuals seeking residential, home care package, and transition care services in Australia undergo an assessment by trained and certified assessors to determine service eligibility and recommendations. The ACAP MDS v2 was created in 2013 by the Australian Institute of Health and Welfare from the data collected during aged care eligibility assessments nationally. The data dictionary created by the Australian Institute of Health and Welfare (AIHW) released in 2013 maps all coding used for the assessments.

Aged Care Assessment Team (ACAT):[13] Team responsible for conducting aged care eligibility assessments under the Aged Care Assessment Program (ACAP). The assessment itself is also frequently referred to as an ACAT.

Aged Care Funding Instrument (ACFI):[14] At entry into permanent residential aged care clients undergo an assessment using the ACFI, which is used to determine the level of care each resident needs, based on current challenges with activities of daily living, behaviour and complex health care. Outcomes of this assessment are used to allocate Australian Government subsidies to residential aged care providers to provide care for residents.

Anatomical Therapeutic Chemical (ATC) Classification System:[15] This was used to identify medication related indicators using the Pharmaceutical Benefits Scheme (PBS) datasets. This is the World Health Organisation classification system for medications. This system groups substances according to organ or system they act on and their therapeutic, pharmacological, and chemical properties. Medications in the PBS datasets are coded using PBS codes that have been mapped to ATC codes.

Case mix adjustment (or risk adjustment):[16-18] *Observed proportion* is the crude ratio of numerator and the denominator and *observed rates* is the ratio of the numerator/1000 resident days in our report. Adjusted proportions and rates of the indicators are also presented, and this means that indicators have accounted for the different profile of the individuals living in each facility. All indicators are at the minimum adjusted for age, sex, and number of comorbidities of the cohorts (termed covariates in our specifications). Additional covariates, including dementia or osteoporosis, are included in the specifications of some indicators. The probability of specific events (i.e. *expected proportion)* was estimated using a logistic regression model, which includes the specified covariates for that model. The expected rate for antibiotic days and antibiotic Defined Daily Doses (DDDs)/1000 resident days was estimated using a Poisson regression model. For each measure and model, variable form specifications are examined, and model fit is assessed. The *ratio of the observed/expected* multiplied by the overall national proportion or rate is the adjusted estimate, which is presented in the report.

Comorbidities: In this report all comorbidities were ascertained using the RxRisk-V[19, 20] pharmaceutical-based comorbidity index. A six-month look-back period from the year of the report was used to ensure a recent comorbidity profile. Unless otherwise specified, the count of comorbidities was included as a covariate. If certain comorbidities (e.g. dementia) were included as a covariate in a statistical calculation, it would be removed from the corresponding count of comorbidities for that calculation.

Confidence intervals: A confidence interval is the range of values in which the true estimate of an indicator may lie. In our plots we show the 95% and 98.5% confidence intervals. Generally, sample size and variability may affect the confidence intervals. In all funnel plots in this report, confidence intervals were calculated using the Wilson method for binomially distributed estimates.[16, 18] This method was chosen as this is a conservative approach (i.e. wide estimates) to estimate the confidence intervals presented in the funnel plot.

Cumulative days in care: The total number of days that a resident receives care from a specific aged care facility or provider. If a resident has periods of 'leave' from the aged care facility (e.g. hospitalisations) these days are not included in the total number of days in care. If an individual enters permanent residential care directly from an episode of respite care, these days have not been counted towards the total.

Dementia diagnoses (Table 2.1): For individuals in permanent residential aged care, dementia is ascertained using at least one of the following indications: (1) health conditions reported in the aged care eligibility assessment; or (2) health conditions reported at the time of an aged care funding instrument assessment at entry into residential aged care; or (3) a history of dispensing of medications specific for dementia, including acetylcholinesterase inhibitors or memantine within the six months prior to entry into aged care. For individuals receiving home care services, dementia is ascertained from (1) health conditions reported in the aged care eligibility assessment; or (2) a history of dispensing of an acetylcholinesterase inhibitor or memantine within the six months prior to entry into aged care.

Table 2.1 Dementia diagnoses, including ACAP MDSV2.0 codes[13] and ATC codes used for ascertainment

Description	ACAP MDSV2.0 code
Dementia in Alzheimer's disease	**0500**
Dementia in Alzheimer's disease with early onset (<65 yrs)	0501
Dementia in Alzheimer's disease with late onset (>65 yrs)	0502
Dementia in Alzheimer's disease, atypical or mixed type	0503

Description	ACAP MDSV2.0 code
Dementia in Alzheimer's disease, unspecified	0504
Vascular dementia	**0510**
Vascular dementia of acute onset	0511
Multi-infarct dementia	0512
Subcortical vascular dementia	0513
Mixed cortical & subcortical vascular dementia	0514
Other vascular dementia	0515
Vascular dementia – unspecified	0516
Dementia in other diseases classified elsewhere	**0520**
Dementia in Pick's disease	0521
Dementia in Creutzfeldt-Jakob disease	0522
Dementia in Huntington's disease	0523
Dementia in Parkinson's disease	0524
Dementia in human immunodeficiency virus (HIV) disease	0525
Dementia in other specified diseases classified elsewhere	0526
Other dementia	**0530**
Alcoholic dementia	0531
Unspecified dementia (includes presenile & senile dementia)	0532
Drug name	**ATC code**
Donepezil	N06DA02
Rivastigmine	N06DA03
Galantamine	N06DA04
Memantine	N06DX01

Note. In the assessment at entry into residential aged care (or ACFI) dementia is only identified using the codes in bold. All codes are used in the assessment conducted prior to entering residential aged care.

Denominator: Total number of eligible residents during the reporting period.

Funnel plots (Figure 1)[16-18]**:** These visualisation tools depict the variation in the indicators included in the report as a scatter plot, where each dot is a unit of measure (e.g. an aged care facility or geographical area). The X-axis (horizontal axis) shows the number of individuals in a facility ('size of group') and the Y-axis (vertical axis) shows the adjusted proportion or rate of each quality indicator. These plots display the provider and facility-level variation for each indicator. The variation is shown by upper and lower confidence limits (95% or 98.5%) around the mean of that measure for all facilities.

To ensure appropriate development of funnel plots, we developed models that appropriately account for case-mix differences; ensuring that the number of observations per facility or provider is sufficient to undertake the analysis proposed, but does not identify them publicly (only facilities with more than 20 cases are displayed); and overdispersion (i.e. greater variation than expected) is tested. We will continue to work to ensure that funnel plot specifications are clear and satisfactory to aged care providers.

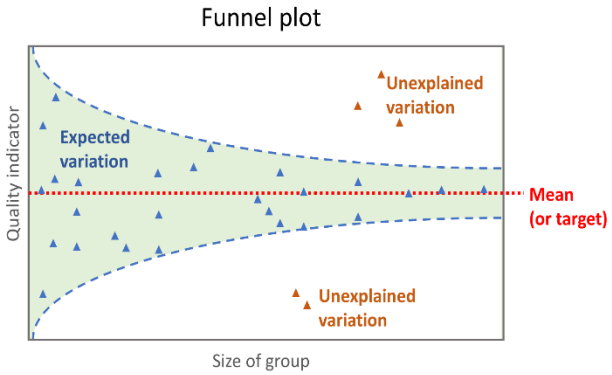

Figure 1. Example of a Funnel Plot

Indicators: The proposed measures of whether services are evidence based (i.e. quality) and free from unintended injury or health consequences (i.e. safety).

International Statistical Classification of Disease and Related Health Problems-Tenth Revision-Australian Modification (ICD-10-AM):[21] This was used to identify indicators using hospitalisations records, emergency department presentations, and cause of death data. This is the classification system for diseases and external causes of injury. The Australian Modification was developed by the National Centre for Classification in Health and is derived from the World Health Organisation ICD-10 classification.

Long-term residents: Individuals who have lived in a specific residential aged care facility for permanent residential care for a cumulative period of 100 or more days.

Numerator: Number of individuals that have experienced the quality/safety indicator of interest.

Reporting periods: Most indicators are reported for long-term care for a specific calendar year (e.g. 01/01/2016-31/12/2016 at this time). There are residents who become long-term care residents during the reporting period (in 2016 this was 27% of the total) and these residents are included in the denominator of the indicators. Indicators including short-term residents are also for a specific calendar year.

RxRisk-V comorbidity index:[19, 20] The RxRisk-V comorbidity index determines an individual's comorbidities based on medicines supplied via the Pharmaceutical Benefits Scheme (PBS) over a six month period. The RxRisk-V comorbidity index includes 46 conditions.

Sedative load: Estimate of the cumulative effect of taking multiple medications with sedative properties. Sedative load is calculated by summing the sedative rating of all medications a person receives. Many medications have sedative properties and therefore are included in this estimate. Specifically, the medications included in our calculation included: primary sedatives (e.g. conventional antipsychotics, antidepressants, anxiolytic, hypnotics and sedatives) which derive a score of 2 and medications with sedation as a prominent side-effect (e.g. atypical antipsychotics, antiemetics, opioids) which derive a score of 1. In our report we calculate the sedative load of medications dispensed within a period of 91 days. Our definition of a high sedative load is a score of 3 or higher, which for example could indicate the use of at least 1 primary sedative (score =2) and at least 1 additional medication with sedative properties (score =1).[22]

Short-term residents: Individuals who have lived in a specific residential aged care facility for a cumulative period less than 100 days.

Data Sources

The Historical and Prospective datasets of the Registry of Senior Australians (ROSA) are comprised of data from the National Aged Care Data Clearinghouse (NACDC), Medicare Benefits Schedule (MBS), Pharmaceutical Benefits Scheme (PBS), National Death Index (NDI), Integrated South Australian Activity Collection (ISAAC), and state health authorities admitted hospitalisation (for the states of South Australia (SA), New South Wales (NSW) and Victoria (VIC)), emergency department hospitalisations (for the states of SA, NSW, VIC), and ambulance data collections (for the states of SA, NSW). See data sources described in Table 2.[23]

Table 2.2 ROSA Data Sources, Data Custodians, Data Integrating Authority, Description of Data Source

Data Source	***Custodian***	***Data Integrating Authority***	***Description of Data Source***
National Aged Care, Medicare, and Mortality Records			
National Aged Care Data Clearing House (NACDC)[24]	Various	AIHW	This is a central, independent repository of national aged care data with data captured since 1997. It coordinates data collection from various agencies and departments and creates data sets from the information that is collected. It brings together data from the Department of Social Services, Aged Care Assessment Program, Department of Human Services, Commonwealth Home and Community Care Program, and the Australian Bureau of Statistics. Datasets with residential assessment (i.e. Aged Care Funding Instrument) are also included.
Medicare Benefits Schedule (MBS)[25]	Department of Health, Australian Commonwealth Government	AIHW	This database contains details of all Medicare subsidised attendances and procedures listed in the MBS and undertaken by medical practitioners, as well as diagnostics and pathology procedures, excluding treatments for inpatients in public hospitals. The MBS lists services that are subsided by Medicare.
Pharmaceutical Benefits Scheme (PBS)[26]	Department of Health, Australian Commonwealth Government	AIHW	This database contains claims for all PBS listed medicines dispensed to Medicare card holders. The Schedule of Pharmaceutical Benefits lists all medicines available through the PBS (including Repatriation Pharmaceutical Benefits Scheme (RPBS)).
National Death Index (NDI)[27]	Registrars of Births, Deaths and Marriages,	AIHW	This database that contains records of deaths registered in Australia since 1980. Data comes from Registrars of Births, Deaths and Marriages in each jurisdiction, the National

Data Source	*Custodian*	*Data Integrating Authority*	*Description of Data Source*
	Australian Commonwealth Government		Coronial Information System and the Australian Bureau of Statistics.
State Admitted Hospitalisation Records			
Integrated South Australian Activity Collection (ISAAC)[28]	SA Health	SA NT DataLink	This SA Health database includes details of all public hospital inpatient hospitalisations in SA.
NSW Admitted Patient Data Collection (NSW APDC)	NSW Ministry of Health	CHeReL	This collection records all admitted patient services provided by NSW Public Hospitals, Public Psychiatric Hospitals, Public Multi-Purpose Services, Private Hospitals, and Private Day Procedures Centres.
Victorian Admitted Episodes Dataset (VAED)	Victorian Health	CVL	The VAED provides a comprehensive dataset of the causes, effects and nature of illness, and the use of health services in Victoria. The VAED supports health service planning, policy formulation, epidemiological research and public hospital funding under the casemix system. All Victorian public and private hospitals, including rehabilitation centres, extended care facilities and day procedure centres, report a minimum set of data for each admitted patient episode.
State Emergency Department Records			
Emergency Department Data Collection (EDDC)[29]	SA Health	SA NT DataLink	This SA Health database includes details of all public hospital emergency department presentations in SA.
NSW Emergency Department Data Collection (NSW EDDC)	NSW Ministry of Health	CHeReL	The Emergency Department collection provides information about patient presentations to the emergency departments of public hospitals in NSW.
Victorian Emergency Minimum Dataset (VEMD)	Victorian Health	CVL	The VEMD comprises de-identified demographic, administrative and clinical data detailing presentations at Victorian public hospitals with designated emergency departments. The VEMD provides information for: epidemiological purposes, health service planning and coordination, policy assessment and formulation, clinical research, quality improvement and patient management.

Data Source	*Custodian*	*Data Integrating Authority*	*Description of Data Source*
State Ambulance Records			
SA Ambulance Services (SAAS)	SA Health	SA NT DataLink	This SA database collects information on ambulance services provided during emergency medical assistance, treatment and transport, and non-urgent patient transport.
NSW Ambulance-Patient Health Care Record (PHCR) and NSW electronic Medical Record (eMR)	NSW Ministry of Health	CHeReL	This NSW Ambulance data collections data documented by clinicians in the paper-based Patient Health Care Record (PHCR) and electronic medical record (eMR). Clinical information includes patient vital signs. NSW Ambulance datasets capture information for emergency and urgent episodes of care for NSW Ambulance patients who: were transported to a hospital; were left at a scene following clinician assessment; or, who died at the scene.

AIHW=Australian Institute of Health and Welfare. CHeReL= Centre for Health Record Linkage. CVL= Centre for Victorian Data Linkage.

SA, NSW, and VIC Admitted and Emergency Hospital Data Collections

While the states' hospitalisation and emergency department data collections have been brought together to develop national estimates of the ROSA OMS indicators through the development of a minimum dataset common to all states, there are several differences between the data collections that need to be considered. These differences, which range from availability of specific data elements to coding practices, are limitations in the ascertainment of ROSA OMS indicators from hospital-based data and potentially can affect the inter-state comparability of some of the OMS indicators.

Seven ROSA OMS indicators use hospital-based data, these include: falls, fractures, medication-related adverse events, weight loss or malnutrition, delirium and/or dementia, emergency department presentation, pressure injury. We have attempted to address the differences between the states' data sources by creating common national definitions (i.e. a minimum common dataset) using the available data when possible and when not possible, create state-specific definitions. Other national hospitalisation datasets (e.g. the Australian Institute of Health and Welfare National Hospital Morbidity Dataset) have been created in the past and have highlighted the main differences between states and territory health authorities' data collection, changes over time in data availability and other important aspects of using these data as a single dataset nationally.[30] In this report we outline the major differences between the states we have used in the development of the ROSA OMS

(specifically SA, VIC and NSW) and how we believe their differences influence national comparisons. In the specifications of each indicator in this report we have also outlined whether there are state-specific definitions that need to be incorporated in the development of an indicator.

Major differences:

I. Data availability.

The main limitation of the SA inpatient admitted hospital data is the unavailability of private hospitalisations, which are available for the states of VIC and NSW. The Integrated South Australian Activity Collection (ISAAC) captures only public hospitalisations, therefore hospitalisations in private hospitals are not included.

> **How this affects the ROSA OMS:** As most emergency hospitalisations (92%) are normally captured in public hospitals,[31] we expect that the indicators that rely on principal discharge diagnosis for hospitalisations that are typically emergency or unplanned (i.e. falls, medication related adverse events, fractures, and delirium and/or dementia) to be well captured within the ROSA OMS. Based on comparisons with other states (VIC, NSW) for these indicators, it is likely we are underestimating these events by between 0-12% (depending on the indicator and year) in SA by using only the public hospitals for these measures. For the indicators that rely on any diagnosis during the inpatient encounters (i.e. pressure injuries and weight loss or malnutrition) it is likely that SA estimates are underestimated by 3-26% (depending on the indicator and year), based on comparisons to other states. For these 2 indicators we recommend focusing on state-wise comparisons.

II. Unique data elements.

In admitted hospitalisations records in SA and VIC a variable that specifies 'injury event-external cause code' is available, which is not available for NSW records.

