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Avoidable Hospital Readmissions

**Report on Australian and International indicators,
their use and the efficacy of interventions to reduce
readmissions**

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Executive summary

All Australian governments have committed to reforms under the *National Health Reform Agreement Addendum*,¹ which include a focus on avoidable hospital readmissions. The Australian Commission on Safety and Quality in Health Care (the Commission) has developed a working definition of an avoidable hospital readmission as follows:

'An avoidable hospital readmission occurs when a patient who has been discharged from hospital (index admission) is admitted again within a certain time interval, and

- The readmission is clinically related to the index admission, and
- The readmission has the potential to be avoided through improved clinical management and/or appropriate discharge planning in the index admission.'

The aim of this literature review was to compare Australian indicators with international indicators and to outline the types of financial incentives employed internationally to reduce readmissions. Specifically this review:

- Provides results of an environmental scan and literature review of Australian and international indicators designed to measure rates of avoidable hospital readmissions.
- Specifies the primary use of the indicator, whether it is for monitoring safety and quality, for hospital performance assessment, or hospital funding or financial incentives.
- Describes clinical and health system interventions explicitly designed to reduce rates of avoidable readmissions and their effectiveness.

This report does not provide information on the outcomes of financial incentive programs on readmission rates, nor does it provide information on outcomes for patients. A further critical appraisal of the literature is required to determine the efficacy of financial incentive programs at reducing readmissions and improving patient outcomes. This literature review does provide information on clinical interventions that have successfully reduced readmissions by addressing patient, clinical and system factors.

Method

The peer reviewed literature search utilised MEDLINE, PubMed and Google Scholar as search engines (2008 onwards). Search terms used were rehospitalisation, hospital readmission, avoidable readmission, unplanned readmission, unexpected readmission, potentially avoidable readmissions, emergency readmission, and return to acute care. In total, the searches yielded 323 peer reviewed papers, of which 196 were identified as relevant. In terms of the international programs, the English NHS program and US Medicare program are both well documented in the grey and peer-reviewed literature, while information for the other programs was largely drawn from secondary sources.

The environmental scan focussed on public and private health organisations/agency databases and websites in Australia and internationally, including the US, UK, New Zealand, Canada, Germany, Denmark and the Netherlands and others. Availability of specific information about the application of readmission indicators in the private sector was limited.

Readmission as a performance metric

Readmission reduction is a common focus of health systems worldwide as they seek to improve the quality and efficiency of healthcare delivery. Hospital readmission rates are commonly used to measure, monitor and improve the quality and safety of the care delivered in hospital and after discharge. Hospital performance for readmissions may be

publicly reported for improved accountability or financial incentives or funding penalties applied – with the goal of reducing the number of readmissions.²

Patient, clinician and system level factors all contribute to the risk of a readmission.³ Areas for quality improvement include reducing the rate of complications and other adverse events arising during the index admission, as well as improving discharge planning, care coordination and the provision of health and other support services in the community.

Australian indicators used for safety and quality monitoring

Australian indicators are predominantly used for local safety and quality monitoring. States and territories use both all-cause and condition-specific readmissions. In Tasmania, the Australian Capital Territory and in the Northern Territory, only all-cause indicators are reported. National condition-specific indicators include the Performance Indicator 23 (PI 23) and Core Hospital-Based Outcome Indicator (CHBOI).

PI 23⁴ is a performance indicator under the *Public Hospital Performance Indicator Framework*.⁵ It measures unplanned or unexpected readmissions after surgery within 28 days for a set of specific surgical procedures, focusing on preventable complications associated with seven procedures, namely: knee replacement, hip replacement, tonsillectomy and adenoidectomy, hysterectomy, prostatectomy, cataract surgery and appendectomy. The CHBOI⁶ comprise a set of indicators recommended for routine monitoring by jurisdictions but not collected or collated nationally. They measure unplanned or unexpected hospital readmission for patients discharged following management for four conditions or procedures, namely: acute myocardial infarction, knee replacements, hip replacements, and paediatric tonsillectomy and adenoidectomy. Readmission time periods are condition-specific.

States and territories utilise a mixture of these indicators with the stated aims of each program as follows:

- **PI 23 (National)** – Measure of whether the government is achieving its objective to provide services that are of a high quality and well-coordinated to ensure continuity of care, specifically in relation to selected surgical procedures.
- **PI 23 (jurisdiction implementation WA)** – Measure of the provision of effective treatment and restorative healthcare in WA; enables measurement and monitoring of performance at an individual hospital level to identify variance with statewide targets and support improvement through a structured review process.
- **PI 23 (jurisdiction implementation SA)** – Measure and monitor performance at an individual hospital level to inform local improvement in line with general targets to improve performance on the previous year.
- **CHBOI4 (Australian Commission of Safety and Quality in Health Care)** – Enable measurement, monitoring and action in relation to unplanned or unexpected readmission for further treatment of the same condition; treatment of a condition related to the one for which the patient was previously hospitalised, or a complication of the condition for which the patient was previously hospitalised.
- **Queensland (Variable Life Adjusted Display) incorporating CHBOI, PI 23 and other indicators** – Measure and monitor performance at an individual hospital level to identify variance with statewide rates and support improvement through a structured review and reporting process.

- **New South Wales (including some CHBO14 / PI 23 measures)** – Decrease the number of unplanned readmissions and increase the focus on the safe transfer of care, coordinated care in the community, and early intervention. Measure and monitor performance at an individual hospital level to identify opportunities for improvement, but with no specific targets or performance levels identified.
- **Victoria (based on CHBO14)** – Enable monitoring of performance at an individual hospital level to identify variance with statewide rates and support improvement through a review and reporting process.

Australian condition-specific readmissions list

In addition to these statewide and national indicators currently in use, a list of avoidable hospital readmissions has been developed by the Australian Commission on Safety and Quality in Health Care and approved by the Australian Health Ministers Advisory Council.ⁱ The list includes readmissions for pressure injuries, infections, surgical complications, respiratory complications, venous thromboembolism, renal failure, gastrointestinal bleeding, medication complications, delirium, cardiac complications, constipation, nausea and vomiting. Condition-specific readmission intervals from the time of the (all-cause) index admission have been defined (refer to Table 1).

Currently, in Australia, no financial incentives or penalties have been applied to readmissions. However, the Independent Hospital Pricing Authority will commence a 24-month analysis of three funding options for the list of avoidable hospital readmissions from July 2019.ⁱⁱ

International indicators

Hospital readmission indicators have been introduced in a number of countries over the last two decades to support quality and safety and to improve healthcare performance. These include both all-cause and condition-specific indicators. Most countries measure readmissions at the hospital level for internal reporting and quality improvement and calculate rates at a regional and national level for benchmarking purposes. All-cause readmissions are measured in England, Scotland the US and Canada for between 28-30 days. In the Netherlands, hospital readmission has been a long-standing primary care indicator and the country introduced all-cause readmission rates as an official quality indicator in hospitals in 2016.⁷

The following countries have implemented condition – or procedure – specific indicators: the US, Canada, Denmark, England and Germany. The US measures acute myocardial infarction (AMI), heart failure, pneumonia, chronic obstructive pulmonary disease (COPD), stroke and readmissions for the following procedures: knee replacement, hip replacement and coronary artery bypass graft (CABG) within 30 days. Canada measures AMI, CABG and percutaneous coronary intervention within 30 days. Denmark measures heart failure, pneumonia, COPD, stroke, dehydration, obstipation, gastroenteritis, nutritional anaemia, arthritis, cystitis and fracture readmissions within 30 days. England measures fractured proximal femur, stroke, hysterectomy, primary hip replacement surgery within 28 days. Germany reports readmission indicators for almost all conditions with exceptions defined at the DRG level.²

ⁱ <https://www.safetyandquality.gov.au/our-work/indicators/avoidable-hospital-readmissions/>

ⁱⁱ https://www.ihsa.gov.au/sites/default/files/publications/pricing_framework_for_australian_public_hospital_services_2019-20.pdf

International financial incentive programs

A number of countries have introduced financial incentives in relation to hospital readmissions, including Germany, England and the US. Denmark has a mechanism of indirectly incentivising reduced readmissions. Canada and Scotland do not currently have incentive programs.