> **How this affects the ROSA OMS:** Only the fall indicator is affected by this limitation. The falls captured by the ROSA OMS should have occurred prior to the hospitalisation episode, therefore the 'injury event-external cause code' that indicates a fall is useful in determining that the reason for the admission was related to a fall. In NSW the 'external cause' diagnosis set of variables was used to determine whether the hospitalisation was related to a fall.

In emergency department records in SA and NSW, a diagnosis (only 1 is available) is available to characterise the encounter, while in VIC a 'injury cause' variable is available.

> **How this affects the ROSA OMS:** Only the fall indicator is affected by this limitation and only if the fall did not require a hospital admission, in which case it would be

captured in that encounter. In SA and NSW the discharge diagnosis was used to identify falls using the ICD-10-AM outlined under the falls indicator specifications. In the VIC dataset the 'injury cause' was used to identify emergency department presentations due to falls. It is possible that when the primary reason for an emergency department presentation are sequalae related to falls (i.e. other injuries) in the NSW and SA datasets this is underestimated.

III. Coding practices.

State admitted hospitalisations are coded in accordance with national coding standards. However, we found the emergency department data collections to be particularly different between states. NSW for example employed ICD-9-AM, ICD-10-AM, and SNOMED coding at different time periods and while SA shared ICD-10-AM mapped encounters, upon further investigation it was found that different coding practices were used in different emergency departments (for example ICD-9-AM that was later mapped to ICD-10-AM). We have attempted to map all encounter coding to ICD-10-AM but this may also introduce challenges, as mapping is not always accurate and codes may be in formats that are not acceptable for mapping (e.g. less digits that required).[32, 33]

How this affects the ROSA OMS: Only the fall indicator is affected by this limitation and only if the fall did not require a hospital admission, in which case it would be captured in that encounter. When other coding was used, in particularly SNOMED, the mapped codes descriptions were reviewed to ensure that they also captured events of specific importance for the ROSA OMS indicators. For example, the ICD-10-AM coding for 'tendency to fall' (R29.6) mapped to 29839007 ('at risk of falls') or 430576002 ('at risk of injury due to falls') which were excluded and therefore not considered a fall. We also checked that SNOMED coding was consistent with the ICD-10-AM specifications we created for the other ROSA OMS indicators and determined them to be appropriate.

Certain conditions may have significant limitations and variations in coding. Weight loss and malnutrition are often underreported. This is partially because while coding this condition in hospitalisation records may at times change the reimbursement of the hospitalisations, when other more serious co-morbid conditions are reported, and the reimbursement is maximised, there is no incentive to code these.[34]

How this affects the ROSA OMS: The indicator most affected by underreporting and the most variable between states (despite very low prevalence) was weight loss and malnutrition, even after acknowledging different data sources between states. These state differences likely highlight varying coding practices of these specific conditions between states and therefore we recommend only conduction of state-wise comparisons for this indicator.

Indicator 1. Sedative Load

Data Source	Definition	Numerator	Denominator	Comments	Covariates
PBS	Proportion of long-term residents potentially experiencing a high sedative load (SL≥3).	Number of long-term residents who had at least one potential period of high sedative load (SL≥3) medication use within a 91-day period in the reporting period of 1 year. Sedative load is calculated by summing the sedative rating of each medication dispensed during the same period (Table I1.1).	Number of long-term residents of aged care. Exclude any that have the reported health conditions of schizophrenia or Huntington's disease (Table I1.2), receiving cancer treatment or are in palliative care (Table I1.3).	The published literature was searched to identify medications that contribute to high sedative load.[22, 35-37]	Age, sex, number of comorbidities.
PBS	Proportion of long-term residents with dementia potentially experiencing a high sedative load (SL≥3).	Number of long-term residents with dementia who had at least one potential period of high sedative load (SL≥3) medication use within a 91-day period in the reporting period of 1 year. Sedative load is calculated by summing the sedative rating of each medication dispensed during the same period (Table I1.1).	Number of long-term residents of aged care with dementia. Exclude any that have the reported health conditions of schizophrenia or Huntington's disease (Table I1.2), receiving cancer treatment or are in palliative care (Table I1.3).	The published literature was searched to identify medications that contribute to high sedative load.[22, 35-37]	Age, sex, number of comorbidities other than dementia.

Calculation of sedative load

Sedative load is calculated by summing the sedative rating of each different medication dispensed within the 91-day period (Table I1.1). Each drug is only counted once towards

sedative load within the 91-day period regardless of the number of scripts or quantity dispensed.

Table I1.1. Medications with Sedative Properties, Description, ATC Codes, and Sedative Rating.

Description	Code	Sedative Rating[1]
Conventional antipsychotics including butrophenones and prochlorperazine	N05AA*, N05AB*, N05AC*, N05AD*, N05AF*	2
Antidepressants; tricyclic agents, non-selective monoamine reuptake inhibitors, antidepressant of second generation, combinations	N06AA*, N06CA01, N06AF*	2
Second-generation antidepressants (mianserin)	N06AX03	2
Anxiolytics	N05B*	2
Hypnotics and sedatives	N05C* (excluding N05CM*)	2
Other (lithium)	N05AN*	2
Antispasmodics with psychoepileptics	A03C*	1
Other alimentary (metoclopramide, scopolamine and in combinations)	A03FA01, A04AD01, A04AD51, N05CM05	1
Indomethacin	M01AB51, M01AB01	1
Centrally acting muscle relaxants including psychotropics (baclofen, tizanidine, orphenadrine and orphenadrine combinations)	M03BX01, M03BX02, M03BC01, M03BC51	1
Opioids	N02A*	1
Antiepileptics	N03*	1
Antiparkinsonian drugs anticholinergic agents	N04A*	1
Atypical antipsychotics	N05AE*, N05AH*, N05AL*, N05AX*	1
Selective serotonin reuptake inhibitors	N06AB*, N06CA03	1
Other antidepressants of second generation	N06AX* (excluding N06AX03), N06AG02	1
Dopamine agonists	N04BC* (excluding N04BC01)	1

Description	Code	Sedative Rating[1]
Migraine preparations	N02C*	1
Old antihistamines and antiemetics or drugs for dizziness, including psychotropics	R06AA*, R06AB*, R06AD*, R06AE*	1
Xanthines	R03DA*, R03DB*	1
Antitussives with sedating components (cough suppressants excluding combinations with expectorants, cough suppressants and expectorants, combinations, bromhexine)	R05DA*, R05F*, R05CB02	1
Anticholinergic drops for eyes	S01FA* (excluding S01FA06 and S01FA56)	1

Note: for drugs that appear on PBS as a 5-digit ATC indication, the WHO ATC code has been used to classify the sedative load.

1. Sedative rating 2= primary sedatives. Sedative rating 1= medications with sedation as prominent side-effect or preparations with a sedating component.

Table I1.2. Health Conditions, ACAP MDS V2.0 Descriptions and Codes.

Description	Code[1]
Dementia in Huntington's disease	0523
Huntington's disease	0602
Schizophrenia	0551
Schizophrenia	550B

1. Reported at any prior ACAT assessment or ACFI assessment.

Table I1.3. Cancer Treatment and Palliative Care, Descriptions, ATC Codes, ACFI Codes.

Description	Code
Antineoplastic and immunomodulating agents[1]	L01*
Palliative care (ACFI question 12, R14): "The person needs a palliative care program involving end of life care where ongoing care will involve very intensive clinical nursing and/or complex pain management in the residential care setting."	"Y"

1. Determined using 6 months of PBS prescription data prior to the study period.

Indicator 2. Antipsychotic Use

Data Source	Definition	Numerator	Denominator	Comments	Covariates
PBS	Proportion of long-term residents dispensed an antipsychotic.	Number of long-term residents who have been dispensed at least one antipsychotic medication during the reporting period (Table I2.1).	Number of long-term residents of aged care. Exclude from denominator and numerator any that have the reported health conditions of: schizophrenia, or Huntington's disease (Table I2.2).		Age, sex, number of comorbidities, history of antipsychotic medication dispensing one year prior to entry into care.
PBS	Proportion of long-term residents with dementia dispensed an antipsychotic.	Number of long-term residents who have been dispensed at least one antipsychotic medication during the reporting period (Table I2.1).	Number of long-term residents of aged care with dementia. Exclude from denominator and numerator any that have the reported health conditions of: schizophrenia, or Huntington's disease (Table I2.2).		Age, sex, number of comorbidities, history of antipsychotic medication dispending one year prior to entry into care.

Table I2.1. Antipsychotic Medications, Descriptions and ATC Codes.[6, 38]

Description	Code
Chlorpromazine	N05AA01
Fluphenazine	N05AB02[1]
Trifluoperazine	N05AB06[1]
Periciazine	N05AC01
Haloperidol	N05AD01
Ziprasidone	N05AE04
Lurasidone	N05AE05

Description	Code
Flupentixol	N05AF01
Zuclopenthixol	N05AF05
Clozapine	N05AH02
Olanzapine	N05AH03
Quetiapine	N05AH04
Asenapine	N05AH05
Amisulpride	N05AL05
Risperidone	N05AX08
Aripiprazole	N05AX12
Paliperidone	N05AX13
Brexpiprazole	N05AX16[1]

1. Fluphenazine and trifluoperazine are no longer listed on the PBS, but were listed on the PBS in 2016; brexpiprazole is currently listed on the PBS but was not listed in 2016.

Table I2.2. Health Conditions, ACAP MDS V2.0 Descriptions and Codes.

Description	Code[1]
Dementia in Huntington's disease	0523
Huntington's disease	0602
Schizophrenia	0551
Schizophrenia	550B

1. Reported at any prior ACAT assessment or ACFI assessment.

Indicator 3. Chronic Opioid Use

Data Source	Definition	Numerator	Denominator	Comments	Covariates
PBS	Proportion of long-term residents considered chronic opioid users.	Number of long-term residents that are chronic opioid users (Table I3.1). Chronic opioid use is defined as receiving any number of opioid medications for at least 90 days continuously, or for 120 non-consecutive days.[39] The number of days of medication use is determined based on the number of units dispensed and estimated dose per day. No gap days between one opioid medication dispensing and another were allowed when determining consecutive use of opioids.	Long-term residents of aged care who do not have a history or current diagnosis of cancer, and who are not receiving palliative care.	Cancer exclusion: history of malignancy as reported at aged care eligibility assessment, entry into residential aged care assessment, and 6 months prior to reporting period history of antineoplastic agents (Table I3.2). Palliative care exclusion is from entry into residential aged care assessment (Table I3.2).	Age, sex, number of comorbidities (excluding pain).

Table I3.1. Opioids Medications, Descriptions, ATC Codes and PBS Codes.

Description	ATC	PBS items
Morphine	N02AA01	08491X, 08492Y, 08493B
		01653B, 01654C, 01655D, 01656E, 02839K, 02840L, 02841M, 05392T, 05393W, 05394X, 05395Y, 08035X, 08349K, 08453X, 08489T, 08494C, 08669G, 08670H
		08146R, 08305D, 08306E, 08490W
		01646P

Description	ATC	PBS items
		02122Q, 02123R, 02124T,
Hydromorphone	N02AA03	09299K, 09406C, 09407D, 09408E, 09409F
		05132D[2], 08424J
		08541M,08542N, 08543P
Oxycodone	N02AA05	08385H, 08386J, 08387K, 08388L, 09399Q, 09400R
		05191F, 05195K, 08464L, 08501K, 08502L, 02481N
		05191F[2], 08644Y
Oxycodone + Naloxone	N02AA55	08000C, 08934F, 08935G, 08936H, 10757E, 10758F, 10776E
Fentanyl[3]	N02AB03	05265D, 05277R, 05278T, 05279W, 05280X, 05437E, 05438F, 05439G, 05440H, 05441J, 08878G, 08891Y, 08892B, 08893C, 08894D
Methadone	N02AC52	01609Q
Methadone liquid	N02AC52	05399E, 05400F
Buprenorphine	N02AE01	08865N, 08866P, 08866P, 08867Q, 10746N, 10755C, 10756D, 10770W, 10948F, 10949G, 10953L, 10957Q, 10959T, 10964C, 10970J
Codeine, combinations with paracetamol	N02AJ06	01215Y, 03316M, 04170L, 04171M, 04275B, 04286N, 08785J
Tramadol	N02AX02	02527B, 08523N, 08524P, 08525Q
		05232J, 08455B, 08611F
		08582Q
		08843K
Tapentadol	N02AX06	10091D, 10092E, 10094G, 10096J, 10100N

1. Quantity per day in tablets unless otherwise stated.
2. Removed from the PBS in 2016.
3. Fentanyl lozenges (PBS items 10684H, 10697B, 10698C, 10729Q, 10737D) were excluded as clinical indication on the PBS is for cancer treatment and palliative care only.

Table I3.2. Cancer Treatment and Palliative Care, Descriptions, ATC Codes, ACFI Code.

Description	Code
Antineoplastic and immunomodulating agents.[1]	L01*
Palliative care (ACFI question 12, R14): "The person needs a palliative care program involving end of life care where ongoing care will involve very intensive clinical nursing and/or complex pain management in the residential care setting."	"Y"

1. Determined using 6 months of PBS prescription data prior to the study period.

Indicator 4. Antibiotic Use

Data Source	Definition	Numerator	Denominator	Comments	Covariates
PBS	Number of days per 1000 resident days of long-term care.[7] Measure is reported per 1000 resident days.	Number of days a long-term resident received at least one antibiotic for systemic use[1] (Table I4.1).	Number of days in residential aged care for long-term residents.		Age, sex, number of comorbidities
PBS	Number of DDD per 1000 resident days of long-term care.[7] Measure is reported per 1000 resident days.	Number of days a long-term resident received at least one antibiotic for systemic use[1] (Table I4.1).	Number of days in residential aged care for long-term residents.		Age, sex, number of comorbidities
PBS	Proportion of long-term residents dispensed an antibiotic.	Number of long-term residents dispensed least one antibiotic for systemic use[1] (Table I4.1).	Number of long-term residents of aged care.		Age, sex, number of comorbidities

1. Dermatological and ophthalmological antibiotics not included. Days of use is defined as quantity dispensed/DDD quantity per day.

Table I4.1. Antibiotics for Systemic Use, Descriptions, ATC Codes and PBS Codes.

Description	ATC Code	PBS Code
omeprazole + clarithromycin + amoxycillin	A02BD05	08272J, 08376W

Description	ATC Code	PBS Code
esomeprazole + clarithromycin + amoxicillin	A02BD06	08738X
vancomycin	A07AA09	03114X
		03113W
rifaximin	A07AA11	10001J
doxycycline	J01AA02	01800R, 02702F, 02703G, 02708M, 02709N, 02714W, 02715X, 03321T, 03322W, 05082L, 09105F, 09107H, 09108J, 10176N, 10777F, 10779H, 10781K
		02707L, 02711Q, 09106G
tetracycline hydrochloride	J01AA07	02134H, 02135J, 03383C,02145X, 02146Y, 03386F
minocycline	J01AA08	03037W
		01616C
ampicillin	J01CA01	02671N, 05014X
		02977Q, 03314K, 06531R, 06533W, 06536B
		01048E
		02390T, 06527M
amoxicillin	J01CA04	05225B, 08705E
		01887H, 03393N
		01878W, 03309E
		01886G, 03302T
		08581P
		01889K, 03300Q
		01883D, 01884E, 03301R
		03303W
		01888J

Description	ATC Code	PBS Code
benzylpenicillin	J01CE01	02647H, 06569R, 06572X
		01775K, 03398W, 06561H, 06563K, 06564L, 06566N
phenoxymethylpenicillin	J01CE02	05029Q, 08977L
		02965C, 03028J, 03361X, 03364C
		01703P, 01705R, 01787C, 01789E, 03360W, 03363B
procaine benzylpenicillin	J01CE09	01794K, 03371K
dicloxacillin	J01CF01	07064T, 07065W, 07067Y, 08124N
		05097G, 07061P, 08122L, 08123M, 10790X
		05096F, 08121K
flucloxacillin	J01CF05	01529L, 09150N
		01528K, 09149M
		01525G, 06729E, 06731G, 06732H, 06734K, 10605E
		01524F, 01527J, 05091Y, 06723W, 06725Y, 06728D, 07018J, 10788T
		01526H, 05090X
amoxicillin + clavulanic acid	J01CR02	05011R
		08319W
		01892N, 05009P
		05006L, 08254K
		01891M, 05008N
ticarcillin + clavulanic acid	J01CR03	02179Q, 10113G
		06879C, 06881E, 06884H
cefotaxime	J01DD01	01086E, 01759N, 06599H, 06602L
		01085D, 01758M, 06593B, 06596E, 06591X

Description	ATC Code	PBS Code
ceftriaxone	J01DD04	01785Y, 06875W, 06876X, 06878B ,06873R
		01784X, 01788D, 06869M, 06870N, 06872Q, 06867K, 06868L
		01783W, 06866J, 09058R
		01782T, 01790F, 06857X
cefalexin	J01DB01	03095X, 03320R
		03094W, 03319Q
		03119E, 03318P, 10778G
		02655R, 03058Y, 03317N
cefalotin	J01DB03	02964B, 03376Q, 06609W, 06611Y, 06614D
cefazolin	J01DB04	05479J, 09326W
		01257E, 01797N, 01799Q, 05478H, 06633D, 06635F, 06638J
		01256D, 05477G, 06629X
cefuroxime	J01DC02	05499K
		05052X, 08292K
cefaclor	J01DC04	02461M
		02460L
		01169M, 05045M
trimethoprim	J01EA01	02666H, 02922T, 10785P
trimethoprim + sulfamethoxazole	J01EE01	03103H
		02951H, 03390K, 10784N
		02949F
erythromycin	J01FA01	02425P
		01401R, 01404X, 03325B, 03328E

Description	ATC Code	PBS Code
		01400Q
erythromycin ethylsuccinate	J01FA01	02428T, 03337P
		02424N, 03334L
		02750R, 03336N
erythromycin lactobionate	J01FA01	01397M
		01398N
roxithromycin	J01FA06	05261X, 08016X
		01760P, 05260W
		08129W
clarithromycin	J01FA09	09192T
		05624B, 06152T
		05625C, 06151R, 08318T
azithromycin	J01FA10	05616N, 08201P
		04115N, 08200N, 08336R
clindamycin	J01FF01	03138E, 05057E
lincomycin	J01FF02	02530E
tobramycin	J01GB01	09480Y
		05442K
		01356J, 08872Y
		10066T
gentamicin	J01GB03	02824P
		01168L
		01068F
ciprofloxacin	J01MA02	01210Q
		01209P

Description	ATC Code	PBS Code
		01208N, 01311B
norfloxacin	J01MA06	03010K
vancomycin	J01XA01	02269K, 02270L
		03130R, 03131T, 06767E, 06770H, 06837W, 06838X, 06839Y, 06842D
fusidate	J01XC01	02311P
		02312Q, 10782L
metronidazole	J01XD01	03341W
		01630T
		01638F, 01821W, 02277W, 05154G
		01621H, 01626N, 05155H, 05159M
		01642K
		01636D, 03339R
tinidazole	J01XD02	01465D
nitrofurantoin	J01XE01	01691B
		01693D
		01692C
methenamine hippurate	J01XX05	03124K
rifampicin	J04AB02	08025J
		01983J, 01984K
		01981G, 01982H
isoniazid	J04AC01	01554T

Indicator 5. Premature Mortality

Data Source	Definition	Numerator	Denominator	Comments	Covariates
NDI	Proportion of short-term residents who had premature deaths, that is their main cause of death is 'external' and considered potentially avoidable.	Number of short-term residents who died and had a main cause of death found in Table I5.1.[40]	Number of short-term residents.	Causes of death used in this indicator were defined as per Ibrahim et al.[40] and additional 'external causes' from the ICD-10-AM listing available.	Age, sex, number of comorbidities.
NDI	Proportion of long-term residents who had premature deaths, that is their main cause of death is 'external' and considered potentially avoidable.	Number of long-term residents who died and had a main cause of death found in Table I5.1.[40]	Number of long-term residents.	Causes of death used in this indicator were defined as per Ibrahim et al.[40] and additional 'external causes' from the ICD-10-AM listing available.	Age, sex, number of comorbidities.

Table I5.1. External and Potentially Avoidable Causes of Death, Descriptions and ICD-10-AM Codes.

Description	Code
Pedestrian injured in transport accident	V01-V09
Pedal cyclist injured in transport accident	V10-V19
Motorcycle rider injured in transport accident	V20-V29
Occupant of three-wheeled motor vehicle injured in transport accident	V30-V39
Car occupant injured in transport accident	V40-V49
Occupant of pick-up truck or van injured in transport accident	V50-V59

Description	Code
Occupant of heavy transport vehicle injured in transport accident	V60-V69
Bus occupant injured in transport accident	V70-V79
Other land transport accidents	V80-V89
Water transport accidents	V90-V94
Air and space transport accidents	V95-V97
Other and unspecified transport accidents	V98-V99
Falls	W00-W19
Exposure to inanimate mechanical forces	W20-W49
Exposure to animate mechanical forces	W50-W64
Accidental drowning and submersion	W65-W74
Other accidental threats to breathing	W75-W84
Exposure to electric current, radiation and extreme ambient air temperature and pressure	W85-W99
Exposure to smoke, fire and flames	X00-X09
Contact with heat and hot substances	X10-X19
Contact with venomous animals and plants	X20-X29
Exposure to forces of nature	X30-X39
Accidental poisoning by and exposure to noxious substances	X40-X49
Overexertion, travel and privation	X50-X57
Accidental exposure to other and unspecified factors	X58-X59
Intentional self-harm	X60-X84
Assault	X85-Y09
Event of undetermined intent	Y10-Y34
Complications of medical and surgical care	Y40-Y84

Description	Code
Drugs, medicaments and biological substances causing adverse effects in therapeutic use	Y40-Y59
Misadventures to patients during surgical and medical care	Y60-Y69
Medical devices associated with adverse incidents in diagnostic and therapeutic use	Y70-Y82
Surgical and other medical procedures as the cause of abnormal reaction of the patient, or of later complication, without mention of misadventure at the time of the procedure	Y83-Y84
Sequelae of external causes of morbidity and mortality	Y85-Y89
Supplementary factors related to causes of morbidity and mortality classified elsewhere	Y90-Y98

Indicator 6. Falls

Data Sources	Definition	Numerator	Denominator	Comments	Covariates
ISAAC, EDDC, NSW APDC, NSW EDDC, VAED, VAMD, NDI, SAAS[1], NSW Ambulance[1]	Proportion of long-term residents who have experienced one or more falls resulting in requiring medical attention.	Number of long-term residents with an ambulance service, emergency department presentation, hospitalisation, or death, or injury cause (VIC only), for fall (Table I6.1).	Number of long-term residents.	We have attempted to include only falls that individuals had prior to presenting at the hospital- this means including only 'external causes of injury' for inpatient admissions, and diagnosis for emergency department presentations. See footnotes of Table I6.1 for specific variables from states where this information was extracted from.	Age, sex, number of comorbidities, dementia, mobility (Table I6.2).

1. SAAS data not currently available but will be used once available.

Table I6.1. Falls, Descriptions and ICD-10-AM Codes.[1,2]

Description	Code
Fall due to ice and snow	W00*
Fall on same level from slipping, tripping and stumbling	W01*
Other fall on same level due to collision with another person	W03*
Fall while being carried or supported by other persons	W04*
Fall from non-moving wheelchair, nonmotorized scooter and motorized mobility scooter	W05 *
Fall from bed	W06*
Fall from chair	W07*
Fall from other furniture	W08*
Fall on and from playground equipment	W09*

Description	Code
Fall on and from stairs and steps	W10*
Fall on and from ladder	W11*
Fall on and from scaffolding	W12*
Fall from, out of or through building or structure	W13*
Fall from tree	W14*
Fall from cliff	W15*
Fall, jump or diving into water	W16*
Other fall from one level to another	W17*
Other slipping, tripping and stumbling and falls	W18*
Unspecified fall	W19*
Tendency to fall, not elsewhere classified[2]	R29.6

1. State specific admitted hospitalisation variables: SA and VIC (injury event- external cause code), NSW (first listed external cause within diagnosis array 1). Excluded where onset in hospital. State specific emergency encounters variables: SA and NSW (diagnosis), VIC (injury cause)
2. NSW uses a mix of SNOMED, ICD-9-AM and ICD-10-AM coding over the years in emergency department encounters. All codes in emergency department encounters were mapped to ICD-10-AM codes. All codes mapped to the ICD-10-AM codes in this table were considered falls, except for SNOMED code was 129839007 ('at risk of falls') or 430576002 ('at risk of injury due to falls'), which were excluded and therefore not considered a fall.

Table I6.2. Assessment of Mobility from ACFI Question 02, Descriptions and Codes.

Description	Code
Independent for both locomotion and transfers.	A (least dependent)
Requires supervision or physical assistance for either transfers OR locomotion but not both.	B
Requires supervision or physical assistance with transfers and supervision with locomotion, OR requires supervision with transfers and physical assistance with locomotion.	C
Requires physical assistance with both transfers and locomotion OR requires mechanical lifting for transfers.	D (most dependent)

Indicator 7. Fractures

Data Sources	Definition	Numerator	Denominator	Comments	Covariates
ISAAC, EDDC, NSW APDC, NSW EDDC, VAED, VAMD, MBS, NDI	Proportion of long-term residents who experience at least one fracture.[41]	Number of long-term residents with an emergency department presentation or hospitalisation for fracture (Table I7.1), or secondary diagnosis where onset is not during the hospitalisation, the external cause of the hospitalisation is fall, treatment for which MBS paid for (Table I7.2), and deaths from fractures (Table I7.1).	Number of long-term residents.		Age, sex, number of comorbidities, dementia, mobility (Table I7.3), osteoporosis medication dispensing (Table I7.4).

Table I7.1. Fractures, Descriptions and ICD-10-AM Codes.

Description	Code
Open wound (of any part of head) communicating with a fracture	S01.81
Fractures of skull and facial bones	S02*
Fractures of neck	S12*
Open wound (of any part of thorax) communicating with a fracture	S21.81
Fracture of rib(s), sternum and thoracic spine	S22*
Open wound (of any part of lower back and pelvis) communicating with a fracture	S31.81
Fracture of lumbar spine and pelvis	S32*
Open wound (of any part of shoulder and upper arm) communicating with a fracture	S41.81
Fracture of shoulder and upper arm	S42*
Open wound (of any part of forearm) communicating with a fracture	S51.81
Fracture of forearm	S52*

Description	Code
Open wound (of any part of wrist and hand) communicating with a fracture	S61.81
Fracture of wrist and hand level	S62*
Open wound (of any part of hip and thigh) communicating with a fracture	S71.81
Fracture of femur	S72*
Open wound (of any part of lower leg) communicating with a fracture	S81.81
Fracture of lower leg including ankle	S82*
Open wound (of any part of ankle and foot) communicating with a fracture	S91.81
Fracture of foot, except ankle	S92*
Fractures involving multiple body regions	T02*
Fracture of spine, level unspecified	T08*
Fracture of upper limb, level unspecified	T10*
Fracture of lower limb, level unspecified	T12*
Fracture of unspecified body region	T14.2*

Table I7.2. Non-surgical and Surgical Treatment of Fractures, Descriptions and MBS Codes.

Description	Code
FRACTURED SKULL, depressed or comminuted, operation for	39606
FRACTURED SKULL, compound, without dural penetration, operation for	39609
FRACTURED SKULL, compound, depressed or complicated, with dural penetration and brain laceration, operation for	39612
FRACTURED SKULL with rhinorrhoea or otorrhoea, repair of by cranioplasty or endoscopic approach	39615
MAXILLA, unilateral or bilateral, treatment of fracture of, not requiring splinting	45975
MANDIBLE, treatment of fracture of, not requiring splinting	45978
ZYGOMATIC BONE, treatment of fracture of, not requiring surgical reduction	45981
MAXILLA, treatment of a complicated fracture of, involving viscera, blood vessels or nerves requiring open reduction not involving plate(s)	45984
MANDIBLE, treatment of a complicated fracture of, involving viscera, blood vessels or nerves, requiring open reduction not involving plate(s)	45987
MAXILLA, treatment of a complicated fracture of, involving viscera, blood vessels or nerves requiring open reduction involving the use of plate(s)	45990
MANDIBLE, treatment of a complicated fracture of, involving viscera, blood vessels or nerves, requiring open reduction involving the use of plate(s)	45993

MANDIBLE, treatment of a closed fracture of, involving a joint surface	45996
MALLET FINGER with intra articular fracture involving more than one third of base of terminal phalanx - open reduction	46442
RADIOULNAR JOINT, DISTAL or PROXIMAL, treatment of dislocation of, by closed reduction, not being a service associated with fracture or dislocation in the same region	47024
RADIOULNAR JOINT, DISTAL or PROXIMAL, treatment of dislocation of, by open reduction, not being a service associated with fracture or dislocation in the same region	47027
DISTAL PHALANX of FINGER or THUMB, treatment of fracture of, by closed reduction, including percutaneous fixation where used	47300
Phalanx, middle or proximal, treatment of fracture of, by closed reduction, requiring anaesthesia, not provided on the same occasion as a service described in item 47304, 47307, 47310, 47313, 47316 or 47319	47301
DISTAL PHALANX of FINGER or THUMB, treatment of intra-articular fracture of, by closed reduction	47303
DISTAL PHALANX of FINGER or THUMB, treatment of fracture of, by open reduction	47306
Phalanx or metacarpal, treatment of fracture of, by closed reduction with percutaneous K wire fixation	47307
DISTAL PHALANX of FINGER or THUMB, treatment of intra-articular fracture of, by open reduction	47309
Phalanx or metacarpal, treatment of fracture of, by open reduction with fixation	47310
MIDDLE PHALANX of FINGER, treatment of fracture of, by closed reduction	47312
Phalanx or metacarpal, treatment of intra articular fracture of, by closed reduction with percutaneous K wire fixation	47313
MIDDLE PHALANX of FINGER, treatment of intra-articular fracture of, by closed reduction	47315
Phalanx or metacarpal, treatment of intra articular fracture of, by open reduction with fixation, not provided on the same occasion as a service to which item 47319 applies	47316
MIDDLE PHALANX OF FINGER, treatment of fracture of, by open reduction	47318
MIDDLE PHALANX OF FINGER, treatment of intra-articular fracture of, by open reduction	47321
PROXIMAL PHALANX OF FINGER OR THUMB, treatment of fracture of, by closed reduction	47324
PROXIMAL PHALANX OF FINGER OR THUMB, treatment of intra-articular fracture of, by closed reduction	47327
PROXIMAL PHALANX OF FINGER OR THUMB, treatment of fracture of, by open reduction	47330
PROXIMAL PHALANX OF FINGER OR THUMB, treatment of intra-articular fracture of, by open operation	47333
METACARPAL, treatment of fracture of, by closed reduction	47336
METACARPAL, treatment of intra-articular fracture of, by closed reduction	47339
METACARPAL, treatment of fracture of, by open reduction	47342
METACARPAL, treatment of intra-articular fracture of, by open reduction	47345
CARPUS (excluding scaphoid), treatment of fracture of, not being a service to which item 47351 applies	47348
CARPUS (excluding scaphoid), treatment of fracture of, by open reduction	47351
CARPAL SCAPHOID, treatment of fracture of, not being a service to which item 47357 applies	47354
CARPAL SCAPHOID, treatment of fracture of, by open reduction	47357
RADIUS OR ULNA, distal end of, treatment of fracture of, by cast immobilisation, not being a service to which item 47363 or 47366 applies	47360

Radius or ulna, or radius and ulna, distal end of, treatment of fracture of, by cast immobilisation, other than a service associated with a service to which item 47362, 47364, 47367, 47370 or 47373 applies	47361
Radius or ulna, or radius and ulna, distal end of, treatment of fracture of, by closed reduction, requiring general or major regional anaesthesia, but excluding local infiltration, other than a service associated with a service to which item 47361, 47364, 47367, 47370 or 47373 applies	47362
RADIUS OR ULNA, distal end of, treatment of fracture of, by closed reduction	47363
Radius or ulna, distal end of, not involving joint surface, treatment of fracture of, by open reduction with fixation, other than a service associated with a service to which item 47361 or 47362 applies	47364
RADIUS OR ULNA, distal end of, treatment of fracture of, by open reduction	47366
Radius, distal end of, treatment of fracture of, by closed reduction with percutaneous fixation, other than a service associated with a service to which item 47361 or 47362 applies	47367
RADIUS, distal end of, treatment of Colles', Smith's or Barton's fracture of, by cast immobilisation, not being a service to which item 47372 or 47375 applies	47369
Radius, distal end of, treatment of intra articular fracture of, by open reduction with fixation, other than a service associated with a service to which item 47361 or 47362 applies	47370
RADIUS, distal end of, treatment of Colles', Smith's or Barton's fracture, by closed reduction	47372
Ulna, distal end of, treatment of intra articular fracture of, by open reduction with fixation, other than a service associated with a service to which item 47361 or 47362 applies	47373
RADIUS, distal end of, treatment of Colles', Smith's or Barton's fracture of, by open reduction	47375
RADIUS OR ULNA, shaft of, treatment of fracture of, by cast immobilisation, not being a service to which item 47381, 47384, 47385 or 47386 applies	47378
RADIUS OR ULNA, shaft of, treatment of fracture of, by closed reduction undertaken in the operating theatre of a hospital	47381
RADIUS OR ULNA, shaft of, treatment of fracture of, by open reduction	47384
RADIUS OR ULNA, shaft of, treatment of fracture of, in conjunction with dislocation of distal radio-ulnar joint or proximal radio-humeral joint (Galeazzi or Monteggia injury), by closed reduction undertaken in the operating theatre of a hospital	47385
RADIUS OR ULNA, shaft of, treatment of fracture of, in conjunction with dislocation of distal radio-ulnar joint or proximal radio-humeral joint (Galeazzi or Monteggia injury), by open reduction or internal fixation	47386
RADIUS AND ULNA, shafts of, treatment of fracture of, by cast immobilisation, not being a service to which item 47390 or 47393 applies	47387
RADIUS AND ULNA, shafts of, treatment of fracture of, by closed reduction undertaken in the operating theatre of a hospital	47390
RADIUS AND ULNA, shafts of, treatment of fracture of, by open reduction	47393
OLECRANON, treatment of fracture of, not being a service to which item 47399 applies	47396
OLECRANON, treatment of fracture of, by open reduction	47399
OLECRANON, treatment of fracture of, involving excision of olecranon fragment and reimplantation of tendon	47402
RADIUS, treatment of fracture of head or neck of, closed reduction of	47405
RADIUS, treatment of fracture of head or neck of, open reduction of, including internal fixation and excision where performed	47408
HUMERUS, treatment of fracture of tuberosity of, not being a service to which item 47417 applies	47411
HUMERUS, treatment of fracture of tuberosity of, by open reduction	47414