Financial incentives commonly include penalties for hospitals with higher numbers or rates of readmissions. Penalties can be in the form of non-reimbursement for an individual readmission, a reduction of reimbursement or even no reimbursement and a penalty for the hospital. The systems examined as part of this review vary considerably in terms of how performance is calculated and how penalties are applied. The details of the programs are:

Germany: Germany was the first to introduce financial incentives in 2004. The system operates at an individual patient level, whereby the patient records of the first admission and the relevant readmission are merged into a single case, and the hospital is paid as if there had been only one admission. Consequently, the hospital receives payment for only one DRG. Additional surcharges apply if the combined length of stay of the first admission and the readmission exceed the DRG specific length of stay threshold. Relevant readmissions include those where the diagnosis is the same as the original diagnosis, or is associated with a complication of the original admission, or relates to admission for surgical management of an original medical admission.⁸

England: In 2011, a policy of non-payment of any readmissions occurring within 30 days of discharge from an elective admission was implemented. Since 2012, this policy has been modified to use locally agreed benchmark rates of hospital readmissions, with non-payment applying to readmissions above hospital-specific readmission rates. The implementation of this policy at the local level also involves a clinical review process to determine the avoidability of the readmission. The incentives are based on all-cause readmissions (not condition- or procedure-specific measures). The savings are directed locally into improvement activities at a hospital and community level.⁹

United States (Medicare population)ⁱⁱⁱ: Introduced in 2012, the Hospital Readmission Risk Reduction Program (HRRP) for US Medicare patients also relies on benchmarks which are determined as expected risk-adjusted readmission rates for each hospital.¹¹⁻¹³ Hospitals with readmission levels higher than their benchmark rate are financially penalised by a fixed percentage amount across all their admitted patient episodes. Conditions selected for inclusion in the program are based on the primary discharge diagnosis.³ The readmission is defined as an admission to an Inpatient Prospective Payment System (IPPS) acute care hospital within 30 days of discharge from the same or a different IPPS acute care hospital.¹⁴ There are over 3,000 hospitals covered by the IPPS in the US.¹⁵

Denmark: Hospital reimbursement may be reduced at a regional level for hospitals that increase their 'treatment intensity', measured as the sum of the Diagnosis Related Group (DRG) value divided by the total number of patients. This approach provides an indirect incentive to reduce readmissions. Some types of readmissions are also funded through block grants, again creating an indirect incentive to reduce readmissions.²

Clinical and health system interventions to reduce hospital readmissions

A considerable body of literature has explored the complex range of factors contributing to hospital readmissions and to what extent these are avoidable or unavoidable. Many have found that inadequate transitions of care between hospital and the home contribute to unplanned readmissions and this has therefore been the subject of considerable research to determine the effectiveness of various interventions.¹⁶⁻¹⁹

ⁱⁱⁱ Maryland operates a distinct payment system and has implemented the Maryland Readmissions Reduction Program ¹⁰

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Internationally, and specifically in the US, clinical interventions have been developed to reduce avoidable readmissions by addressing patient, clinician and system factors.¹⁶⁻¹⁹ In the US, several national^{20,21,22} and local intervention programs are funded.^{23,24}

There is evidence that these programs can be effective in reducing readmissions. Specifically, there is evidence for the effectiveness of interventions involving: improving transitions of care; delivering multicomponent interventions to address discharge planning; better medication reconciliation; and patient and carer education regarding self-management and follow-up. Interventions that begin in hospital and continue after discharge are the most effective.^{16, 17, 25-27} Condition-specific interventions that have demonstrated effectiveness in reducing readmissions have been developed for heart failure,²⁸⁻³¹ COPD,³²⁻³⁶ surgery,^{37, 38} and pneumonia.³⁹⁻⁴²

In addition to intervention programs, several tools have been developed to enable prediction of readmission risk. However, these tools have been shown to have poor discriminant validity, are expensive, and have only been investigated in a small number of patient types.⁴³⁻⁴⁵

Comparison of Australian and international indicators

Unlike in Australia, most international indicators include all-causes readmission associated with the given index admission diagnosis. A limited number of the condition-specific readmissions align with the Australian list of diagnoses, including heart failure (US, Scotland) and pneumonia (US), and there is alignment in general terms reflecting readmission risk associated with, for example, surgical procedures and cardiac conditions.

In Denmark the readmission policy for adults 67 years old and older is based on the readmission diagnoses, some of which overlap with the Australian list, for example, obstipation (severe constipation), pneumonia, cystitis, heart failure, gastroenteritis. In Germany, only readmissions for the same reason; for complications of treatment; or for surgical treatment of a previous medical condition, are considered relevant.

With the exception of Germany, other countries make information on readmissions available to the public, with the aim of motivating hospitals to reduce readmissions. In comparison, the level of public reporting in Australia is limited. NHS England has made data publicly available since 1998. Denmark introduced public reporting in 2006, four years after initiating their readmission measurement policy in 2002. In the US, public reporting of condition- and procedure-specific readmission indicators was introduced in 2010, with financial incentives introduced in 2012 under the Hospital Readmission Reduction Program.

Reporting is facilitated in jurisdictions with mature and integrated data systems and unique patient identifiers, such that readmissions to any hospital, not just the original admitting hospital, can be included. This is a limitation of systems in some states and territories in Australia.

Conclusion

Internationally, indicators for readmissions have been developed to include all-cause readmissions associated with the index readmission. In a similar way, many jurisdictions in Australia are currently measuring and reporting on unplanned readmissions for some surgical procedures and conditions and monitoring performance against statewide targets. A number of countries have gone further and introduced financial incentives in relation to hospital readmissions, including Germany, England and the US. Denmark has a mechanism of indirectly incentivising reduced readmissions.

Australia does not currently have financial incentives for readmissions, however the Independent Hospital Pricing Authority will commence a 24-month analysis of three funding options for the Commission's list of avoidable hospital readmissions from July 2019. The Commission's national list of avoidable hospital readmissions is based on a readmission diagnosis of pressure injuries, infections, surgical complications, respiratory complications, venous thromboembolism, renal failure, gastrointestinal bleeding, medication complications, delirium, cardiac complications, constipation, nausea and vomiting. For each condition, the relevant time interval from the index admission (all-cause) has been clinically determined.

Evidence exists for programs that improve transitions of care, discharge planning, medication reconciliation; and patient and carer education regarding self-management and follow-up. Interventions that begin in hospital and continue after discharge are the most effective. As such, this provides a useful guide to the system in Australia for improving patient care and outcomes.

1. Introduction

1.1 Background and purpose

All Australian governments have committed to reforms under the *National Health Reform Agreement Addendum*,¹ which include a focus on avoidable hospital readmissions. These reforms aim to integrate safety and quality into the pricing and funding of Australian public hospitals in a way that:

- Improves patient outcomes
- Provides an incentive in the system to provide the right care, in the right place, at the right time
- Decreases avoidable demand for public hospital services
- Signals to the health system the need to reduce instances of preventable poor quality patient care, while supporting improvements in data quality and information available to inform clinicians' practice.

The reforms focus on reducing sentinel events, hospital-acquired complications and avoidable hospital readmissions.

At the request of the Australian Health Ministers' Advisory Council (AHMAC), and in line with the *National Health Reform Agreement Addendum*, the Australian Commission on Safety and Quality in Health Care (the Commission) – the government agency that leads and coordinates national improvements in safety and quality in health care across Australia – developed the list of conditions considered to be avoidable hospital readmissions.

This list of conditions, and the related condition-specific time intervals was developed in consultation with clinical and consumer experts, taking into consideration:

- The literature on avoidable hospital readmissions, and
- Australian public hospital data, through analysis of the admitted patient care national minimum data set.

In providing advice about avoidable hospital readmissions, the Commission has adopted a working definition of an avoidable hospital readmission as follows:

'An avoidable hospital readmission occurs when a patient who has been discharged from hospital (index admission) is admitted again within a certain time interval, and

- *The readmission is clinically related to the index admission, and*
- *The readmission has the potential to be avoided through improved clinical management and/or appropriate discharge planning in the index admission.'*

To be included in the list, conditions have to be:

- Related to the index admission
- Avoidable by improved clinical management in the initial admission and/or appropriate discharge planning and follow up, and
- Measurable through coded data generated from the patient medical record.

The list contains conditions that all Australian governments, through the AHMAC, have agreed are avoidable hospital readmissions (hereafter referred to as the Australian list of avoidable hospital readmissions), refer to Table 1.

Further work to refine and plan application of the readmission indicators includes this environmental scan and literature review. The findings of the review have informed the Independent Hospital Pricing Authority's section on pricing and funding of avoidable hospital readmissions in their *Consultation Paper on the Pricing Framework for Australian Public Hospitals 2019-20*.

Table 1. Australian list of avoidable hospital readmissions

Readmission condition	Readmission diagnosis	Readmission interval
Pressure injury	Stage III ulcer	14 days
	Stage IV ulcer	7 days
	Unspecified decubitus and pressure area	14 days
Infections	Urinary tract infection	7 days
	Surgical site infection	30 days
	Pneumonia	7 days
	Bloodstream infection	2 days
	Central line and peripheral line associated bloodstream infection	2 days
	Multi-resistant organism	2 days
	Infection associated with devices, implants and grafts	90 days
	Infection associated with prosthetic devices, implants and grafts in the genital tract or urinary system	30 days
	Infection associated with peritoneal dialysis catheter	2 days
	Gastrointestinal infections	28 days
Surgical complications	Postoperative haemorrhage/ haematoma	28 days
	Surgical wound dehiscence	28 days
	Anastomotic leak	28 days
	Pain following surgery	14 days
	Other surgical complications	28 days
Respiratory complications	Respiratory failure including acute respiratory distress syndromes	21 days
	Aspiration pneumonia	14 days
Venous thromboembolism	Venous thromboembolism	90 days
Renal failure	Renal failure	21 days
Gastrointestinal bleeding	Gastrointestinal bleeding	2 days
Medication complications	Drug related respiratory complications or depression	2 days
	Hypoglycaemia	4 days
Delirium	Delirium	10 days
Cardiac complications	Heart failure and pulmonary oedema	30 days
	Ventricular arrhythmias and cardiac arrest	14 days
	Atrial tachycardia	14 days

Readmission condition	Readmission diagnosis	Readmission interval
	Acute coronary syndrome including unstable angina, STEMI and NSTEMI	30 days
Other	Constipation	14 days
	Nausea and vomiting	7 days

1.2 Key concepts

Hospital readmission and quality of care

A hospital readmission occurs when a patient has been discharged from hospital and is admitted again within a certain time interval.

Generally, hospital readmissions can be considered in two broad categories:

1. readmissions that relate to routine care, for example those that relate to necessary treatments such as chemotherapy or dialysis, and are required to ensure safe clinical care (also called planned readmissions), and
2. readmissions that are unplanned and potentially avoidable.

Readmission reduction is a common focus of health systems worldwide as they seek to improve the quality and efficiency of healthcare delivery, in the face of rising healthcare costs and increasing prevalence of chronic disease. The focus is understandable given the impact of hospital readmission on patients and carers, and the cost savings if avoidable readmissions can be prevented. Indeed, the interest in readmissions as a measure of quality of care spans several decades, and researchers have endeavoured to describe the relationship between quality of care and readmission, as well as other outcome and process measures.³

Various factors contribute to the risk of readmission, including at a patient, clinician and system level. These include, for example:

- Patient level – age, clinical instability and comorbidities, health literacy, capacity for self-care, social support, financial capacity
- Clinician level – lack of compliance with treatment guidelines, lack of adequate discharge planning
- System level – lack of structured discharge processes including medication reconciliation, lack of integration in the broader health system.

High rates of hospital readmission can indicate low-quality care during a prior hospital stay or poor care coordination following discharge. Therefore, for an individual hospital, measurement of readmissions can highlight areas for quality improvement, addressing factors such as complications and adverse events.

Defining readmission indicators

All readmission measures, whether individual or rate-based, require a clear definition, aligned with the objective of the policy (refer to Table 2). The definition comprises the following elements³:

- the original admission (index/initial/first)
- the subsequent admission (readmission/second)
- the time-period between the admissions.

Both admissions can be specified in terms of inclusion or exclusion criteria. A relevant index and second admission can be defined in terms of:

- the patient’s clinical characteristics (for example, the diagnosis)
- demographic characteristics (for example, age and gender)
- the specialty where the patient was treated
- the admission type (for example, emergency or elective admission).

If, for example, a policy aims to reduce readmissions associated with particular high-risk or high-prevalence diagnoses or procedures, these may be specified in the index admission definition (for example, heart failure, pneumonia, knee replacement, CABG) and any readmissions (all-cause) following this index readmission within a specified time interval are captured. However, in other cases, certain readmission diagnoses may flag issues with care (for example, urinary tract infection, and delirium). These are so-called ‘condition’ or ‘procedure’ specific readmission indicators, and the index readmission may be ‘all-cause’. In this example, the patient may have presented for any reason at the index admission, but they are flagged as a readmission for specific conditions or procedures.³

Table 2. Major components to the definition of a readmission

Component	Sub-component	Notes
Index admission	Length of stay	<ul style="list-style-type: none"> • What is a hospital admission? • Same day or multi-day stay? • Elective or emergency • Medical or surgical • Hospital transfer • Discharge against medical advice • Deaths (in-hospital and post-discharge)
	Type	
	Mode of separation	
Time to readmission		7 days to 365 days
Readmission	Length of stay	<ul style="list-style-type: none"> • What is a hospital admission? • Same-day or multi-day stay • All or, <ul style="list-style-type: none"> ○ Planned or unplanned ○ Other (emergency, unexpected, avoidable) ○ Complication of a previous admission ○ Recurrence of a disease process ○ Unrelated new diagnoses • Readmission to the same hospital • Readmission to any hospital
	Type	
	Catchment	

The time period between the initial admission and readmission is specified to determine whether a second admission is a relevant readmission and not another primary admission, and whether the readmission is more likely to be associated with the care process. For example, there is evidence that shorter timeframes may be more likely associated with processes of care within the hospital, and longer timeframes with care delivered (or not delivered) in the community. Certain timeframes are also more indicative for certain conditions. Time can be measured from discharge for the index admission, or from the first day of the index admission.⁴⁶

Readmission indicators are also defined in terms of the destination of the readmission (i.e., to the same or a different hospital). It is preferable to capture all readmissions and thus to enable identification of readmissions whether they are to the original hospital or any other hospital. Data linkage across the health system is required to achieve this and is a limitation of some systems.¹⁰

Data linkage capacity is an important requirement for accurately reporting readmissions. Some jurisdictions are limited to reporting same-hospital readmissions, which has been shown to underestimate unplanned readmissions.¹⁰

Readmission as a performance metric

Avoidable readmissions may result from a variety of healthcare factors including inadequate care or unmet need during the admission, premature hospital discharge, inadequate preparation of the patient or the family for discharge, complications that become apparent after discharge or poor care transitions back to the community.⁴⁷ However, these may still be influenced by patient characteristics such as age, comorbidities and health literacy; social circumstances such as socioeconomic status, marital status and social supports; and broader health system factors such as access to primary care. Risk-adjustment is one method used to account for 'unavoidable' comorbidities (for example, using the Charlson or Elixhauser indices) and patient factors (such as age, sex and socioeconomic status) that may make a return to acute care more or less likely. This approach reflects the concept that, in many cases, appropriate clinical treatment reduces the risk of poor health outcomes for patients but may not avoid those outcomes.

Researchers have endeavoured to establish the proportion of readmissions that are avoidable. A systematic review and subsequent meta-analysis by van Walraven found that the proportion of readmissions deemed avoidable ranged widely (from 5% to 59%) with a mean of 23%, thus confirming the potential for improvement, but reflecting the wide variability in health systems and methods of determining avoidability.^{48, 49} In the US, nearly 20% of all Medicare discharges had a readmission within 30 days in 2009, with an estimated 12% being potentially avoidable.⁵⁰ In the UK, pooling studies only from the UK provided a figure of 15.6% of readmissions that could be avoided.⁵¹ In light of this variability, the establishment of absolute targets for hospital readmissions has not been widely supported.

Researchers have also sought to establish what conditions contribute most to avoidable readmissions; however it appears no single diagnostic group or set of conditions stands out as being responsible for a high proportion of admissions.⁵¹

Studies of avoidable readmissions have also sought to isolate 'system factors' from 'clinician factors', with 15% attributable to system factors such as inadequate discharge planning, lack of care coordination, inadequate end-of-life care and factors such as communication systems, and over 40% attributable to clinician factors such as premature discharge, drug-related adverse events, and diagnostic and measurement errors.⁵¹

Design principles of successful financial incentive programs have been developed, specifically for when payment is linked to hospital rates of readmission: ⁵²

- Programs *'should initially focus on those outcomes for which a quality failure results in an increase in payment'*, that is where there is currently a perverse incentive for poor outcomes.
- *'Financial incentives should be substantial enough to induce hospital behaviour change'*, that is they should reflect the considerable effort and investment required to achieve the necessary changes and outcomes.
- Programs should *'focus on outcomes that are amenable to quality improvement efforts'*, that is they should be linked to outcomes that are within a hospital's influence to control and improve.
- *'Outcome standards should be empirically derived based on performance levels that are being achieved by the best-performing hospitals'* that is the prescribed outcomes are viewed as realistic and achievable.
- Programs *"should not mandate the specific care processes that hospitals use to achieve the paying-for-outcome standards"*, that is hospitals should be able to respond in a way that aligns with best clinical practice within the context of their service and their community.
- *'Financial rewards and penalties should be determined based on a hospital's overall relative outcome performance and applied as an overall hospital payment adjustment, rather than as a patient-specific payment adjustment.'*
- *'The determination of the relative performance of a hospital must be risk adjusted to take into account severity of illness'.*
- *'Methodologies must be transparent, clinically precise and comprehensive, with a uniform and consistent structure.'*

2. Methodology

A narrative literature review was undertaken comprising an environmental scan and grey literature search, and review of the peer reviewed literature.