HUMERUS, treatment of fracture of tuberosity of, and associated dislocation of shoulder, by closed reduction	47417
HUMERUS, treatment of fracture of tuberosity of, and associated dislocation of shoulder, by open reduction	47420
HUMERUS, proximal, treatment of fracture of, not being a service to which item 47426, 47429 or 47432 applies	47423
HUMERUS, proximal, treatment of fracture of, by closed reduction, undertaken in the operating theatre of a hospital	47426
HUMERUS, proximal, treatment of fracture of, by open reduction	47429
HUMERUS, proximal, treatment of intra-articular fracture of, by open reduction	47432
HUMERUS, proximal, treatment of fracture of, and associated dislocation of shoulder, by closed reduction	47435
HUMERUS, proximal, treatment of fracture of, and associated dislocation of shoulder, by open reduction	47438
HUMERUS, proximal, treatment of intra-articular fracture of, and associated dislocation of shoulder, by open reduction	47441
HUMERUS, shaft of, treatment of fracture of, not being a service to which item 47447 or 47450 applies	47444
HUMERUS, shaft of, treatment of fracture of, by closed reduction, undertaken in the operating theatre of a hospital	47447
HUMERUS, shaft of, treatment of fracture of, by internal or external fixation	47450
HUMERUS, shaft of, treatment of fracture of, by intramedullary fixation	47451
HUMERUS, distal, (supracondylar or condylar), treatment of fracture of, not being a service to which item 47456 or 47459 applies	47453
HUMERUS, distal (supracondylar or condylar), treatment of fracture of, by closed reduction, undertaken in the operating theatre of a hospital	47456
HUMERUS, distal (supracondylar or condylar), treatment of fracture of, by open reduction, undertaken in the operating theatre of a hospital	47459
CLAVICLE, treatment of fracture of, not being a service to which item 47465 applies	47462
CLAVICLE, treatment of fracture of, by open reduction	47465
STERNUM, treatment of fracture of, not being a service to which item 47467 applies	47466
STERNUM, treatment of fracture of, by open reduction	47467
SCAPULA, neck or glenoid region of, treatment of fracture of, by open reduction	47468
RIBS (1 or more), treatment of fracture of - each attendance	47471
PELVIC RING, treatment of fracture of, not involving disruption of pelvic ring or acetabulum	47474
PELVIC RING, treatment of fracture of, with disruption of pelvic ring or acetabulum	47477
PELVIC RING, treatment of fracture of, requiring traction	47480
PELVIC RING, treatment of fracture of, requiring control by external fixation	47483
PELVIC RING, treatment of fracture of, by open reduction and involving internal fixation of anterior segment, including diastasis of pubic symphysis	47486
PELVIC RING, treatment of fracture of, by open reduction and involving internal fixation of posterior segment (including sacro-iliac joint), with or without fixation of anterior segment	47489
ACETABULUM, treatment of fracture of, and associated dislocation of hip	47492
ACETABULUM, treatment of fracture of, and associated dislocation of hip, requiring traction	47495

ACETABULUM, treatment of fracture of, and associated dislocation of hip, requiring internal fixation, with or without traction	47498
ACETABULUM, treatment of single column fracture of, by open reduction and internal fixation, including any osteotomy, osteectomy or capsulotomy required for exposure and subsequent repair, and excluding services to which item 47933 or 47936 apply	47501
ACETABULUM, treatment of T-shape fracture of, by open reduction and internal fixation, including any osteotomy, osteectomy or capsulotomy required for exposure and subsequent repair, and excluding services to which item 47933 or 47936 apply	47504
ACETABULUM, treatment of transverse fracture of, by open reduction and internal fixation, including any osteotomy, osteectomy or capsulotomy required for exposure and subsequent repair, and excluding services to which item 47933 or 47936 apply	47507
ACETABULUM, treatment of double column fracture of, by open reduction and internal fixation, including any osteotomy, osteectomy or capsulotomy required for exposure and subsequent repair, and excluding services to which item 47933 or 47936 apply	47510
FEMUR, treatment of fracture of, by closed reduction or traction	47516
FEMUR, treatment of trochanteric or subcapital fracture of, by internal fixation	47519
FEMUR, treatment of subcapital fracture of, by hemi-arthroplasty	47522
FEMUR, treatment of fracture of, for slipped capital femoral epiphysis	47525
FEMUR, treatment of fracture of, by internal fixation or external fixation	47528
FEMUR, treatment of fracture of shaft, by intramedullary fixation and cross fixation	47531
FEMUR, condylar region of, treatment of intra-articular (T-shaped condylar) fracture of, requiring internal fixation, with or without internal fixation of 1 or more osteochondral fragments	47534
FEMUR, condylar region of, treatment of fracture of, requiring internal fixation of 1 or more osteochondral fragments, not being a service associated with a service to which item 47534 applies	47537
TIBIA, plateau of, treatment of medial or lateral fracture of, not being a service to which item 47546 or 47549 applies	47543
TIBIA, plateau of, treatment of medial or lateral fracture of, by closed reduction	47546
TIBIA, plateau of, treatment of medial or lateral fracture of, by open reduction	47549
TIBIA, plateau of, treatment of both medial and lateral fractures of, not being a service to which item 47555 or 47558 applies	47552
TIBIA, plateau of, treatment of both medial and lateral fractures of, by closed reduction	47555
TIBIA, plateau of, treatment of both medial and lateral fractures of, by open reduction	47558
TIBIA, shaft of, treatment of fracture of, by cast immobilisation, not being a service to which item 47564, 47567, 47570 or 47573 applies	47561
TIBIA, shaft of, treatment of fracture of, by closed reduction, with or without treatment of fibular fracture	47564
TIBIA, shaft of, treatment of fracture of, by internal fixation or external fixation	47565
TIBIA, shaft of, treatment of fracture of, by intramedullary fixation and cross fixation	47566
TIBIA, shaft of, treatment of intra-articular fracture of, by closed reduction, with or without treatment of fibular fracture	47567
TIBIA, shaft of, treatment of fracture of, by open reduction, with or without treatment of fibular fracture	47570
TIBIA, shaft of, treatment of intra-articular fracture of, by open reduction, with or without treatment of fibula fracture	47573
FIBULA, treatment of fracture of	47576

PATELLA, treatment of fracture of, not being a service to which item 47582 or 47585 applies	47579
PATELLA, treatment of fracture of, by excision of patella or pole with reattachment of tendon	47582
PATELLA, treatment of fracture of, by internal fixation	47585
KNEE JOINT, treatment of fracture of, by internal fixation of intra-articular fractures of femoral condylar or tibial articular surfaces and requiring repair or reconstruction of 1 or more ligaments	47588
KNEE JOINT, treatment of fracture of, by internal fixation of intra-articular fractures of femoral condylar and tibial articular surfaces and requiring repair or reconstruction of 1 or more ligaments	47591
ANKLE JOINT, treatment of fracture of, not being a service to which item 47597 applies	47594
ANKLE JOINT, treatment of fracture of, by closed reduction	47597
ANKLE JOINT, treatment of fracture of, by internal fixation of 1 of malleolus, fibula or diastasis	47600
ANKLE JOINT, treatment of fracture of, by internal fixation of more than 1 of malleolus, fibula or diastasis	47603
CALCANEUM OR TALUS, treatment of fracture of, not being a service to which item 47609, 47612, 47615 or 47618 applies, with or without dislocation	47606
CALCANEUM OR TALUS, treatment of fracture of, by closed reduction, with or without dislocation	47609
CALCANEUM OR TALUS, treatment of intra-articular fracture of, by closed reduction, with or without dislocation	47612
CALCANEUM OR TALUS, treatment of fracture of, by open reduction, with or without dislocation	47615
CALCANEUM OR TALUS, treatment of intra-articular fracture of, by open reduction, with or without dislocation	47618
TARSO-METATARSAL, treatment of intra-articular fracture of, by closed reduction, with or without dislocation	47621
TARSO-METATARSAL, treatment of fracture of, by open reduction, with or without dislocation	47624
TARSUS (excluding calcaneum or talus), treatment of fracture of	47627
TARSUS (excluding calcaneum or talus), treatment of fracture of, by open reduction, with or without dislocation	47630
METATARSAL, 1 of, treatment of fracture of	47633
METATARSAL, 1 of, treatment of fracture of, by closed reduction	47636
METATARSAL, 1 of, treatment of fracture of, by open reduction	47639
METATARSALS, 2 of, treatment of fracture of	47642
METATARSALS, 2 of, treatment of fracture of, by closed reduction	47645
METATARSALS, 2 of, treatment of fracture of, by open reduction	47648
METATARSALS, 3 or more of, treatment of fracture of	47651
METATARSALS, 3 or more of, treatment of fracture of, by closed reduction	47654
METATARSALS, 3 or more of, treatment of fracture of, by open reduction	47657
PHALANX OF GREAT TOE, treatment of fracture of, by closed reduction	47663
PHALANX OF GREAT TOE, treatment of fracture of, by open reduction	47666
PHALANX OF TOE (other than great toe), 1 of, treatment of fracture of, by open reduction	47672
PHALANX OF TOE (other than great toe), more than 1 of, treatment of fracture of, by open reduction	47678
SPINE (excluding sacrum), treatment of fracture of transverse process, vertebral body, or posterior elements - each attendance	47681

SPINE, treatment of fracture, dislocation or fracture-dislocation, without spinal cord involvement, with immobilisation by calipers or halo	47684
SPINE, treatment of fracture, dislocation or fracture-dislocation, with spinal cord involvement, with immobilisation by calipers or halo, and including up to 14 days post-operative care	47687
SPINE, treatment of fracture, dislocation or fracture-dislocation, without cord involvement, with immobilisation by calipers or halo, requiring reduction by closed manipulation	47690
SPINE, treatment of fracture, dislocation or fracture-dislocation, with cord involvement, with immobilisation by calipers or halo, requiring reduction by closed manipulation, including up to 14 days post-operative care	47693
SPINE, reduction of fracture or dislocation of, without cord involvement, undertaken in the operating theatre of a hospital	47696
SPINE, treatment of fracture, dislocation or fracture-dislocation, without cord involvement, requiring open reduction with or without internal fixation	47699
SPINE, treatment of fracture, dislocation or fracture-dislocation, with cord involvement, requiring open reduction with or without internal fixation, including up to 14 days post-operative care	47702
SKULL, treatment of fracture of, each attendance	47703
NASAL BONES, treatment of fracture of, not being a service to which item 47738 or 47741 applies - each attendance	47735
NASAL BONES, treatment of fracture of, by reduction	47738
NASAL BONES, treatment of fracture of, by open reduction involving osteotomies	47741
MAXILLA, treatment of fracture of, requiring splinting, wiring of teeth, circumosseous fixation or external fixation	47753
MANDIBLE, treatment of fracture of, requiring splinting, wiring of teeth, circumosseous fixation or external fixation	47756
ZYGOMATIC BONE, treatment of fracture of, requiring surgical reduction by a temporal, intra-oral or other approach	47762
ZYGOMATIC BONE, treatment of fracture of, requiring surgical reduction and involving internal or external fixation at 1 site	47765
ZYGOMATIC BONE, treatment of fracture of, requiring surgical reduction and involving internal or external fixation or both at 2 sites	47768
ZYGOMATIC BONE, treatment of fracture of, requiring surgical reduction and involving internal or external fixation or both at 3 sites	47771
MAXILLA, treatment of fracture of, requiring open operation	47774
MANDIBLE, treatment of fracture of, requiring open reduction	47777
MAXILLA, treatment of fracture of, requiring open reduction and internal fixation not involving plate(s)	47780
MANDIBLE, treatment of fracture of, requiring open reduction and internal fixation not involving plate(s)	47783
MAXILLA, treatment of fracture of, requiring open reduction and internal fixation involving plate(s)	47786
MANDIBLE, treatment of fracture of, requiring open reduction and internal fixation involving plate(s)	47789
HIP, treatment of a fracture of the femur where revision total hip replacement is required as part of the treatment of the fracture (not including intra-operative fracture), being a service associated with a service to which items 49324 to 49333 apply	49336
MAXILLA, unilateral or bilateral, treatment of fracture of, not requiring splinting	53400
MANDIBLE, treatment of fracture of, not requiring splinting	53403

MAXILLA, treatment of fracture of, requiring splinting, wiring of teeth, circumosseous fixation or external fixation	53406
MANDIBLE, treatment of fracture of, requiring splinting, wiring of teeth, circumosseous fixation or external fixation	53409
ZYGOMATIC BONE, treatment of fracture of, not requiring surgical reduction	53410
ZYGOMATIC BONE, treatment of fracture of, requiring surgical reduction by a temporal, intra-oral or other approach	53411
ZYGOMATIC BONE, treatment of fracture of, requiring surgical reduction and involving internal or external fixation at 1 site	53412
ZYGOMATIC BONE, treatment of fracture of, requiring surgical reduction and involving internal or external fixation or both at 2 sites	53413
ZYGOMATIC BONE, treatment of fracture of, requiring surgical reduction and involving internal or external fixation or both at 3 sites	53414
MAXILLA, treatment of fracture of, requiring open reduction	53415
MANDIBLE, treatment of fracture of, requiring open reduction	53416
MAXILLA, treatment of fracture of, requiring open reduction and internal fixation not involving plate(s)	53418
MANDIBLE, treatment of fracture of, requiring open reduction and internal fixation not involving plate(s)	53419
MAXILLA, treatment of fracture of, requiring open reduction and internal fixation involving plate(s)	53422
MANDIBLE, treatment of fracture of, requiring open reduction and internal fixation involving plate(s)	53423
MAXILLA, treatment of a complicated fracture of, involving viscera, blood vessels or nerves, requiring open reduction not involving plate(s)	53424
MANDIBLE, treatment of a complicated fracture of, involving viscera, blood vessels or nerves, requiring open reduction not involving plate(s)	53425
MAXILLA, treatment of a complicated fracture of, involving viscera, blood vessels or nerves, requiring open reduction involving the use of plate(s)	53427
MANDIBLE, treatment of a complicated fracture of, involving viscera, blood vessels or nerves, requiring open reduction involving the use of plate(s)	53429
MANDIBLE, treatment of a closed fracture of, involving a joint surface	53439
NASAL BONES, treatment of fracture of, not being a service to which item 53459 or 53460 applies	53458
NASAL BONES, treatment of fracture of, by reduction	53459
NASAL BONES, treatment of fractures of, by open reduction involving osteotomies	53460

Table I7.3 Assessment of Mobility from ACFI Question 02, Descriptions and Codes.

Description	Code
Independent for both locomotion and transfers.	A (least dependent)
Requires supervision or physical assistance for either transfers OR locomotion but not both.	B
Requires supervision or physical assistance with transfers and supervision with locomotion, OR requires supervision with transfers and physical assistance with locomotion.	C
Requires physical assistance with both transfers and locomotion OR requires mechanical lifting for transfers.	D (most dependent)

Table I7.4. Osteoporosis Medications, Descriptions and ATC Codes.