2.1 Environmental scan and grey literature review

The environmental scan focussed on public and private health organisations and agency databases and websites in Australia and internationally, including the US, the UK, New Zealand, Canada, Germany, Denmark and the Netherlands, and other countries identified in consultation with the Commission. The search included the websites outlined in Table 3.

The websites were searched using the keywords presented in Table 4. Grey literature findings were used to summarise condition-specific indicator programs and financial incentive programs for Australian and international jurisdictions.

Table 3. Australian and international organisations and agency databases

Country	Organisation / agency websites and databases
Australia	<p>Australian Institute of Health and Welfare (AIHW): National Hospitals Data Collection</p> <p>Australian Commission on Safety and Quality in Health Care (ACSQH): Core, Hospital-based Outcome Indicators (CHBOI) Australian Bureau of Statistics National Healthcare Agreement (NHA) Health Roundtable</p>
Australian states and territories	<p><i>Australian Capital Territory</i> Australian Capital Territory Health</p> <p><i>New South Wales</i> Clinical Excellence Commission Bureau of Health Information Agency for Clinical Innovation</p> <p><i>Northern Territory</i> Northern Territory Department of Health</p> <p><i>Queensland</i> Patient Safety and Quality Improvement Service</p> <p><i>South Australia</i> Department of Health South Australia</p> <p><i>Tasmania</i> Department of Human Services, Tasmanian</p> <p><i>Victoria</i> Department of Health and Human Services (DHHS)</p> <p><i>Western Australia</i> Department of Health Western Australia</p>
Canada	<p>Canadian Institute for Health Information (CIHI) Canadian Patient Safety Institute Statistics Canada</p> <p><i>Ontario</i> Quality Compass (Ontario)</p>

Country	Organisation / agency websites and databases
	Health Quality Ontario <i>Alberta</i> Health Quality Council of Alberta
Europe	ECRI Institute European Observatory on Health Systems and Policies (HSPM) Global Health Observatory data repository International Organisation for Standardization (ISO) Organisation for Economic Cooperation and Development (OECD) Picker Institute Europe WHO Europe World Health Organisation (WHO)
New Zealand	Health Quality and Safety Commission New Zealand (HQSCNZ) Health Quality Measures New Zealand (HQMNZ) Ministry of Health New Zealand
United Kingdom	Care Quality Commission (CQC) Dr Foster Health and Social Care, Northern Ireland Healthcare Improvement Scotland Information Services Division, Scotland National Health Service England (NHS) National Health Service Scotland National Health Service Wales National Institute for Health and Clinical Excellence (NICE) Northern Ireland Department of Health Nuffield Trust Regulation and Quality Improvement Authority (RQIA) The King's Fund UK Statistics Authority
United States	Agency for Healthcare Research and Quality (AHRQ) American Hospital Association American Institute of Healthcare Improvement Centers for Disease Control and Prevention (CDC) Kaiser Family Foundation Kaiser Permanente Medicare Hospital Compare, United States National Committee for Quality Assurance National Quality Forum (NQF) National Quality Measures Clearinghouse (NQMC), AHRQ Pan American Health Organisation (PAHO) RAND Corporation The Centers for Medicare and Medicaid Services (CMS) The Commonwealth Fund The Joint Commission

2.2 Peer reviewed literature

A broad search strategy was implemented using key words as identified in Table 4. The peer reviewed literature search utilised MEDLINE, PubMed and Google Scholar as search engines (2008 onwards). Search terms used were rehospitalisation, hospital readmission, avoidable readmission, unplanned readmission, unexpected readmission, potentially avoidable readmissions, emergency readmission and return to acute care. In total, the searches yielded 323 peer reviewed papers, of which 196 were identified as relevant. In terms of the international programs, the English NHS program and US Medicare program are both well documented in the grey and peer-reviewed literature, information for the other programs was I drawn mainly from secondary sources.

Table 4. Keyword search terms

Readmission	Indicators	Specified conditions	Quality improvement performance measurement / management
Rehospitalisation Hospital readmission Avoidable readmission Unplanned readmission Unexpected readmission Potentially avoidable readmissions Emergency readmission Return to acute care	Indicators Quality measures Quality indicators Health indicators Hospital performance	Pressure injury Infections Surgical complications Venous thromboembolism Respiratory complications Renal failure Gastrointestinal bleeding Medication complications Delirium Cardiac complications Constipation Nausea and vomiting	Readmission reduction Intervention programs Interventions Evaluation

In relation to the interventions search, the search was limited to studies published within the past five years (2013 to 2018), with a particular focus on systematic reviews and large scale randomised controlled trials. Table 5 indicates the inclusion criteria. Of the 35 systematic reviews identified, 14 focussed on general all-cause readmissions, 11 on cardiac-related conditions such as heart failure and AMI, three on pneumonia, two on COPD, and one on surgical-related conditions. There were also systematic reviews on interventions targeted at readmissions in different settings and age groups such as psychiatric facilities (two papers), intensive care unit (ICU) (one paper), paediatric patients (one paper), and in the elderly (one paper) which supplemented findings.

In relation to outcomes of incentive-based programs, these were found in literature published after 2011 and are related mainly to the US HRRP.

In total, the searches yielded 323 peer reviewed papers. Through initial screening, 196 were identified as relevant to the research questions and were categorised in the following areas:

- General reviews of readmission reduction policies, indicators and programs (not just condition or procedure specific) including reviews addressing the validity or value of indicators for quality improvement and performance management
- Evaluations of interventions to reduce hospital readmissions.

Table 5. Inclusion criteria

Domain	Include
Population	Patients readmitted to hospital The following conditions were the initial focus but studies were not excluded if they more broadly addressed relevant issues. <ul style="list-style-type: none"> • Pressure injury • Infections • Surgical complications • Respiratory complications • Venous thromboembolism • Renal failure • Gastrointestinal bleeding • Medication complications • Delirium • Cardiac complications • Constipation • Nausea and vomiting
Study focus	<ul style="list-style-type: none"> • Hospital readmission as a focus of the study • Report a condition-specific indicator from the list provided • Report regarding readmission indicators • Report readmission as an outcome of an intervention • Use administrative data • Implementation of readmission indicators • Interventions programs to reduce readmission for listed conditions • Evaluation of intervention programs
Data collection method	<ul style="list-style-type: none"> • Administrative data
Study type	<ul style="list-style-type: none"> • Reviews (systematic, narrative) • Randomised Controlled Trial • Cohort • Cross-sectional • Case studies

3. Australian indicators for unplanned condition-specific readmissions

This section provides an overview of the readmission policies, programs and indicators in place currently within Australia. This information was gained from the review of national and state and territory public health system websites. While the focus is on unplanned / avoidable readmissions relating to specific conditions, procedures and complications, other indicators are mentioned where contextually relevant, including all-cause readmission indicators.

Index and readmission diagnoses of other existing Australian readmission indicators are mapped against the Commission's list of avoidable hospital readmissions (refer to [Appendix 1](#)). Direct comparisons between these indicators are not possible due to the differences in methodology and purpose of the indicators as highlighted in the report: however, the mapping provides a useful overview of how these indicators are applied nationally.

Specifically, the Australian list of conditions has been developed for the integration of safety and quality into pricing and funding for Australian hospital services. The other existing indicators all share the high-level purpose of improving quality and safety, and measuring performance to support improvement, although this does vary across Australia.

3.1 National readmission indicator (PI 23)

Since 2008, the *National Healthcare Agreements* in Australia have included the indicator 'Unplanned or unexpected readmissions after surgery (PI 23)⁴ for a set of specific surgical procedures, focusing on preventable complications associated with seven procedures (knee replacement, hip replacement, tonsillectomy and adenoidectomy, hysterectomy, prostatectomy, cataract surgery and appendectomy).

PI 23 is a performance indicator under the *Public Hospital Performance Indicator Framework*.⁵ It is used as a measure of whether the government is achieving its objective to provide services that are of high quality and well-coordinated to ensure continuity of care. The goal is for low or decreasing rates: however, currently there are no targets or performance incentives associated with these measures at a national level. Some states and territories use the indicators to apply local targets and manage performance (refer to [Section 3.4](#)). 'Selected unplanned hospital readmission rates' is defined as the rate at which patients unexpectedly return to the same hospital within 28 days for further treatment where the original admission involved one of the above procedures, and the readmission is identified as a post-operative complication as coded for one of 18 readmission diagnoses in Table 6.⁵

These readmission diagnoses are mapped against the Australian list of avoidable hospital readmissions in [Appendix 1](#). This comparison highlights the increased focus on specific clinical outcomes in the Australian list of avoidable hospital readmissions, including specific infection outcomes associated with surgery and other more specific surgical outcomes such as hemorrhage/haematoma, surgical wound dehiscence, anastomotic leak, pain following surgery and aspiration pneumonia. The mapping also shows that the timeframes for some of the measures are shorter than those described for the PI 23, reflecting the evidence for timeframes for complications associated with inpatient care.⁴⁶

Data for the PI 23 indicator are extracted from the *National Morbidity Database* and reported for each state and territory as rates per 1,000 per procedure. Western Australia analyses and contributes its data separately. The data are publicly reported each year by the Australian Institute of Health and Welfare (AIHW), in the *AIHW Admitted Patient Care*

Reports (2015–16).⁵³ The data are also reported by the Australian Government Productivity Commission, in a report published in January 2018 (refer to Table 7).⁵ The rates are not risk adjusted, but the analysis is conducted by hospital peer group, Indigenous status, remoteness and socioeconomic status. While the *National Hospital Morbidity Database* includes episodes of care for virtually all hospitals in Australia, the PI 23 indicator is only publicly reported for public hospitals. Data for these indicators are not reported on the [My Hospital](#) website as the methodology limits comparison of rates between hospitals.

Table 6. Readmission diagnoses included in the numerator for the PI 23 Indicator

Complications associated with readmission	
•	Complications following infusion, transfusion and therapeutic injection (T80)
•	Complications of procedures, not elsewhere classified (T81)
•	Complications of cardiac and vascular prosthetic devices, implants and grafts (T82)
•	Complications of genitourinary prosthetic devices, implants and grafts (T83)
•	Complications of internal orthopaedic prosthetic devices, implants and grafts (T84)
•	Complications of other internal prosthetic devices, implants and grafts (T85)
•	Failure and rejection of transplanted organs and tissues (T86)
•	Complications peculiar to reattachment and amputation (T87)
•	Other complications of surgical and medical care, not elsewhere classified (T88)
•	Postprocedural endocrine and metabolic disorders, not elsewhere classified (E89)
•	Postprocedural disorders of the nervous system, not elsewhere classified (G97)
•	Postprocedural disorders of the eye and adnexa, not elsewhere classified (H59)
•	Postprocedural disorders of the ear and mastoid process, not elsewhere classified (H95)
•	Postprocedural disorders of the circulatory system, not elsewhere classified (I97)
•	Postprocedural respiratory disorders, not elsewhere classified (J95)
•	Postprocedural disorders of the digestive system, not elsewhere classified (K91)
•	Postprocedural musculoskeletal disorders, not elsewhere classified (M96)
•	Postprocedural disorders of the genitourinary system, not elsewhere classified (N99).

Note: For mapping against the Australian list of avoidable hospital readmission measures, see [Appendix 1](#)

The data in Table 7 show considerable variability between the states and territories, and show the highest national readmission rates for paediatric tonsillectomy and adenoidectomy (34.7 per 1,000 separations) and hysterectomy (33.4 per 1,000 separations). The lowest readmission rate is for cataract extraction (3.2 per 1,000 readmissions).

Table 7. Selected unplanned hospital readmissions rates for public hospitals 2011–12 to 2015–16 (rate per 1,000 admissions)⁵

	<i>NSW</i>	<i>Vic</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas</i>	<i>NT</i>	<i>ACT</i>	<i>Aust</i>	<i>Aust no.</i>
	<i>rate per 1000 separations</i>									
2011–12										
Knee replacement	18.5	19.1	26.9	17.7	17.4	np	np	np	20.0	204
Hip replacement	17.7	17.4	14.2	23.7	22.5	np	np	np	17.7	129
Tonsillectomy and Adenoidectomy	24.8	23.7	32.6	33.7	33.3	60.6	np	18.3	27.8	557

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	<i>NSW</i>	<i>Vic</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas</i>	<i>NT</i>	<i>ACT</i>	<i>Aust</i>	<i>Aust no.</i>
	<i>rate per 1000 separations</i>									
Hysterectomy	27.9	32.4	33.2	28.1	31.5	28.1	np	np	30.9	281
Prostatectomy	22.7	26.4	36.3	25.9	50.3	np	np	np	27.2	181
Cataract surgery	2.8	3.2	4.0	3.3	2.6	7.2	np	–	3.2	156
Appendectomy	23.5	24.5	20.4	36.0	31.3	29.8	49.6	26.3	24.7	623
2012–13										
Knee replacement	21.6	15.1	35.1	18.6	22.3	37.0	np	–	22.4	227
Hip replacement	18.0	16.1	16.1	19.3	15.9	29.6	np	12.9	17.5	130
Tonsillectomy and Adenoidectomy	30.3	29.1	35.7	37.5	42.4	51.9	83.0	44.7	33.1	673
Hysterectomy	31.6	25.9	31.8	28.7	43.6	52.0	np	23.1	30.6	277
Prostatectomy	27.3	26.5	40.7	28.9	33.9	57.8	np	np	31.1	198
Cataract surgery	3.4	3.0	4.6	2.9	2.6	4.4	6.0	0.9	3.4	167
Appendectomy	22.4	22.8	22.0	27.0	29.0	26.5	43.5	20.4	23.1	584
2013–14										
Knee replacement	21.4	21.2	31.3	18.5	34.4	33.8	np	30.6	23.7	264
Hip replacement	18.1	16.3	19.3	20.9	24.8	14.9	–	18.4	17.8	145
Tonsillectomy and Adenoidectomy	28.5	30.1	43.4	35.7	45.4	35.3	58.5	27.3	33.0	683
Hysterectomy	28.6	26.0	34.8	30.9	37.3	8.4	np	64.1	29.8	281
Prostatectomy	25.8	19.8	30.4	29.3	29.6	30.5	np	np	25.5	165
Cataract surgery	2.7	3.7	4.3	1.7	2.1	2.1	9.3	–	3.1	162
Appendectomy	18.3	20.3	19.7	25.7	32.9	19.1	34.9	30.2	20.3	538
2014–15										
Knee replacement	19.4	19.4	36.3	18.6	28.1	18.3	np	7.0	22.7	265
Hip replacement	16.9	16.1	23.5	7.1	16.7	21.6	np	8.5	17.1	151
Tonsillectomy and Adenoidectomy	31.7	26.0	49.5	53.9	41.3	34.9	105.0	31.3	35.7	752
Hysterectomy	28.6	28.4	40.9	25.5	38.6	27.5	np	78.3	31.6	301
Prostatectomy	23.0	23.4	33.0	13.0	12.6	–	np	np	24.3	155
Cataract surgery	2.5	2.9	5.1	2.5	3.1	4.1	10.1	0.9	3.1	167
Appendectomy	20.5	19.8	23.9	26.7	35.1	36.5	37.7	14.3	22.0	583
2015–16										
Knee replacement	19.5	19.3	31.4	27.5	23.3	36.4	55.6	9.4	23.1	279
Hip replacement	17.3	19.1	20.0	20.9	21.9	39.0	23.8	–	19.2	176
Tonsillectomy and Adenoidectomy	27.1	23.9	56.7	52.3	53.7	46.0	85.7	30.6	34.7	746
Hysterectomy	38.3	25.9	35.0	33.6	42.9	36.3	51.5	48.8	33.4	319
Prostatectomy	23.6	20.7	42.3	29.2	40.4	10.5	37.0	27.8	26.5	174
Cataract surgery	2.7	2.8	4.6	2.6	1.6	8.8	6.6	2.0	3.2	176
Appendectomy	18.8	19.3	20.2	34.1	32.5	35.0	43.3	12.2	20.9	562

Abbreviations: np = not published; – nil or rounded to zero

NOTES:

- (a) Only the first readmission following surgery is included. A readmission was not included if there was an intervening unrelated separation.
- (b) There are some difficulties in identifying readmissions that were unplanned. The indicator is more likely to be an under-estimate because: it identifies only those patients readmitted to the same hospital, so does not include patients who go to another hospital; episodes of non-admitted patient care provided in outpatient clinics or emergency departments which may have been related to a previous admission are not included; and the unplanned and/or unexpected readmissions are limited to those having a principal diagnosis of a post-operative adverse event. This does not include all possible unplanned/unexpected readmissions.
- (c) Cells have been suppressed to protect confidentiality where the presentation could identify a patient or a service provider or where rates are more likely to be highly volatile, for example where the denominator is very small. Rates were suppressed where the numerator was less than 5 and/or the denominator was less than 200. Rates were suppressed where the numerator was zero and the denominator was less than 200. Counts were suppressed when the number was less than 5.
- (d) Total rates and numbers for Australia do not include WA.