Description	Code
Bisphosphonates and bisphosphonates combinations	M05BA01–M05BB05
Strontium ranelate	M05BX03
Denosumab	M05BX04
Raloxifene	G03XC01
Teriparatide	H05AA02

Indicator 8. Medication-related Adverse Events

Data sources	Definition	Numerator	Denominator	Comments	Covariates
ISAAC, EDDC, NSW APDC, NSW EDDC, VAED, VAMD	Proportion of long-term residents who had an emergency department presentation or hospitalisation for medication-related events.	Number of long-term residents who had an emergency department presentation or hospitalisation where a medication-related event was the principal discharge diagnosis for the encounter (Table I8.1) or the external cause type for the encounter (Table I8.2).	Number of long-term residents.		Age, sex, number of comorbidities.

Table I8.1 Medication-related Adverse Events, Diagnosis Descriptions and ICD-10-AM Codes.

Description	Code
Entrocolitis due to *Clostirdium difficile*	A04.7*
Acute paralytic poliomyelitis, vaccine-associated	A80.0
Drug-induced folate deficiency anaemia	D52.1
Drug-induced autoimmune hemolytic Anemia	D59.0
Drug-induced non-autoimmune hemolytic Anemia	D59.2
Drug-induced aplastic Anemia	D61.1
Secondary sideroblastic anaemia due to drugs and toxins	D64.2
Hemorrhagic disorder due to circulating anticoagulants	D68.3

Description	Code
Purpura and other haemorrhagic conditions	D69.0
Secondary thrombocytopenia	D69.5
Hypothyroidism due to medicaments and other exogenous substances	E03.2
Drug-induced thyroiditis	E06.4
Nondiabetic hypoglycemic coma	E15
Drug-induced hypoglycaemia without coma	E16.0
Drug-induced hypopituitarism	E23.1
Drug-induced Cushing syndrome	E24.2
Drug-induced adrenocortical insufficiency	E27.3
Drug-induced obesity	E66.10
Mental and behavioural disorders due to use of opioids	F11*
Mental and behavioural disorders due to use of sedatives or hypnotics	F13*
Mental and behavioural disorders due to use of other stimulants, including caffeine	F15*
Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances	F19
Abuse of non-dependence-producing substances	F55*
Malignant neuroleptic syndrome	G21.0
Other drug-induced secondary parkinsonism	G21.1
Secondary parkinsonism due to other external agents	G21.2
Drug-induced dystonia	G24.0
Drug-induced tremor	G25.1
Drug-induced chorea	G25.4
Drug-induced tics and other tics of organic origin	G25.6
Drug-induced headache, not elsewhere classified	G44.4
Drug-induced polyneuropathy	G62.0

Description	Code
Drug-induced myopathy	G72.0
Drug-induced cataract	H26.3
Glaucoma secondary to drugs	H40.6
Ototoxic hearing loss	H91.0
Cardiomyopathy due to drugs and other external agents	I42.7
Hypotension due to drugs	I95.2
Acute drug-induced interstitial lung disorders	J70.2
Chronic drug-induced interstitial lung disorders	J70.3
Drug-induced interstitial lung disorders	J70.4
Toxic gastroenteritis and colitis	K52.1
Toxic liver disease with cholestasis	K71.0
Toxic liver disease with hepatic necrosis	K71.1
Toxic liver disease with acute hepatitis	K71.2
Toxic liver disease with hepatitis, not elsewhere classified	K71.6
Toxic liver disease, unspecified	K71.9
Drug-induced acute pancreatitis	K85.3
Drug-induced pemphigus	L10.5
Allergic contact dermatitis due to drugs in contact with skin	L23.3
Irritant contact dermatitis due to drugs in contact with skin	L24.4
Unspecified contact dermatitis due to drugs in contact with skin	L25.1
Generalized skin eruption due to drugs and medicaments	L27.0
Localized skin eruption due to drugs and medicaments	L27.1
Dermatitis due to other substances taken internally	L27.8
Dermatitis due to unspecified substance taken internally	L27.9
Lichenoid drug reaction	L43.2

Description	Code
Toxic epidermal necrolysis	L51.2
Drug phototoxic response	L56.0
Drug photoallergic response	L56.1
Drug-induced androgenic alopecia	L64.0
Drug-induced gout	M10.2*
Drug-induced systemic lupus erythematosus	M32.0
Systemic sclerosis induced by drugs and chemicals	M34.2
Drug-induced osteoporosis with pathological fracture	M80.4*
Drug-induced osteoporosis	M81.4*
Other drug-induced osteomalacia in adults	M83.5
Osteonecrosis due to drugs	M87.1
Analgesic nephropathy	N14.0
Nephropathy induced by other drugs, medicaments and biological substances	N14.1
Nephropathy induced by unspecified drug, medicament or biological substance	N14.2
Nephropathy induced by heavy metals	N14.3
Toxic nephropathy, not elsewhere classifieds	N14.4
Drug-induced fever	R50.2
Poisoning by systemic antibiotics	T36*
Poisoning by other systemic anti-infectives and antiparasitics	T37*
Poisoning by, adverse effect of and underdosing of glucocorticoids and synthetic analogues	T38*
Poisoning by, adverse effect of and underdosing of nonopioid analgesics, antipyretics and antirheumatics	T39*
Poisoning by, adverse effect of and underdosing of narcotics and psychodysleptics [hallucinogens]	T40*
Poisoning by, adverse effect of and underdosing of anesthetics and therapeutic gases	T41*

Description	Code
Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs	T42*
Poisoning by psychotropic drugs, not elsewhere classified	T43*
Poisoning by drugs primarily affecting the autonomic nervous system	T44*
Poisoning by, adverse effect of and underdosing of primarily systemic and hematological agents, not elsewhere classified	T45*
Poisoning by, adverse effect of and underdosing of agents primarily affecting the cardiovascular system	T46*
Poisoning by, adverse effect of and underdosing of agents primarily affecting the gastrointestinal system	T47*
Poisoning by, adverse effect of and underdosing of agents primarily acting on smooth and skeletal muscles and the respiratory system	T48*
Poisoning by topical agents primarily affecting skin and mucous membrane and by ophthalmological, otorhinolaryngological and dental drugs	T49*
Poisoning by diuretics and other and unspecified drugs, medicaments and biological substances	T50*
Anaphylactic shock, unspecified	T78.2
Angioneurotic edema	T78.3
Allergy, unspecified	T78.4
Other adverse effects, not elsewhere classified	T78.8
Adverse effect, unspecified	T78.9
Vascular complications following infusion, transfusion and therapeutic injection	T80.1
Infections following infusion, transfusion and therapeutic injection	T80.2
ABO incompatibility reaction	T80.3
Rh incompatibility reaction	T80.4
Anaphylactic shock due to serum	T80.5
Complications following infusion, transfusion and therapeutic injection: other serum reactions	T80.6
Other complications following infusion, transfusion and therapeutic injection	T80.8

Description	Code
Unspecified complication following infusion, transfusion and therapeutic injection	T80.9
Malignant hyperthermia due to anaesthesia	T88.3
Anaphylactic shock due to adverse effect of correct drug or medicament properly administered	T88.6
Unspecified adverse effect of drug or medicament	T88.7
Sequelae of poisoning by drugs, medicaments and biological substances	T96

Table I8.2 Medication-related Adverse Events, External Cause Descriptions and ICD-10-AM Codes.

Description	Code
Accidental poisoning by and exposure to nonopioid analgesics antipyretics and antirheumatics	X40*
Accidental poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified	X41*
Accidental poisoning by and exposure to narcotics and psychodysleptics [hallucinogens] not elsewhere classified	X42*
Accidental poisoning by and exposure to other drugs acting on the autonomic nervous system	X43*
Accidental poisoning by and exposure to other and unspecified drugs, medicaments and biological substances	X44*
Poisoning by and exposure to nonopioid analgesics antipyretics and antirheumatics, undetermined intent	Y10
Poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified, undetermined intent	Y11*
Poisoning by and exposure to narcotics and psychodysleptics [hallucinogens] not elsewhere classified	Y12*
Poisoning by and exposure to other drugs acting on the autonomic nervous system, undetermined intent	Y13*
Poisoning by and exposure to other and unspecified drugs, medicaments and biological substances, undetermined intent	Y14*

Description	Code
Drugs, medicaments and biological substances causing adverse effects in therapeutic use	Y40-Y59
Nonadministration of necessary drug, medicament or biological substance	Y63.6
Sequelae of adverse effects caused by drugs, medicaments and biological substances in therapeutic use	Y88.0

Indicator 9. Weight Loss or Malnutrition

Data Sources	Definition	Numerator	Denominator	Comments	Covariates
ISAAC, EDDC, NSW APDC, NSW EDDC, VAED, VAMD	Proportion of long-term residents with any emergency department presentation or hospitalisation, where weight loss or malnutrition were reported.[41, 42]	Number of long-term residents who had an emergency department presentation or hospitalisation where this was recorded in any of the discharge diagnoses for the encounter (Table I9.1).	Number of long-term residents who do not have cancer and are not in palliative care.	Cancer exclusion: 6 months prior to reporting period history of antineoplastic agents (Table I9.2). Palliative care exclusion is from entry into residential aged care assessment (Table I9.2).	Age, sex, number of comorbidities.

Table I9.1. Weight Loss or Malnutrition, Descriptions and ICD-10-AM Codes.

Description	Codes
Unspecified severe protein-calorie malnutrition	E43*
Moderate protein-calorie malnutrition	E44.0
Mild protein-calorie malnutrition	E44.1
Unspecified protein-calorie malnutrition	E46*
Nutritional deficiency, unspecified	E63.9
Abnormal weight loss	R63.4
Underweight	R63.6
Cachexia, applicable to wasting syndrome	R64*
Underweight: Body mass index 19.9 or less, adult	Z68.1

Table I9.2. Cancer Treatment and Palliative Care, Descriptions, ATC Codes, ACFI Code.

Description	Code
Antineoplastic and immunomodulating agents.[1]	L01*
Palliative care (ACFI question 12, R14): "The person needs a palliative care program involving end of life care where ongoing care will involve very intensive clinical nursing and/or complex pain management in the residential care setting."	"Y"

1. Determined using 6 months of PBS prescription data prior to the study period.

Indicator 10. Delirium and/or Dementia

Data Sources	Definition	Numerator	Denominator	Comments	Covariates
ISAAC, EDDC, NSW APDC, NSW EDDC, VAED, VAMD	Proportion of long-term residents who had an emergency department presentation or hospitalisation for delirium or dementia.	Number of long-term residents who had an emergency department presentation or hospitalisation where dementia or delirium were the principal discharge diagnoses for the encounter (Table I10.1).[43]	Number of long-term residents with dementia diagnosis.		Age, sex, number of comorbidities.

Table I10.1. Delirium and Dementia, Descriptions and ICD-10-AM Codes.

Description	Code
Other symptoms and signs involving cognitive functions and awareness	R41
Disorientation, unspecified	R41.0
Other and unspecified symptoms and signs involving cognitive functions and awareness	R41.8
Alzheimer's disease	G30*
Lewy body disease	G31.3
Dementia in Alzheimer's disease	F00*
Vascular dementia	F01*
Dementia in other diseases classified elsewhere	F02*
Unspecified dementia	F03*
Delirium, not induced by alcohol and other psychoactive substances	F05*

Indicator 11. Emergency Department Presentations

Data Sources	Definition	Numerator	Denominator	Comments	Covariates
ISAAC, EDDC, NSW APDC, NSW EDDC, VAED, VAMD	Proportion of short-term residents who had an emergency department presentation within 30 days of entry/re-entry to aged care from hospital.[41, 44]	Number of aged care recipients who had an emergency department presentation within 30 days of entry/re-entry to the aged care (>1 day after entry).	Number of aged care residents admitted/re-admitted into aged care following an inpatient hospitalisation.	Excluding hospitalisations for dialysis and other planned day procedures.	Age, sex, number of emergency inpatient hospitalisations the year prior, number of comorbidities, hospital length of stay.
ISAAC, EDDC, NSW APDC, NSW EDDC, VAED, VAMD	Proportion of long-term residents who had an emergency department within 30 days of re-entry to aged care from hospital.[41, 44]	Number of aged care recipients who had an emergency department presentation within 30 days of entry/re-entry to the aged care (>1 day after entry).	Number of long-term aged care residents re-admitted into aged care following an inpatient hospitalisation.	Excluding hospitalisations for dialysis and other planned day procedures.	Age, sex, number of emergency inpatient hospitalisations the year prior, number of comorbidities, hospital length of stay.

Indicator 12. Pressure Injuries

Data Sources	Definition	Numerator	Denominator	Comments	Covariates
ISAAC, EDDC, NSW APDC, NSW EDDC, VAED, VAMD	Proportion of long-term residents who had an emergency department presentation or hospitalisation where pressure injury was reported.[41, 42]	Number of long-term residents who had a hospitalisation or an emergency department presentation where pressure injury was included in any of the diagnoses and was not identified as onset during hospitalisation (Table I12.1).	Number of long-term residents.	Analysis should be stratified by "high risk" people in residential aged care facilities (Table I12.2). It is also stratified by any pressure injury versus pressure injury stage II-IV or unspecified.	Age, sex, number of comorbidities.

Table I12.1. Pressure Injury, Descriptions and ICD-10-AM Codes.

Description	Code
Pressure injury stage I	L89.0*
Pressure injury stage II	L89.1*
Pressure injury stage III	L89.2*
Pressure injury stage IV	L89.3*
Pressure injury unstageable	L89.4*
Suspected deep tissue injury	L89.5*
Pressure injury unspecified stage	L89.9*

Table I12.2. High Risk of Pressure Injury, ACFI Questions and Descriptions.

Description	Question
Whether the person needs complex skin integrity management for residents with compromised skin integrity who are confined to bed and/or chair or cannot self-ambulate. The management plan must include repositioning at least 4 times per day.	Q12_R5, response "Y"
Whether the person needs management of chronic wounds, including varicose and pressure ulcers, and diabetic foot ulcers.	Q12_R10, response "Y"
Requires physical assistance with both transfers and locomotion OR requires mechanical lifting for transfers.	Q02, response "D"

References

1. Inacio M, Lang C, Caughey G, Bray S, Harrison S, Whitehead C, Visvanathan R, Evans K, Corlis M, Cornell V and Wesselingh S. The Registry of Senior Australians (ROSA) Outcome Monitoring System: Quality and Safety Indicators for Aged Care. *Int J Qual Health Care*. 2020;doi: 10.1093/intqhc/mzaa078.
2. Australian Commission on Safety and Quality in Healthcare. A guide to the potentially preventable hospitalisations indicator in Australia. 2017;2018.
3. Masnoon N, Shakib S, Kalisch-Ellett L and Caughey GE. What is polypharmacy? A systematic review of definitions. *BMC Geriatr*. 2017;17:230.
4. Joenpera J, Van Der Zwan F, Karmel R and Cooper-Stanbury M. Long and winding road: Aged care use before death. *Australas J Ageing*. 2016;35:9-11.
5. Centers for Medicare & Medicaid Services. MDS 3.0 Quality Measures USER'S MANUAL. 2016;2018.
6. Religa D, Fereshtehnejad SM, Cermakova P, Edlund AK, Garcia-Ptacek S, Granqvist N, Hallback A, Kawe K, Farahmand B, Kilander L, Mattsson UB, Nagga K, Nordstrom P, Wijk H, Wimo A, Winblad B and Eriksdotter M. SveDem, the Swedish Dementia Registry - a tool for improving the quality of diagnostics, treatment and care of dementia patients in clinical practice. *PLoS One*. 2015;10:e0116538.
7. Ageing and Aged Care Branch, Victorian Government, Department of Health. Strengthening Care Outcomes for Residents with Evidence (SCORE). 2012.
8. Sweden's Municipalities and the County Council and the National Board of Health and Welfare. Open comparisons 2017. Care for the elderly. Comparisons between municipalities and counties. https://webbutik.skl.se/sv/artiklar/oppna-jamforelser-vard-och-omsorg-om-aldre-2017.html [Accessed Nov 2, 2019]. 2018.
9. Winters-Van Der Meer S, Kool RB, Klazinga NS and Huijsman R. Are the Dutch long-term care organizations getting better? A trend study of quality indicators between 2007 and 2009 and the patterns of regional influences on performance. *Int J Qual Health Care*. 2013;25:505-14.
10. OECD/EU. *A Good Life in Old Age? Monitoring and Improving Quality in Long-term Care, OECD Health Policy Studies*: OECD Publishing: Paris; 2013.
11. Canadian Institute for Health Information (CIHI). Canadian Institute for Health Information (CIHI). www.cihi.ca. Accessed Oct 26, 2019. 2019.
12. Central Region's Technical Advisory Services Limited (TAS). 2017/18 interRAI NZ Annual Report. https://www.interrai.co.nz/about/publications/ Accessed October 10, 2019. 2018.
13. Australian Government, Department of Health and Ageing. Aged Care Assessment Program Data Dictionary. Version 3.0. 2013;2020.
14. Australian Government, Department of Health and Ageing. Aged Care Funding Instrument. User Guide. 2013;2020.
15. World Health Organization Collaborating Centre for Drug Statistics Methodology. ATC/DDD Index 2018 2018.
16. Spiegelhalter DJ. Funnel plots for comparing institutional performance. *Stat Med*. 2005;24:1185-202.
17. Dover DC and Schopflocher DP. Using funnel plots in public health surveillance. *Popul Health Metr*. 2011;9:58.
18. Verburg IW, Holman R, Peek N, Abu-Hanna A and de Keizer NF. Guidelines on constructing funnel plots for quality indicators: A case study on mortality in intensive care unit patients. *Stat Methods Med Res*. 2018;27:3350-3366.