Source AIHW National Hospital Morbidity Database; WA Health (unpublished).

3.2 Core Hospital-Based Outcome Indicators (CHBOI4)

The Australian Commission on Safety and Quality in Health Care oversees a *National Indicator's Project* with the objectives of:⁵⁴

- Enhancing the quality and safety focus in national health data standards and indicators
- Driving improvement in safety and quality at local levels through fostering supportive feedback
- Improving transparency and accountability in reporting on healthcare safety and quality.

Amongst these indicators is the Core Hospital-Based Outcome Indicators (CHBOI)⁶, which were released in 2015 and are a set of indicators recommended for routine monitoring by jurisdictions but not collected or collated nationally. The indicators can be generated by jurisdictions or private hospital ownership groups and reported back to provider facilities using the statistical process control charts generated by the software. The emphasis is on generating meaningful and actionable data at a local level to inform improvement.

The CHBOI4 indicator category focusses on unplanned/unexpected hospital readmission for patients discharged following management for four conditions/procedures:⁶

- Acute myocardial infarction
- Knee replacements
- Hip replacements
- Paediatric tonsillectomy and adenoidectomy.

For each of these conditions, unplanned/unexpected readmission refers to an unexpected admission for: further treatment of the same condition; treatment of a condition related to the one for which the patient was previously hospitalised; or a complication of the condition for which the patient was previously hospitalised. As well as identifying complications associated with the index admission, the indicators identify unplanned/unexpected readmission for further treatment of the same condition; and treatment of a condition related to the one for which the patient was previously hospitalised. This is achieved through the definition of a comprehensive set of readmission diagnoses in the indicator numerator. The readmission time period varies depending on the readmission diagnosis, with a default time period set for each index diagnosis where a time period is not specified.

As with the indicators under the *National Healthcare Agreement*, the CHBOI4 indicators define specific codes for the readmission diagnosis to enable differentiation of avoidable unplanned admissions. For example, for AMI, there are over 500 codes identifying reasons for readmission that may be unplanned/unavoidable. In addition, while a 'default' readmission interval is assigned to each of the conditions (30 days for AMI, 60 days for knee replacement, 60 days for hip replacement, 15 days for tonsillectomy and adenoidectomy) the indicator also assigns varying readmission intervals to the readmission diagnoses (where present) based on the likelihood of the diagnosis being associated with an unplanned/unexpected event (usually 0 to 7 days).⁵⁵ There is considerable overlap between the numerator codes for CHBOI4 and the Australian list of avoidable hospital readmission as shown in the mapping in [Appendix 1](#).

Risk-adjustment coefficients are not provided for these readmission indicators; however, jurisdictions and private hospital organisations are advised to stratify results by hospital peer group. Other CHBOI indicators address hospital mortality, notably CHBOI1 (hospital standardised mortality ratio), CHBOI2 (death in low-mortality Diagnostic Related Groups) and CHBOI3 (in hospital mortality for AMI, stroke, fractured neck of femur and pneumonia).

The states and territories that currently monitor the diagnoses defined in the CHBOI4 indicators include Victoria, Queensland and New South Wales, although the specifications vary as described below and as shown in Table 12. South Australia and Western Australia do not implement the CHBOI4 indicators within their public hospital system. Information about private hospital implementation of the indicators was not able to be established.

3.3 Indicators used by Australian states and territories

State and territory based programs

The states and territories implement various national indicators, adopting specifications to local requirements and defining additional local indicators as required to measure performance in relation to their objectives (refer to Table 12). Data are mainly collected via admitted patient data collection and hospital patient admission systems, although the ACT bases their measure on medical record audit data. The condition/procedure specific indicators are generally used for quality improvement purposes. Some incorporate targets and processes for performance management as described below. The individual state/territory information is presented below.

Queensland

Queensland Health's 10-year vision – *My Health* identifies the 2026 goal to 'Attain the lowest rate in Australia of unplanned readmission rates for selected procedures'. This goal is positioned under the second of four priority directions: 1) promoting wellbeing, 2) delivering healthcare, 3) connecting healthcare and 4) pursuing innovation).⁵⁶ Also positioned within this priority direction is the goal to 'publish information on service delivery and patient outcomes'. While Queensland has reported health outcomes internally to health services, these data have not been reported publicly and are not included in Queensland Health Annual Reports.

The priority direction 'delivering healthcare' is linked closely to 'connecting healthcare' which seeks to address factors known to influence hospital admission and readmission. A particular strategy in this regard is the introduction of 'Nurse Navigators' across the public health system. Their role is to work with high needs patients to coordinate admission to hospital, facilitate discharge and linkages to community care. The Innisfail Hospital became the first hospital in the Hospital and Health Services to implement a nurse navigator in February 2016. This has been reported to have a positive patient impact with a decrease in length of stay in hospitals, improved linkage to support services and fewer readmissions.

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Additional strategies will be supported through a \$35 million Integrated Care Innovation Fund.⁵⁷

In relation to hospital monitoring and reporting, the longstanding Variable Life Adjusted Display (VLAD) system (established in 2007) informs quality improvement for a selection of local quality indicators as well as the national indicators.⁵⁸ VLAD involves a flagging process, which occurs when a pre-specified level of variation from the state average is reached as measured by three flagging levels. Based on the flagging level, a structured review process may be triggered to enable identification of factors contributing to the observed outcomes.

There are four indicator groups, categorised according to the variation trigger points. For example, AMI readmission is included in Indicator Group B (flags triggered at 30%, 50%, 75% variation from state average) while readmissions for most other conditions and procedures (for example, heart failure, hip replacement, knee replacement) are included in Group C (flags triggered at 50%, 75%, and 100% variation from the state average). Paediatric tonsillectomy and adenoidectomy readmission is included in Group D (flags triggered at 100%, 125% and 150% variation).⁵⁸ In addition, hospitals with statistically significant variation against the national indicators, including PI 23 are required to submit a response to the Patient Safety Quality Improvement Service.

The VLAD control charts and notification reports are generated monthly using the *Queensland Hospital Admitted Patient Data Collection* and *Perinatal Data Collection*. They are published via the *VLAD Clinical Monitoring System* for hospital access only, and communicated to hospital management. The VLAD Guidelines also set out the investigation methodology.⁵⁸

The national unplanned readmission performance indicator for select surgical procedures (PI 23) is included in the VLAD methodology and reported monthly to Queensland hospitals based on state-wide averages for the selected procedures. In addition, the following unplanned readmission indicators are monitored via the VLAD methodology. The specifications broadly align with those the CHBOI4 indicators. The reports containing the latest reviews and rationale for the current indicators are referenced after each:

- Paediatric tonsillectomy and adenoidectomy 15-day readmission (V1 – 2010–11)⁵⁹
- Heart failure 30-day readmission (V2 – 2011–12)⁶⁰
- Laparoscopic cholecystectomy 30-day readmission (V1 – 2011–12)⁶¹ (not included in CHBOI4)
- Hip replacement readmission – with readmission interval depending on Principal Diagnosis and aligning closely with CHBOI4c; ranging from 7 to 60 days (V2 – 2011–12)⁶²
- Knee replacement readmission – with readmission interval depending on Principal Diagnosis and aligning closely with CHBOI4b (V2 – 2011–12)⁶²
- Acute myocardial infarction readmission within 7 or 30 days depending on diagnosis; this aligns closely with CHBOI4a, with some differences as outlined in the specification (V2 – 2011–12).⁶³

As for the CHBOI, the readmission diagnosis codes identify conditions that could be a consequence of the procedure or a consequence of the initial treatment; however, there are some difference between these diagnosis codes and those used in the CHBOI set of indicators. These indicators capture readmission to the same or a different facility. The rates are expressed as a per cent of index admissions resulting in readmission and meeting the numerator definitions. The rates are risk adjusted with criteria varying for each indicator.

Other readmission indicators include those for depression and schizophrenia, but these include all readmissions within 28 days and do not differentiate planned from unplanned.

New South Wales

The New South Wales Government's *NSW2021 plan*⁶⁴ (developed in 2010) identified a goal of 5% reduction in unplanned readmissions per year from 2010–11 to 2014–15, coinciding with a state-wide *Integrated Care Strategy*.⁶⁵

The NSW Health service agreements with Local Health Districts incorporate KPIs and performance thresholds (high performing, under-performing or not performing) for various indicators. In the 2017–18 service agreements, unplanned hospital readmissions (all-cause) is included as an indicator of 'Integrated systems to deliver truly connected care', with a performance requirement to decrease from the previous year. The indicator unplanned mental health readmissions to acute care (within 28 days) is also a KPI.^{66, 67}

In addition to these KPIs and targets, 'improvement measures' are identified in the service agreements. In 2016–17 hospitals were required to report the percentage of unplanned and unexpected hospital readmissions to the same public hospital within 28 days for the following index admission diagnoses⁶⁸:

- Acute myocardial infarction (SSQ108); this differs from CHBOI in that the readmission diagnoses are the same as the index admission diagnoses
- Heart failure (SSQ109)
- Knee and hip replacements (SSQ110); specifications are as for PI 23
- Paediatric tonsillectomy and adenoidectomy (SSQ111); specifications are as for PI 23

In 2017–18, additional conditions and procedures were added to this list including⁶⁶:

- Ischaemic stroke (MS2109)
- Pneumonia (MS2110)
- Hip fracture surgery (MS2111); specifications as for PI 23
- Chronic obstructive pulmonary disease (MS2112).

The stated goal of these condition/procedure specific measures is to decrease the number of unplanned readmissions and to increase the focus on the safe transfer of care, coordinated care in the community, and early intervention.

Developments in the NSW readmission indicators and performance reporting have been informed by a 2015 report by the Auditor General of NSW⁶⁹, which identified several limitations relating to the current specifications for unplanned readmissions, as well as the accessibility and utility of the data for supporting improvement. It also noted the absence of initiatives in place to reduce hospital readmissions. Many of these issues are not limited to New South Wales. In particular, the Auditor General highlighted:

- the need for linked data to capture readmissions to any hospital, not just the original admitting hospital
- the need to differentiate reasons for readmission and thus enable better identification of unplanned and avoidable readmissions
- the need to consider different follow-up periods according to the reasons for the initial admissions (including longer follow-up periods for hip replacement and shorter periods for other conditions)

- the need to facilitate local health district and hospital-level analysis and reporting of unplanned readmissions
- the need to identify and coordinate statewide and local strategies to reduce unplanned readmissions. The report specifically identified the need to target specific conditions and patient groups who would most benefit from reductions in unplanned readmissions, and to ensure all programs were appropriately evaluated.
- the need to formally review and evaluate the [HealthNet service](#) in terms of its ability to support continuity of care between hospitals and primary and community care.⁶⁹

A series of reports by the Bureau of Health Information (BHI) has informed and tracked the development of the measurement and monitoring of hospital readmissions and mortality in New South Wales since it began actioning the Auditor General’s recommendations. The *Exploring clinical variation* suite of reports includes: an overarching synthesis and summary report⁷⁰, a volume that describes variation in patient outcome measures across NSW public hospitals⁷¹; tailored hospital profiles that provide detailed information about patient cohorts and outcomes⁷²; and method-based reports that describe the analytic approach and the sensitivity analyses that informed the development and validation of the measures used to assess performance.^{47, 73}

Spotlight on Measurement (2015) provides the basis for a condition/procedure specific approach in NSW and the methodology for risk-standardised readmission ratio (RSRR), similar to that used in the US (refer to [Section 5.2](#)).⁴⁷ The RSRR describes for each hospital, the number of ‘returns to acute care’ in the 30 days (or for joint replacement 60 days) following discharge compared with the ‘expected’ number of readmissions. The expected number of readmissions is generated by a statistical model that takes into account patient characteristics that affect the likelihood of requiring readmission. Readmissions within these timeframes are included regardless of the principal diagnosis of the return.

The latest BHI report *Exploring clinical variation in readmission* analyses the application of this model for returns to acute care from July 2012 to June 2015, exploring the performance of NSW hospitals for each of the conditions relative to the expected performance.⁷¹ The results are presented in various ways to highlight the key outcomes and to facilitate understanding of variation. The graphical and diagrammatic treatments are highly effective in this regard.

The BHI reports provide specific data highlighting the importance of linked data in determining accurate readmission rates. For example, the 2015 report identified 5,214 additional returns to acute care (readmissions) for seven conditions/procedures for the period from July 2009 to June 2012 (refer to Table 8).

Table 8. Proportion of returns to acute care that were returns to the discharging hospital, July 2009 to June 2012

	Percentage of returns to the discharging hospital	Number of extra returns captured by linked data
Conditions		
Acute myocardial infarction	68%	1,411
Ischaemic stroke	77%	299
Congestive heart failure	82%	1,242
Pneumonia	80%	1,089
Hip fracture surgery	74%	360

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	Percentage of returns to the discharging hospital	Number of extra returns captured by linked data
Surgical procedure		
Total hip replacement	60%	277
Total knee replacement	65%	536

Source: Bureau of Health Information NSW 2015⁴⁷

Victoria

While Victoria has had a long standing quality indicator program, the recent *Targeting Zero* review of hospital safety and quality assurance in Victoria (2017) made specific recommendations in relation to improving state-wide performance on specific readmissions, along with other key quality and safety measures such as complications, length of stay and mortality.⁷⁴

The Victorian Health Services Performance Monitoring Framework 2017–18 identifies five unplanned readmission indicators, including the CHBOI4 indicators (AMI, knee replacement, hip replacement, paediatric tonsillectomy and adenoidectomy) as well unplanned 30-day readmission for heart failure. Other unplanned readmission indicators are defined for mothers after giving birth and for newborns.⁷⁵

The stated purpose or rationale is to ‘enable monitoring of performance at an individual hospital level to identify variance with statewide rates and support improvement through a review and reporting process’.⁷⁵

Specific readmission diagnoses are defined for each indicator. These differ from those of the CHBOI4, with a more limited range of diagnoses. For example, the readmission diagnosis codes for AMI are limited to I21 and I22 (acute and subsequent AMI). A standard readmission timeframe is also defined for each condition rather than applying different intervals for various readmission diagnoses (30 days for AMI, 60 days for hip and knee replacement, 15 days for paediatric tonsillectomy and adenoidectomy and 30 days for heart failure). These diagnoses are mapped against the Australian list of avoidable hospital readmissions in [Appendix 1](#).

All readmission indicators are defined in relation to readmissions to the same hospital; thus, readmissions to other hospitals are not captured. Results are expressed as a percentage. In terms of hospital performance, results are required to fall within an expected range against statewide rates. Results above the 99.8% confidence interval are considered outliers and the statewide target is to have no outliers. Results between the 95–99.8%CI reflect higher or lower than expected rates. High rates are a prompt for further investigation by the hospital and reviews are shared with Safer Care Victoria who provides feedback. Results are collected and reported at the campus level. Frequency of reporting to hospitals is quarterly (lagged by a quarter), representing a quarterly rate and an annual (preceding twelve months) rate. Outliers are calculated based on the annual rate.

Various case studies have been published by the Department of Health (via the Commission for Hospital Improvement) to highlight local successes in reducing unplanned readmissions.⁷⁶⁻⁷⁸ The initiatives are underpinned by efforts to use data to understand hospital performance and the factors influencing readmissions and the opportunities for practice and system improvement.

Western Australia

In Western Australia, the *Performance Policy Framework* sets out the principles and mandatory requirements for health service performance management, the detail of which is reflected in the *Performance Management Policy (2018)* and Service Agreements.⁷⁹⁻⁸¹

The *National Health Agreement* selected surgical readmission indicator (PI 23) is among the key effectiveness indicators contributing to Outcome 1 of their 2017–18 Outcome Based Management ('Public hospital-based services that enable effective treatment and restorative healthcare in Western Australian') (OBM KPI Quality Statements). These are mandated outcome measures for health services.⁸²

The methodology for this indicator has been modified to ensure reporting of readmissions is as accurate as possible. The readmission is to the same hospital or a different hospital. All readmissions within 28 days for complications associated with the surgery are counted, including if there is more than one. Data sources include the *Hospital Morbidity Data Collection, Data Collections Directorate, Purchasing and System Performance Division*, Department of Health WA. Detailed specifications are found in the Definition Manual.⁸³ Data is reported quarterly to healthcare services for the readmission indicator.