19. Sloan KL, Sales AE, Liu CF, Fishman P, Nichol P, Suzuki NT and Sharp ND. Construction and characteristics of the RxRisk-V: a VA-adapted pharmacy-based case-mix instrument. *Med Care*. 2003;41:761-74.
20. Pratt NL, Kerr M, Barratt JD, Kemp-Casey A, Kalisch Ellett LM, Ramsay E and Roughead EE. The validity of the Rx-Risk Comorbidity Index using medicines mapped to the Anatomical Therapeutic Chemical (ATC) Classification System. *BMJ Open*. 2018;8:e021122.
21. Independent Hospital Pricing Authority (IHPA). The International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM). 2016.
22. Taipale HT. Sedative load and adverse events among community-dwelling older people. Publications of the University of Eastern Finland Dissertations in Health Sciences. 2012.
23. Inacio MC, Bray S, Whitehead C, Corlis M, Evans K, Griffith E and Wesselingh S. The Registry of Older South Australians (ROSA): Framework and Plan. . *BMJ Open*. 2019;In press
24. Australian Institute of Health and Welfare. National Aged Care Data Clearinghouse. 2017;2018.
25. Australian Government, Department of Health. Medicare Benefits Schedule Book. Operating from 01 November 2016. 2016;2020.
26. Australian Government, Department of Health. The Pharmaceutical Benefits Scheme. Schedule of Pharmaceutical Benefits. 2020;2020.
27. Australian Government. Australian Institute of Health and Welfare. National Death Index (NDI). 2018;2019.
28. South Australian Government. Admitted Patient Care Data Elements. Reference Manual 2019-2020. 2020;2020.
29. South Australian Government. Non-admitted emergency activity (EDDC) 2020;2020.
30. Australian Government, Australian Institute of Health and Welfare. Data quality statement: National Hospital Morbidity Database 2014–15. 2016;2020.
31. Australian Institute of Health and Welfare. Admitted patient care 2017–18: Australian hospital statistics. Health services series no. 90. Cat. no. HSE 225. 2019;2019.
32. New Zealand Government Ministry of Health. Mapping between ICD-10 and ICD-9. 2020.
33. Commonwealth Scientific and Industrial Research Organisation(CSIRO). Australian eHealth Research Centre. SNOMAP Master AU. Release 20200514. 2020;2020.
34. Agarwal E, Ferguson M, Banks M, Bauer J, Capra S and Isenring E. Malnutrition coding in acute care hospitals. *Nutrition & Dietetics*. 2015;72:69-73.
35. Linjakumpu T, Hartikainen S, Klaukka T, Koponen H, Kivela SL and Isoaho R. A model to classify the sedative load of drugs. *Int J Geriatr Psychiatry*. 2003;18:542-4.
36. Taipale HT, Bell JS, Soini H and Pitkala KH. Sedative load and mortality among residents of long-term care facilities: a prospective cohort study. *Drugs Aging*. 2009;26:871-81.
37. Peklar J, O'Halloran AM, Maidment ID, Henman MC, Kenny RA and Kos M. Sedative load and frailty among community-dwelling population aged >/=65 years. *J Am Med Dir Assoc*. 2015;16:282-9.
38. Westbury J, Gee P, Ling T, Kitsos A and Peterson G. More action needed: Psychotropic prescribing in Australian residential aged care. *Aust N Z J Psychiatry*. 2019;53:136-147.
39. Von Korff M, Saunders K, Thomas Ray G, Boudreau D, Campbell C, Merrill J, Sullivan MD, Rutter CM, Silverberg MJ, Banta-Green C and Weisner C. De facto long-term opioid therapy for noncancer pain. *Clin J Pain*. 2008;24:521-7.
40. Ibrahim JE, Ranson DL and Bugeja L. Premature deaths of nursing home residents: an epidemiological analysis. *The Medical Journal of Australia*. 2018;208:143.
41. MDS 3.0 Quality Measures USER'S MANUAL. Prepared for: The Centers for Medicare & Medicaid Services under Contract No. HHSM500- 2013-13015I (HHSM-500-T0001). . 2016;2018.
42. Australian Government Department of Health. National Aged Care Quality Indicator Program resource manual for residential aged care facilities. 2016;2017.

43. Wilkinson T, Ly A, Schnier C, Rannikmae K, Bush K, Brayne C, Quinn TJ, Sudlow CLM, Group UKBNO and Dementias Platform UK. Identifying dementia cases with routinely collected health data: A systematic review. *Alzheimers Dement*. 2018;14:1038-1051.
44. Centers for Medicare and Medicaid Services. Nursing Home Compare Claims Based Quality Measure Technical Specifications 2018;2018.

Data Limitations

1. If an individual has transferred between facilities during the same year and was a long-term resident of both, it is possible that they are included in the denominator of both facilities for that year.
2. If an individual died after officially leaving a residential aged care facility this death is not included in the 'premature mortality' indicator, even if the reason for mortality was included in this list.
3. There are individual cases with missing facility/provider identifiers (e.g. 0.17% in 2016). These cases were included in the overall denominator and calculation of expected rates, but not included in the report figures.
4. In all indicators the period of time for which a person entered 'long-term' care was calculated using their entry into permanent residential aged care and does not include the period of time that they used residential respite immediately prior to permanent care in the calculation of cumulative days in care. The ROSA has identified that individuals can enter permanent care directly from respite care (e.g. in 2016 31% of long-term residents had been in residential respite care immediately prior to their permanent residential care entry) and in certain scenarios including this period of time in care may be appropriate, as a resident could have experienced an event during these periods.

Appendix 3

Methods: Search Strategy and Data Extraction for Part 1

Table 3.1: Part 1 Methods for Search Strategy and Data Extraction

Search Strategy and Databases

First the bibliographic sources of MEDLINE (Ovid) and EMBASE were systematically searched, using Medical Subject Headings (MeSH) and keywords: (residential facilities (MeSH) OR homes for the aged (MeSH) OR long-term care (MeSH) OR nursing homes (MeSH) OR assisted living facilities(MeSH) OR nursing homes (MeSH) OR skilled nursing facilities (MeSH) OR aged care facility (key words) OR long term care facility (key words) OR assisted living (key word) OR residential home (key word)) AND (quality indicators, health care (MeSH) OR quality assurance, health care (MeSH) OR quality of care indicator* (key word) OR clinical indicator* (key word) OR indicator* (key word)). The search was limited to studies that were in English and published between 1st July 2009 to current.

Second, an internet search using Google (July / October 2019) was performed to search for relevant websites from using the following keywords: quality indicator, quality measure, quality in health care, residential aged care, nursing home, long-term care, aged care and long-term care facility, with the first 100 hits screened to maximise relevance to search criteria. Country specific government websites were also searched including CMS (Centers for Medicare and Medicaid Services; www.cms.gov), Health Data.gov (www.healthdata.gov), NICE (National Institute for Health and Clinical Excellence; www.nice.org.uk), European Society for Quality in Health Care (www.edqm.eu), European Directorate for the Quality Use of Medicines & Healthcare (www.esqh.net) and Canadian Institute for Health Information (www.cihi.ca).

Thirdly, reference lists of identified publications, reports and websites were also systematically searched to identify relevant publications.

A non-systematic search for home-care based quality indicators was also included that focused on the Canadian Monitoring system.

Selection Criteria

Identified quality and safety outcome monitoring systems or indicators were included in the report if they fulfilled the following criteria: i) the indicator was aimed at monitoring / improving quality of care at the population level; ii) data collection was population-based; iii) data collection was standardised; iv) data collection and reporting were current (last 10 years); v) reporting of indicators and/or outcomes were publicly available and vi) the study, report or website was in English.

Data Extraction

Identified studies from the initial database search (titles and abstracts) were reviewed by GEC and full text obtained for potentially relevant papers. Full text / data from papers, reports and internet searches (websites of relevant governments / organisations) were extracted by GEC. Identified indicators / systems were then matched to the inclusion criteria (GEC), with consultation by a second reviewer (MI) to discuss appropriateness of inclusion and meeting inclusion criteria. Disagreement were resolved by consensus or a third party.

Data extracted and summarised from the identified studies and indicators / systems included:

- a general description of the indicators in place (country, name of indicator / system, start date)
- type of indicators (e.g. health, aged care or other)
- methods of data collection
- framework (e.g. public reporting, rating systems)
- employment of indicators (e.g. measure absolute performance, comparative performance against other provider, inform standards, internal use, payment)
- reporting time frames
- type of output
- definitions and methods for calculation of indicators
- methods of risk adjustments
- broad country specific factors
- prevalence / rates of indicators
- any other additional details and latest reports references.

Appendix 4

Summary of Identified International Quality and Safety Indicators for Analysis in Part 2 Using ROSA Data: Data Rules and Modifications

Table 4.1. Summary, Data Rules and Modifications of Identified Quality and Safety Indicators for Analysis in Part 2 using ROSA data

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
MEDICATION-RELATED INDICATORS				
Anti-Psychotic medication				
ROSA Indicator: Antipsychotic Use *(see Appendix 2)*	Australia	12 months		1. Proportion of long-term residents dispensed an antipsychotic. *See Appendix 2 for details.* Numerator: Number of long-term residents dispensed at least one antipsychotic medication (ATC codes N05A*) during the reporting period Denominator: Number of long-term residents of aged care excluding residents with schizophrenia or Huntington's disease. 2. Proportion of long-term residents with dementia dispensed an antipsychotic. *See Appendix 2 for details* Numerator: Number of long-term residents dispensed at least one antipsychotic medication (ATC codes N05A*) during the reporting period

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
				Denominator: Number of long-term residents of aged care excluding residents with schizophrenia or Huntington's disease.
Short Stay: Newly Receiving Antipsychotic Medication (without indication)	USA	90 days	Short stay residents <100 days. Indication=Schizophrenia, Huntington's Disease, Tourette's syndrome, Schizoaffective disorder but ROSA data only has Schizophrenia, Huntington's Disease. New user will be defined as no prior use in 12 months prior to start of study period.	Proportion of short stay residents (<100 days in RAC) that are new users of an antipsychotic medication (ATC codes N05A*) in 90 days that do not have Schizophrenia or Huntington's Disease (diagnosis recorded on ACFI or ACAT, see Appendix 2 Table I2.2)
Antipsychotic Medication	USA	7 days	7 day look back in 90-day period- need to calculate duration / dosing interval. Can only exclude residents with Schizophrenia, Huntington's Disease	Proportion of LTC residents dispensed an antipsychotic medication(ATC codes N05A*) in 7-day period excluding Schizophrenia, or Huntington's disease (diagnosis recorded on ACFI or ACAT, see Appendix 2 Table I2.2)

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Taken antipsychotics without a diagnosis of psychosis	Canada	7 days	7 day look back in 90-day period- need to calculate duration / dosing interval. Palliative care / <6 months to live exclusion - ROSA data will use palliative care flag in ACFI	Proportion of LTC residents dispensed an antipsychotic medication(ATC codes N05A*) in 7-day period excluding Schizophrenia, Huntington's disease or palliative care / <6 months to live (see Appendix 2, Table I2.2 and Table I1.3 Palliative recorded in ACFI)
Prevalence of anti-psychotic in absence of indication	Finland	6 months	Presence of psychotic disorder =Schizophrenia or other psychoses using ACFI or ACAT data	Proportion of LTC residents dispensed an antipsychotic medication (ATC codes N05A*) in 6 months excluding patients with psychotic disorder (diagnosis recorded on ACFI or ACAT see Appendix 2 Table I2.2)
Prevalence of anti-psychotic drug use in absence of indication	Iceland	120 days	As above	Proportion of LTC residents dispensed an antipsychotic (ATC codes N05A*) in 120 days excluding patients with psychotic disorder (diagnosis recorded on ACFI or ACAT see Appendix 2 Table I2.2)
Proportion of people aged 75+ who have been treated with antipsychotic drugs in home care	Sweden	12 months	Limited to people aged ≥75 years	Proportion of home care residents aged ≥75 years dispensed an antipsychotic medication (ATC codes N05A*) in 12 month period

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Proportion of people aged 75+ who have been treated with antipsychotic drugs in residential care	Sweden	12 months	Limited to people aged ≥75 years	Proportion of LTC residents aged ≥75 years dispensed an antipsychotic medication (ATC codes N05A*) in 12 month period
Antipsychotic prevalence	SHELTER	6 months	Presence of psychotic disorder =Schizophrenia or other psychoses using ACFI or ACAT data Palliative care / <6 months to live exclusion - ROSA data will use palliative care flag in ACFI	Proportion of LTC residents dispensed an antipsychotic medication (ATC codes N05A*) in 6 months excluding residents with end-stage disease or hospice care (palliative care / <6 months to live (see Appendix 2 Table I1.3), or psychotic disorder (recorded in ACFI or ACAT see Appendix 2 Table I2.2)
High risk antipsychotic prevalence	SHELTER	6 months	Palliative care / <6 months to live exclusion - ROSA data will use palliative care flag in ACFI	Proportion of LTC residents dispensed an antipsychotic medication (ATC codes N05*) in 6 months excluding residents with palliative care / <6 months to live (palliative recorded in ACFI see Appendix 2 Table I1.3) high risk use = people who do not have an indication (see Appendix 2 Table I2.2)
Low risk antipsychotic prevalence	SHELTER	6 months	Can only exclude residents with Schizophrenia, Huntington's Disease. Palliative care / <6 months	1. Proportion of LTC residents dispensed an antipsychotic medication (ATC codes N05*) in 6 months excluding Schizophrenia, Huntington's disease (diagnosis recorded on ACFI or ACAT), palliative care / <6 months to live (see Appendix 2 Table I1.3), dependent in daily decision

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
			to live exclusion - ROSA data will use palliative care flag in ACFI Dependent in daily decision making, short-term memory problem or behaviour symptoms (recorded in ACFI using assessment of Cognitive function (moderate -severe impairments) or behavioural daily living domain (medium-high)	making, short-term memory problem or behaviour symptoms (data recorded in ACFI)- low risk use = people who are likely to have an indication (see Appendix 2 Table I2.2)
Anti-anxiety or Hypnotic medications				
ROSA Indicator: Sedative Load *(see Appendix 2)*	Australia	91 day cross-sectional periods over 12 months		1. Proportion of long-term residents potentially experiencing a high sedative load (SL ≥3). *See Appendix 2 for details*. Numerator: Number of long-term residents who had at least one 91-day period of potential high sedative load within the 12-month reporting period Denominator: Number of long-term residents of aged care excluding residents with schizophrenia or Huntington's disease or are receiving cancer treatment or in palliative care.

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
				2. Proportion of long-term residents with dementia potentially experiencing a high sedative load (SL ≥3). *See Appendix 2 for details*. Numerator: Number of long-term residents with dementia who had at least one 91-day period of potential high sedative load within the 12 month reporting period Denominator: Number of long-term residents of aged care excluding residents with schizophrenia or Huntington's disease or are receiving cancer treatment or in palliative care.
Anti-anxiety or hypnotic medication	USA	7 days	Similar to sedative load indication. 7 day look back instead of 91 days and no exclusions	Proportion of LTC residents dispensed an anti-anxiety (ATC codes N05B*) or hypnotic medications (ATC codes N05C*) in 7 days. *See Appendix 4 Table 2 for medications available on PBS.*
Prevalence of anti-anxiety or hypnotic drug use	Iceland	120 days	Similar to sedative load indication. Use in 120 days instead of 91 days and no exclusions	Proportion of LTC residents dispensed an anti-anxiety (ATC codes N05B*) or hypnotic medications (ATC codes N05C*) in 120 days. *See Appendix 4 Table 2 for medications available on PBS.*
Prevalence of anti-anxiety / hypnotic use	Finland	6 months	Similar to sedative load indication. Use in 6 months instead of 91 days and no exclusions	1. Proportion of LTC residents dispensed an anti-anxiety (ATC codes N05B) or hypnotic medications (ATC codes N05C) in 6 months. *See Appendix 4 Table 2 for medications available on PBS.*

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Psychotropic medications				
Three or more psychotropic drugs in older people aged 75 years and older living in community	Sweden- Home care	12 months	Psychotropic drugs: Look at all 'N' class medicines (includes ATC codes N01 Anaesthetics, N02 Analgesics, N03 Antiepileptics, N04 Anti-Parkinson Drugs, N05 Psycholeptics, N06 Psychoanaleptics, N07 Other Nervous System Drugs) and dispensing of ≥ 3 unique medications over 12 months	Proportion of home care residents dispensed ≥3 psychotropic medications (ATC code N* medications) aged >75 years old in 12 months
Three or more psychotropic drugs in older people aged 75 years and older living in residential care	Sweden	12 months	Psychotropic drugs: Look at all 'N' class medicines (includes N01 Anaesthetics, N02 Analgesics, N03 Antiepileptics, N04 Anti-Parkinson Drugs, N05 Psycholeptics, N06 Psychoanaleptics, N07 Other Nervous System Drugs),	Proportion of LTC residents dispensed ≥3 psychotropic medications (ATC code N* medications) aged >75 years old in 12 months

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
			dispensing of ≥ unique medicines over 12 months	
Psycho-pharmacy	Netherlands	12 months	Psycho-pharmacy drugs: Look at dispensing of ≥1 Psycholeptic (ATC code N05*) or Psychoanaleptic (ATC code N06*) medications over 12 months	1. Proportion of LTC residents dispensed ≥1 psycho-pharmacy medications (ATC codes N05* or N06*) in 12 months
Polypharmacy				
Use of 9 or more medications	Victoria, Australia	90 days (conduct audit in a nominated week in a quarter)	PRN and short-term medicines such as antibiotics, eye drops excluded. Can't identify PRN from PBS data but will exclude antibiotics (J01*) and eye-drops, ear drops (S01*-S03*). Report as Prevalence (%) and ≥9 medicines per 1,000 occupied bed days. Include LTC and respite residents.	1. Proportion of LTC and respite residents dispensed ≥9 medications in 90 days excluding ATC codes S01*-S03* and J01* 2. ≥9 medications per 1,000 occupied bed days

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Use of 9 or more medications	Finland	12 months		1. Proportion of LTC residents dispensed ≥9 medications in 12 months
9 or more different medications	Iceland	120 days		1. Proportion of LTC residents dispensed ≥9 medications in 120 days
10 or more different medications in people aged 75 years and older living in the community	Sweden-Home care	12 months		1. Proportion of homecare residents dispensed ≥10 medications aged 75 years and older living in the community in 12 months
10 or more different medications in people aged 75 years and older living residential care	Sweden	12 months		1. Proportion of LTC residents dispensed ≥10 medications aged 75 years and older living in the community in 12 months

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Inappropriate drug use				
Inappropriate drug use in people aged 75 years and older living in the community	Sweden-Home care	12 months	Sweden has list of 4 drugs / drug combinations that are considered inappropriate (the 4th one is proportion of LTC residents taking propiomazine-not on PBS). *See Appendix 4 Table 3 for details.* Medications with significant anticholinergic properties will include medicines that have been defined as having moderate-strong anticholinergic properties (Australian Medicines Handbook and National Prescribing Service, Australia). *See Appendix 4 Table 4 for details*.	*See Appedix 4 Table 3 for details of Sweden's definition of inappropriate drug use.* 1. Proportion of LTC residents taking a long acting benzodiazepine (ATC codes N05BA01, N05CD02, N05CD03) in 12 months 2. Proportion of LTC residents taking medications with significant anticholinergic properties* in 12 months *Significant anticholinergic properties = Moderate to Strong Anticholinergics. *See Appendix 4 Table 4 for details.* 3. Proportion of LTC residents taking tramadol (ATC code N02AX02) in 12 months Overall: Proportion of home care recipients taking ≥1 inappropriate drug, aged 75 years and older in 12 month period
Inappropriate drug use in people aged 75 years and older	Sweden	12 months	As Above	As Above

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
living in residential care				Overall: Proportion of LTC residents taking ≥1 inappropriate drug aged 75 years and older in 12 month period
Antidepressant medications				
Use of an antidepressant	Netherlands-LTC and Home Care	12 months		Proportion of LTC residents receiving an antidepressant medication (ATC code N06A*) in 12 months. Report by LTC and Home Care
Antidepressant prevalence	SHELTER	6 months		Proportion of LTC residents receiving an antidepressant medication (ATC code N06A*) in 6 months
PAIN				
ROSA Indicator: Chronic Opioid Use *(see Appendix 2)*	Australia	12 months		Proportion of long-term residents considered chronic opioid users. *See Appendix 2 for details.* Numerator: Number of long-term residents that are chronic opioid users (ATC code N02A*). Chronic opioid use is defined as receiving any number of opioid medications for at least 90 days continuously, or for 120 non-consecutive days. The number of days of medication use is determined based on the number of units dispensed and estimated dose per day. No gap days between one opioid medication dispensing and another are allowed when determining consecutive use of opioids. Denominator: Long-term residents of aged care who do not have a

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
				history or current diagnosis of cancer, and who are not receiving palliative care.
Short Stay: Moderate-Severe Pain	USA	Past 5 days	Continuous opioid use will be a proxy for moderate to severe pain. Need to determine duration of opioid exposure	1. Proportion of short stay residents (<100 days in RAC) that have continuous opioid (ATC code N02A) use for 5 or more days during stay (0-99 days from entry) 2. Proportion of short stay residents (<100 days in RAC) that have continuous opioid use (ATC code N02A) for past 5 or more days
Self-Report Moderate-Severe Pain	USA	Past 5 days	Continuous opioid use will be a proxy for moderate to severe pain. Need to determine duration of opioid exposure.	1. Proportion of LTC residents that have continuous opioid (ATC code N02A) use for 5 or more days in 90-day period 2. Proportion of LTC residents that have continuous opioid (ATC code N02A) use for past 5 or more days
Has Pain	Canada	90 days	Opioid use will be proxy for pain or pain as reported in ACFI (Medical Dx Pain Q14_C1-C3: 1704 or Pain management or complex pain management (Q12_R3 or R4 "Y")	Proportion of LTC residents that have been dispensed an opioid (ATC code N02A) or more days or report pain in ACFI in 90-day period

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Pain	Korea	7 days	Continuous opioid use for 7 days will be used as a proxy for daily pain, intense pain or pain that interrupts activities	Proportion of LTC residents that have continuous opioid (ATC code N02A) use for past 7 or more days
Percent of residents with pain	NZ	90 days	Pain defined as daily in last 3 days or Pain Intensity Moderate-Severe or times when pain is horrible or excruciating: continuous opioid use for 3 days or more will be used as a proxy. NZ also examines by presence of Dementia.	1. Proportion of LTC residents that have continuous opioid (ATC code N02A) use for 3 or more days in 90-day period 2. Proportion of LTC residents with dementia that have that have continuous opioid use for 3 or more days in 90-day period
Daily pain	Canada* Home-care	90 days	Continuous opioid use will be a proxy for daily pain.	Proportion of home care residents that have continuous opioid (ATC code N02A) use for 90 days
PRESSURE INJURY				
ROSA Indicator: Pressure Injury ***(see Appendix 2)***	Australia	12 months		1. Proportion of long-term residents who had an emergency department presentation or hospitalisation where pressure injury* was reported. *See Appendix 2 for details.* Numerator: Number of long-term residents who had a hospitalisation or an emergency department presentation where pressure injury was included in any of the diagnoses and not identified as having onset

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
				during hospitalisation Denominator: Number of long-term residents of aged care. Pressure injury ICD-10-AM L89.0*-L89.3* stage I-IV, unstageable L89.4*, Suspected deep tissue injury L89.5*, pressure injury unspecified L89.9* 2. Proportion of "high-risk" long-term residents who had an emergency department presentation or hospitalisation where pressure injury was reported Numerator: Number of "high-risk" long-term residents who had a hospitalisation or an emergency department presentation where pressure injury was included in any of the diagnoses and not identified as having onset during hospitalisation Denominator: Number of long-term residents of aged care. *"High-risk" residents (identified from ACFI: Q12_R5 or Q12_R10 response "Y" or Q02 response "D" Q12: Skin management and complex skin integrity management. Q02: Immobile 3. Proportion of long-term residents who had an emergency department presentation or hospitalisation where a stage 2-4 or unspecified pressure injury was reported Numerator: Number of long-term residents who had a hospitalisation or an emergency department presentation where a stage 2-4 or unspecified pressure injury was included in any of the diagnoses and with onset not during hospitalisation. Denominator: Number of long-term residents of aged care.

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Pressure Injury - Overall				
Pressure injuries	Australia	90 days	Reported as pressure injuries per 1,000 occupied bed days. Includes respite residents. Reporting by each of the six stages (Stage I-IV, unstageable or deep tissue) and overall	1. Proportion of LTC and respite residents who had an emergency department presentation or hospitalisation where pressure injuries were reported in 90 days 2. Pressure injuries per 1,000 occupied bed days 3. Pressure injuries by stage per 1,000 occupied bed days
Pressure injuries	Victoria, Australia	90 days	Reported as pressure injuries per 1,000 occupied bed days. Includes respite residents.	1. Proportion of LTC and respite residents who had an emergency department presentation or hospitalisation where pressure injuries were reported in 90 days 2. Pressure injuries per 1,000 occupied bed days
Short Stay: Pressure Ulcers - New or Worsened	USA	90 days	Short stay residents (<100 days RAC)	Proportion of short stay residents (<100 days in RAC) who had an emergency department presentation or hospitalisation where pressure injury was reported in 90 days
Pressure Ulcers	Netherlands-LTC and Home Care	12 months		Proportion of LTC residents who had an emergency department presentation or hospitalisation where pressure injuries were reported in 12 months
Prevalence of grade 1–4 pressure ulcers	Finland	6 months	ICD-10 AM codes for pressure injury stage I-IV (L89.0*-L89.3*)	Proportion of LTC residents who had an emergency department presentation or hospitalisation where pressure injuries stage 1-4 were reported in 6 months

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Pressure ulcer prevalence	SHELTER	6 months		see above Finland
Stages 1-4 pressure ulcers	Iceland	120 days	ICD-10 AM codes for pressure injury stage I-IV (L89.0*-L89.3*)	Proportion of LTC residents who had an emergency department presentation or hospitalisation where pressure injuries stage 1-4 were reported in 120 days
Pressure Injury Stage II to IV or Risk Level				
High-Risk Residents with Stage II-IV Pressure Ulcers	USA	90 days	Can use "High-risk" residents (identified from ACFI: Q12_R5 or Q12_R10 response "Y" or Q02 response "D" requiring skin management or impaired mobility. USA also includes malnutrition- can use hospitalisation for malnutrition /weight loss same as ROSA indicator	Proportion of "high-risk" long-term residents who had an emergency department presentation or hospitalisation with a stage II-IV pressure injury in 90 days
Has a new stage II to IV pressure ulcer	Canada	90 days	New= incident pressure injury (no previous hospitalisation in 12 months prior)	Proportion of long-term residents who had an emergency department presentation or hospitalisation with a stage II-IV pressure injury in 90 days but not in 12 months prior.

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Percent of residents who have a Pressure Ulcer Stage 2 to 4	NZ	90 days		Proportion of long-term residents who had an emergency department presentation or hospitalisation with a stage II-IV pressure injury in 90 days
High risk pressure ulcer prevalence	SHELTER	6 months	High risk=comatose, extensive assistance or more with toilet transfer or bed mobility. Use Q02 "D" requires assistance for mobility (transfers, locomotion)	Proportion of high-risk long-term residents who had an emergency department presentation or hospitalisation for a pressure ulcer in 6 months
Low risk pressure ulcer prevalence	SHELTER	6 months	Low risk= excl. high risk Exclude Q02 "D"	Proportion of low risk long-term residents who had an emergency department presentation or hospitalisation for a pressure injury in 6 months
High risk pressure ulcer prevalence	Korea	90 days	High risk=not defined but use same as above.	Proportion of high-risk long-term residents who had an emergency department presentation or hospitalisation for a pressure injury in 90 days
Low risk pressure ulcer prevalence	Korea	90 days	Low risk= not defined but use same as above	Proportion of low risk long-term residents who had an emergency department presentation or hospitalisation for a pressure injury in 90 days

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
HOSPITALISATIONS				
ROSA Indicator: Medication-related adverse events *(see Appendix 2)*	Australia	12 months		1. Proportion of short-term residents who had an emergency department presentation or hospitalisation for medication-related events. *See Appendix 2 for details* Numerator: Number of long-term residents who had an emergency department presentation or hospitalisation where a medication-related event was the principal discharge diagnosis for the presentation Denominator: Number of long-term aged care residents
Hospitalisations				
Number of hospitalisations per 1000 long-stay resident days (Claim-based)	USA	90 days	Long-stay. USA claims-based quality measure	1. Number of hospitalisations per 1000 long-stay resident days
Unplanned hospitalisations	Korea	90 days	Unplanned hospitalisation= exclude all elective admissions	1. Proportion of residents with unplanned hospitalisation in the past 90 days
Pneumonia	Korea	90 days	Can only identify hospitalisation for	1. Proportion of residents with hospitalisation for pneumonia (J12-J18) in the past 90 days

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
			pneumonia not Dx in primary care	
Emergency Department Visits				
ROSA Indicator: Emergency Department (ED) Presentation *(see Appendix 2)*	Australia	12 months		1. Proportion of short-term residents who had an ED presentation within 30 days of entry/re-entry to residential aged care from hospital. *See Appendix 2 for details.* Numerator: Number of short-stay aged care residents who had an ED presentation within 30 days of entry/re-entry to the aged care (>1 day after entry) Denominator: Number of short-term aged care residents admitted/re-admitted into aged care following an inpatient hospitalisation 2. Proportion of long-term residents who had an ED presentation within 30 days of entry / re-entry to residential aged care from hospital. *See Appendix 2 for details.* Numerator: Number of long-term aged care residents who had an ED presentation within 30 days of entry/re-entry to the aged care (>1 day after entry) Denominator: Number of long-term aged care residents admitted/re-admitted into aged care following an inpatient hospitalisation
Short Stay: Outpatient ED Visit after	USA	90 days	Short stay. USA claims-based	Proportion of short-stay residents who entered or re-entered the facility from a hospital, presented at an ED within 30 days of the start of the stay and this visit did not result in an inpatient or observation stay.

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Hospitalisation (Claims-based)			(administrative data) quality measure	
Number of outpatient ED visits per 1000 long-stay resident days (Claims-based)	USA	90 days	Long-stay. USA claims-based (administrative data) quality measure	Number of outpatient ED presentations per 1000 long-stay resident days
ED visit	Korea	90 days	Indicator included ED visit or emergency care.	Proportion of residents who had an emergency department presentation n the past 90 days
Other				
Hospitalisation or ED visit	Canada* Home-care	90 days		Proportion of home care residents who had a hospitalisation or ED presentation in 90 days
Hospitalisation for fracture / burns	Canada* Home-care	6 months		Proportion of home care residents who had a hospitalisation or ED presentation for a fracture (as defined in fracture indicators *see Appendix 2*) or burns (ICD-10AM T20-T29.3)

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
CARE PLANS / MEDICATION REVIEW				
Updated Care Plan	Sweden-LTC and Home Care	12 months	Can identify Care Plans using MBS data (GPMP: MBS codes 721, 723, 729, 731, 732 nb. 731 is specific for RAC)	Proportion of LTC and Home Care residents that have had MBS claim for a care plan in 12 months
Medication Review	Sweden-LTC and Home Care	12 months	Can identify medication reviews using MBS data (RMMR: MBS code 903; HMR 900 Nb. RMMR is specific for RAC)	Proportion of LTC and Home Care residents that have had MBS claim for a medication review in 12 months
Care plan and evaluation	Netherlands-LTC and Home Care	12 months	See above	See above Sweden. Report for both LTC and Home Care
MORTALITY				
ROSA Indicator: Premature mortality *(see Appendix 2)*	Australia	12 months		1. Proportion of short-term residents who had premature deaths* *Premature death=the main cause of death is 'external' (ICD-10 AM codes V01-Y98) and considered potentially avoidable. *See Appendix 2 for details.* Numerator: Number of short-term residents who died prematurely. Denominator: Number of short-term residents 2. Proportion of long-term residents who had premature deaths* *See*

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
				Appendix 2 for details. Numerator: Number of long-term residents who died prematurely. Denominator: Number of long-term residents
Mortality	Korea	90 days		Proportion of long-term residents who died in the past 90 days
WEIGHT LOSS / MALNUTRITION				
ROSA Indicator: Weight loss or malnutrition *(see Appendix 2)*	Australia	12 months		Proportion of long-term residents with any emergency department presentation or hospitalisation, where weight loss or malnutrition were reported. *See Appendix 2 for details* Numerator: Number of long-term residents who had an emergency department presentation or hospitalisation where weight loss or malnutrition were reported in any of the discharge diagnoses Denominator: Number of long-term residents who do not have cancer and are not in palliative care Malnutrition=ICD-10 AM codes E43,E44.0, E44.1, E46, E63.9; Weight loss= R63.4, R63.6, R64, Z68.1 Cancer treatment= L01 6 months prior or Palliative care ACFI R14 "Y" or use of MBS Items for palliative care

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Weight Loss				
Unplanned weight loss	Australia	3 months	Hospitalisation codes for weight loss likely under-estimate. Exclude palliative care, respite care	1. Proportion of long-term residents with any emergency department presentation or hospitalisation where weight loss was reported in 3 months and not in palliative care 2. Number of emergency department presentations or hospitalisations where weight loss was reported per 1000 occupied long-term resident days in 3 months
Unplanned weight loss	Victoria, Australia	3 months	Hospitalisation codes for weight loss likely under-estimate. Exclude palliative care	1. Proportion of long-term residents with any emergency department presentation or hospitalisation where weight loss was reported in 3 months and not in palliative care 2. Number of emergency department presentations or hospitalisations where weight loss was reported per 1000 occupied long-term resident days in 3 months
Weight loss	USA	6 months	Hospitalisation codes for weight loss likely under-estimate	1. Proportion of long-term residents with any emergency department presentation or hospitalisation, where weight loss was reported in 6 months
Weight loss	Finland	6 months	Hospitalisation codes for weight loss likely under-estimate	As above

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Percent of residents who have unexplained weight loss	NZ	90 days	Hospitalisation codes for weight loss likely under-estimate. Exclude palliative care	Proportion of long-term residents with any emergency department presentation or hospitalisation, where weight loss was reported in 90 days, excluding palliative care
Prevalence weight loss	Iceland	120 days	Hospitalisation codes for weight loss likely under-estimate	Proportion of long-term residents with any emergency department presentation or hospitalisation, where weight loss was reported in 120 days
Weight loss in past 30 days	Korea	30 days	Hospitalisation codes for weight loss likely under-estimate	Proportion of long-term residents with any emergency department presentation or hospitalisation, where weight loss was reported in 30 days
Weight loss	Canada* Home-care	6 months	Hospitalisation codes for weight loss likely under-estimate	Proportion of home care residents who had a hospitalisation or ED visit where weight loss was reported in 6 months
Malnutrition				
Malnutrition	Netherlands--LTC and Home Care	12 months	Hospitalisation codes for malnutrition likely under-estimate	Proportion of long-term residents with any emergency department presentation or hospitalisation, where malnutrition was reported in 12 months. Report for LTC and Home Care

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Tube feeding				
Prevalence of tube feeding	Finland	12 months	Use MBS item codes for nasogastric tube insertion or percutaneous endoscopic gastrostomy or ACFI Q12_R17 = "Y" Person needs management of ongoing tube feeding.	Proportion of long-term residents with tube feeding* in 12 months *nasogastric tube MBS codes 31456, 31458 or PEG 30481,304782,30483,31460 or ACFI tube feeding Q12_R17= 'Y'
Feeding tube	NZ	90 days	Excludes residents in palliative care.	Proportion of long-term residents with tube feeding* in 90 days, excluding palliative care *nasogastric tube MBS codes 31456, 31458 or PEG 30481,304782,30483,31460 or ACFI tube feeding Q12_R17= 'Y'
Feeding tube prevalence	SHELTER	6 months	Excludes residents in palliative care.	Proportion of long-term residents with tube feeding* in 6 months, excluding palliative care *nasogastric tube MBS codes 31456, 31458 or PEG 30481,304782,30483,31460 or ACFI tube feeding Q12_R17= 'Y'
Prevalence of tube feeding	Iceland	120 days		Proportion of long-term residents with tube feeding* in 120 days *nasogastric tube MBS codes 31456, 31458 or PEG 30481,304782,30483,31460 or ACFI tube feeding Q12_R17= 'Y'

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Dehydration				
Prevalence of dehydration	Finland	12 months	Hospitalisation codes for dehydration likely under-estimate (only severe cases)	Proportion of long-term residents hospitalised for dehydration in 12 months ICD-10AM code E86: dehydration and other volume depletion
Prevalence of dehydration	Iceland	120 days	Hospitalisation codes for dehydration likely under-estimate (only severe cases)	Proportion of long-term residents hospitalised for dehydration in 120 days ICD-10AM code E86: dehydration and other volume depletion
INFECTIONS				
ROSA Indicator: Antibiotic Use *(see Appendix 2)*	Australia	12 months		1. Proportion of long-term residents dispensed an antibiotic. *See Appendix 2 for details.* Includes systemic antibiotics only (ATC codes J01*, J04AB02, J04AC01, A02BD05, A02BD06, A07AA09, A07AA11) Numerator: Number of long-term residents dispensed least one antibiotic for systemic use. Denominator: Number of days in residential aged care for long-term residents
One or more infections	Canada	90 days	Use PBS data and prescribing of antibiotic	Proportion of residents having at least one or more dispensings of a systemic antibiotic in 90 days

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Infections (Pneumonia, COPD, septicemia, sexually transmitted disease, UTI or viral hepatitis)	SHELTER	6 months	Can use hospital data to identify hospitalisation for each of the conditions.	Proportion of residents with a hospitalisation for selected conditions associated with an infection in 6 months. ICD-10 AM codes Pneumonia J12-J18, COPD J43-44, septicaemia A40-A41, sexually transmitted disease A50-64, UTI N39.0, viral hepatitis B15-B19
FALLS / FRACTURES				
ROSA Indicator: Fractures *(see Appendix 2)*	Australia	12 months		1. Proportion of long-term residents who experience at least one fracture. *See Appendix 2 for details* Numerator: Number of long-term residents with an emergency department presentation or hospitalisation for fracture, or secondary diagnosis where onset is not during the hospitalisation, the external cause of the hospitalisation is fall, treatment for which MBS paid for or deaths from fractures Denominator: Number of long-term residents
Falls and fall-related fractures				
Falls and fall-related fractures	Victoria, Australia	90 days	Reports both proportions of falls and fall-related fractures and rate per 1,000 bed days	1. Proportion of long-term residents who have a recorded fall in 90-day period 2. Rate of falls per 1,000 bed days in 90-day period 3. Proportion of long-term residents who have a fall-related fracture in

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
				90-day period 4. Rate of fall-related fractures per 1,000 bed days in 90-day period
Fractures				
Incidence of new fractures	Finland	6 months	As defined using ICD-10 codes from ROSA OMS (Appendix 2)	Proportion of long-term residents who experience at least one fracture in 6 months
Number of fractures of hip or thigh per 100,000 inhabitants aged 65 years and older	Sweden-LTC and Home Care	12 months	As defined using ICD-10 codes from ROSA OMS (Appendix 2)	Proportion of long-term residents who have a hip or femur fracture aged 65 years and older in 12 months. Report for both LTC and Home Care
ROSA Indicator: Falls *(see Appendix 2)*	Australia	12 months		Proportion of long-term residents who experienced one or more falls resulting in requiring medical attention. *See Appendix 2 for details* Numerator: Number of long-term residents with an ambulance service, emergency department presentation, hospitalisation, or death from a fall Denominator: Number of long-term residents

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Falls				
One or more falls with major injury	USA	12 months	Includes major injury = Medical attention, ED visit, ambulance service, hospitalisation or death	Proportion of long-term residents who experience a fall resulting in ambulance service, emergency department presentation, hospitalisation or death from a fall in 12 months
Number of injuries due to falls per 1,000 inhabitants aged 80+.	Sweden-LTC and Home Care	12 months	Limited to ≥80 years old	Number of long-term residents who experience a fall resulting in ambulance service, emergency department presentation, hospitalisation or death from a fall per 1000 residents aged 80 years and older in 12 months. Report for both LTC and Home Care
Falls	Canada	90 days		Proportion of long-term residents who experience a fall resulting in ambulance service, emergency department presentation, hospitalisation or death from a fall in 90 days
Fallen in last 30 days	NZ	30 days	NZ: Stratified by Dementia	1. Proportion of long-term residents who experience a fall resulting in ambulance service, emergency department presentation, hospitalisation or death from a fall in 30 days 2. Proportion of long-term residents with dementia who experience a fall resulting in ambulance service, emergency department presentation, hospitalisation or death from a fall in 30 days
Falls	Netherlands-LTC and Home Care	12 months		As above. Report for LTC and Home Care

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Prevalence of falls	Iceland	30 days		Proportion of long-term residents who experience a fall resulting in ambulance service, emergency department presentation, hospitalisation or death from a fall in 30 days
Prevalence of falls within 30 d prior to the assessment	Finland	30 days		As above
Falls	Canada* Home-care	90 days		Proportion of home care residents who experienced one or more falls resulting in requiring medical attention in 90 days
DEPRESSIVE SYMPTOMS / DEPRESSION				
Depressive symptoms				
Depressive symptoms	USA	14 days - but 90-day assessment period	Assessed using Resident Mood Interview [PHQ-9] or Staff Mood Interview [PHQ-9-OV] - can use ACFI data Cornell Scale for depression Q10_R1 response 2-4 (mild, mod, severe interference of depressive symptoms with regular activities)	Proportion of long-term residents with depressive symptoms that interfere with regular activities

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Symptoms of depression without antidepressive	Finland	12 months	As above but not taking N06A* medication	Proportion of long-term residents with depressive symptoms that interfere with regular activities and not dispensed an antidepressant (ATC code N06A*) within a 60-day period in a 12-month period
Prevalence of symptoms of depression	Finland	12 months	As above but over 12 months	Proportion of long-term residents with depressive symptoms that interfere with regular activities in 12 months
Symptoms of depression	Iceland	120 days	As above but 120 days	1. Proportion of long-term residents with depressive symptoms that interfere with regular activities in 120 days
Symptoms of depression without antidepressive	Iceland	120 days	As above but not taking N06A*	Proportion of long-term residents with depressive symptoms that interfere with regular activities and not dispensed an anti-depressant (ATC code N06A*) within the 120-day period
Depression				
Depression prevalence	SHELTER	6 months	As above but 6 months	Proportion of long-term residents with a diagnosis of depression in 6 months

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Depression	Netherlands-LTC and Home Care	12 months	Can use Medical Dx or Mental and Behavioural Dx in ACFI or Cornell Scale for depression Q10_R1 response 3-4 (mod, severe interference of depressive symptoms with regular activities) *. Can also use ICD-10AM hospitalisations for depression (F32, F31.3-F31.5, U79.3)	Proportion of long-term residents with a diagnosis of depression in 12 months. Report for both LTC and Home Care
BOWEL / BLADDER INCONTINENCE				
Low risk residents with bowel / bladder incontinence	USA	7 day look back in 90 days	Use both bladder and bowel incontinence. In ACFI from Q05_R1 urinary incontinent response 2-4, Q05_R2 bowel incontinent response 2-4, or Medical Dx other= urinary or faecal incontinence High risk= cognitive impairment, dependant in mobility	The proportion of low risk long term residents with bowel or bladder incontinence* Recorded in most recent ACFI. Low risk= exclude residents with dementia Dx ACFI (Medical 0500-0532) or Mod-High Cognitive impairment Q06 response 3-4 PAS CIS score or Q02= Immobile

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Incontinence	Finland	12 months	Use both bladder and bowel incontinence as above.	The proportion of long-term residents with bowel or bladder incontinence recorded in most recent ACFI
Occasional / frequent bowel / bladder incontinence	Netherlands-LTC and Home Care	12 months	As above.	As above. Report for both LTC and Home Care
Prevalence of bowel / bladder incontinence	Iceland	120 days	Use both bladder and bowel incontinence as above.	The proportion of long-term residents with bowel or bladder incontinence recorded in most recent ACFI
Prevalence of bladder incontinence	Korea	14 days	Bladder incontinence from ACFI Q05_R1 urinary incontinent response 1-4	The proportion of long-term residents with bladder incontinence recorded in most recent ACFI
Prevalence of bowel incontinence	Korea	14 days	Bowel incontinence from ACFI Q05_R2 bowel incontinent response 1-4	The proportion of long-term residents with bowel incontinence recorded in most recent ACFI
Bowel / bladder incontinence	SHELTER	6 months	Use both bladder and bowel incontinence as above. Exclude palliative care	The proportion of long-term residents with bowel or bladder incontinence, excluding palliative care recorded in most recent ACFI

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
High risk bowel / bladder incontinence	SHELTER	6 months	Use both bladder and bowel incontinence as above. High risk= palliative care, and high risk defined as above	The proportion of high-risk long-term residents with bowel or bladder incontinence, excluding palliative care recorded in most recent ACFI
Low risk bowel / bladder incontinence	SHELTER	6 months	Use both bladder and bowel incontinence as above. Low risk=exclude high risk apart from palliative care	The proportion of low risk long term residents with bowel or bladder incontinence, excluding palliative care recorded in most recent ACFI
Bladder incontinence	Canada* Home-care	60 days	Bladder incontinence from ACFI Q05_R1 urinary incontinent response 1-4	Proportion of home care residents with bladder incontinence recorded in most recent ACFI
COGNITION				
ROSA Indicator: Delirium and/or Dementia *(see Appendix 2)*	Australia	12 months		Proportion of long-term residents with dementia who had an emergency department presentation or hospitalisation for delirium or dementia. *See Appendix 2 for details* Numerator: Number of long-term residents with dementia who had an emergency department presentation or hospitalisation where dementia or delirium were the principal discharge diagnoses for the presentation Denominator: Number of long-term residents with dementia diagnosis

Indicator	Country / Study	Time Period	Comment Difference / Modification	Indicator Data Rules for ROSA Analysis
Cognitive impairment	Finland	6 months	Cognitive impairment using ACFI. Can also use hospitalisation for dementia but will not capture cognitive impairment	Proportion of long-term residents with dementia Dx ACFI (Medical 0500-0532) or Mod-High Cognitive impairment Q06 response 3-4 PAS CIS score in 6-month period
Cognitive impairment	Canada* Home-care	6 months	As above.	Proportion of home care residents 1. Proportion of long-term residents with dementia Dx ACFI (Medical 0500-0532) or Mod-High Cognitive impairment Q06 response 3-4 PAS CIS score in 6-month period

Table 4.2: Anti-anxiety (N05B*) and hypnotic (N05C*) medications available on the PBS

ATC Codes	Medication name
N05BA01	diazepam
N05BA04	oxazepam
N05BA08	bromazepam
N05BA12	alprazolam
N05BE01	buspirone
N05CD02	nitrazepam
N05CD03	flunitrazepam
N05CD07	temazepam
N05CD08	midazolam
N05CF01	zopiclone

Table 4.3: Sweden's Inappropriate Medications Indicator

1. Proportion of LTC residents dispensed a long acting benzodiazepine (N05BA01, N05CD02, N05CD03) in 12 months
2. Proportion of LTC residents dispensed medications with significant anticholinergic properties (moderate to strong anticholinergics)* in 12 months
3. Proportion of LTC residents dispensed tramadol (N02AX02) 12 months
4. Overall: Proportion of LTC residents taking ≥1 inappropriate drug in 12 months

Table 4.4: Moderate - Strong Anticholinergic Medications*

ATC Codes	Medication Description
R03BB05	aclidinium
N04BB01	amantadine
N06AA09	amitriptyline
A03BA01, S01FA01	atropine
A03BA04	belladonna alkaloids
N04AC01	benzatropine
N04AA02	biperiden
R06AB01	brompheniramine
N05AA01	chlorpromazine
N06AA04	clomipramine
N05AH02	clozapine
R06AX02	cyproheptadine
R06AA02	diphenhydramine
C01BA03	disopyramide
N06AA16	dosulepin
N06AA12	doxepin
A03AB02, R03BB06	glycopyrronium
S01FA05	homatropine

ATC Codes	Medication Description
A03BB01	hyoscine (butylbromide or hydrobromide)
N06AA02	imipramine
R03BB01, R01AX03, R03AK04	ipratropium (nebulised)
N06AX03	mianserin
N06AA10	nortriptyline
N05AH03	olanzapine
N04AB02	orphenadrine
G04BD04	oxybutynin
N05AC01	periciazine
R06AB05	pheniramine
N02CX01	pizotifen
N05AB04 (A04AD on PBS)	prochlorperazine
R06AD02 (A04AD on PBS)	promethazine
A03AB05	propantheline
R03BB04	tiotropium
N04AA01	trihexyphenidyl
R03BB07	umeclidinium

* The following are not on PBS and thus not in the estimation but may be used in Australia: Alimemazine R06AD01, chlorphenamine R06AB04, cyclizine R06AE03, cyclopentolate S01FA04, darifenacin G04BD10, dexchlorpheniramine R06AB02, levomepromazine N05AA02, solifenacin G04BD08, tolterodine G04BD07, triprolidine R06AX07, tropicamide S01FA06