Targets for all services (expressed as the rate per 1,000 admissions) are as follows⁸¹:

- Knee replacement <26.2
- Hip replacement <17.2
- Tonsillectomy and adenoidectomy <61.0
- Hysterectomy <41.3
- Prostatectomy <38.8
- Cataract <1.1
- Appendectomy <32.9.

The targets for all indicators are based on a consideration of national policy-based targets, existing state-based targets and previous performance baselines, including results of testing and expert advice. Performance thresholds include: Performing, Under Performing and Not Performing. For the readmission indicators, Performing is defined as achieving less than or equal to the defined target readmission level for the procedure; Under Performing is defined as exceeding the targeted level but less than 120% of target, and Not Performing is defined as exceeding the unplanned admission rate by more than 120% of the target level.⁸² The processes for management of underperformance are outlined in the *Performance Management Policy*.⁸⁰

Readmission indicators do not appear to be reported publicly and are not featured in the *Department of Health Annual Report 2017*.

South Australia

The *2016–17 SA Health Performance Framework* describes KPIs and supporting indicators for their health services and networks, which are in turn reflected in Service Level Agreements. As for most other states and territories, there are two levels of performance measures. Key performance indicators (Tier 1) are established for which performance targets are determined. Performance against these indicators is reported in the *Monthly Performance* report prepared by the Department for Health and Ageing, which identifies three categories: Performing (at or better than target), Underperforming (within tolerance range) or Not Performing.⁸⁴

In addition to KPIs, a range of supporting indicators (Tier 2) are monitored which provide context to KPI performance and allow more detailed analysis and interrogation of a broad range of factors that may inform future developments. A range of other measures and standards are also included in the Performance Framework.⁸⁴

A performance review process is described in the *Performance Framework*, which may include performance meetings with the DHA and agreement of mitigation strategies and recovery plans as appropriate to the issue.⁸⁴

The national PI 23 indicator for selected surgical procedures is included in the Service Level Agreements as a Tier 2 indicator under the domain of Quality and Effectiveness, with a non-specific target to improve relative to the previous year.⁸⁴

Only mental health readmissions have been reported publicly in the latest *SA Health Annual Report (2015–16)*.⁸⁵

Australian Capital Territory

In the ACT, the local hospital network, comprising Canberra Hospital and Health Services, Calvary Public Hospital, Clare Holland House and Queen Elizabeth II Family Centre, has a yearly Service Level Agreement that includes key performance priority targets. Performance is reported publicly in the *ACT Health Annual Report*.⁸⁶ Under Strategic Objective 3 'Maximising the quality of hospital services', there are four indicators, one of which is 'the proportion of people separated from ACT public hospitals who are readmitted to hospital within 28 days of their separation due to complications of their condition (where the readmission was unforeseen at the time of separation)'. This indicator highlights the effectiveness of hospital-based and community services in the ACT in the treatment of persons who receive hospital-based care. A detailed specification could not be found on the internet.

The data are obtained by screening individual medical records of patients against the Australian Council of Healthcare Standards definitions.⁸⁷

Targets for each of the two public hospitals are established based on their differing casemix, and reported each year in the *ACT Health Annual Report*⁸⁸ and quarterly performance reports to the hospitals.⁸⁹ For Canberra Hospital the target for 2016–17 was <2.0%, and the hospital achieved a rate of 1.30%. For Calvary Public Hospital the target was <1.0%, and the service achieved a rate of 0.59%.⁸⁶

Northern Territory

The *Service Delivery Agreements for 2017–2018 for the Central Australia Health Service and Top End Health Service* identify several priorities including the collaboration towards the pricing methodology concerning hospital acquired complications and avoidable readmissions. Unplanned readmission indicators; however, are not included among the KPIs in the agreement.^{90, 91}

The *NT Health Strategic Plan 2018–2022* may address hospital readmissions, but it was unavailable via the NT Health website at the time of this review. Hospital readmissions are not explicitly addressed in the current *Renal Services Strategy 2017–2022*.⁹²

Of potential interest is a recently published paper which describes a study protocol for a randomised control trial aimed at comparing a tailored, multidimensional transitional care package to usual care. The objective of the trial conducted at Alice Springs Hospital is 'to evaluate the efficacy of the transitional care package for Indigenous and non-Indigenous

Australian patients with chronic diseases at risk of recurrent readmission with the aim of reducing readmission rates and improving transition to primary care in a remote setting'. The findings, when published, may inform specific strategies for this target group.⁹³

Tasmania

The *Tasmanian Health Service Performance Framework* sets out the overall performance requirements for Tasmanian health services and the performance intervention process.⁹⁴ In turn, the Service Agreement between the Minister for Health and the Tasmanian Health Services Governing Council sets out the specific service delivery and performance expectations.⁹⁵

The current *Service Agreement (2017–18)* identifies readiness for the National Pricing for Safety and Quality Framework as a priority in terms of improving data quality and linkages to enable accurate data reporting; and developing business processes for reporting and validating data.⁹⁵

Key performance indicators in the Service Agreement are grouped under five quality domains: acceptability, accessibility, effectiveness, efficiency, and safety, with relevant targets for each. These include, under the 'effectiveness' domain, a KPI for 28-day readmission for all patients, excluding mental health patients. The statewide target for the 28-day readmission is <5%. Further details of the specifications of the indicator were not available.

Performance against the KPIs is published annually in the Tasmanian Health Services Annual report. The all-cause readmission indicator was under development leading up to 2016–2017 report and is yet to be published.⁹⁶

A *Tasmanian Statewide Cardiac Services Plan 2018–2022* was submitted to the Government for consideration in August 2017 by the Heart Foundation, highlighting the need to develop actions to 'improve models of care for people with chronic heart failure to reduce avoidable readmission to hospital or representation to emergency departments'.⁹⁷

3.4 Other initiatives

The grey literature sought to identify other organisations that are utilising condition/procedure specific readmission indicators to inform healthcare improvement.

The Royal Australian College of Surgeons, in collaboration with Medibank Private, publishes *Surgical Variance Reports*, which analyse several clinical and other indicators for common procedures within surgical specialties, including general surgery, urology, ear, nose and throat surgery, vascular surgery and orthopaedic surgery.

The first series of reports were published in 2016 and based on analysis of de-identified Medibank claims data from 2014, which Royal Australian College of Surgeons analysed and interpreted.⁹⁸ Hospital readmission within 30 days of discharge is among the outcome indicators reported, which also include hospital acquired complications, transfer to ICU, transfer to inpatient rehabilitation, and re-operation. Some cost indicators are also reported.

The hospital readmission indicator is defined as 'the percentage of patients readmitted to the same or a different hospital within 30 days of discharge for the defined surgical procedure'. It includes readmissions for all causes except for rehabilitation, psychiatric treatment, dialysis and chemotherapy, and is expressed as a percentage of a surgeon's total separations for the procedure. Separations involving patients 80 years or older are also excluded. The data

do not indicate whether the readmissions are planned or unplanned. The data are not risk-adjusted.

The data contained in the reports are based on administrative claims data received by Medibank. Data relating to individual surgeons and physicians are identified using the Medicare provider number, with activity aggregated and summarised across all practice locations relating to that provider number.

Surgeon-level analysis of the indicators is limited to surgeons who performed at least five procedures, and this is done to ensure that each surgeon has a sufficient sample of separations to state and territory values are only published where five or more specialists were included in the dataset. Variation in practice is analysed based on 95% confidence intervals.

The report of orthopaedic procedures was published in 2017⁹⁹ and comprises data for the 2015 and 2016 financial years for hip replacement and knee replacement procedures and knee ACL procedures.

Other reports relate to ENT procedures, including tonsillectomy and adenoidectomy 2016⁹⁸, urology 2016¹⁰⁰, vascular surgery 2016⁹⁹ and general surgery 2017.¹⁰⁰ These are available via the [RACS website](#).

Table 9. Measurement characteristics for condition/procedure-specific hospital readmission – Australian states and territories (Public hospitals)

Measurement characteristic	NSW (2017–18)	Qld VLAD Indicators 2014	SA (2017–18)	Vic (2017–18)	WA (2017–18)
Readmission destination (in relation to initial admission)	Same hospital	All hospitals	All hospitals	Same hospital	All hospitals
Data source(s)	Admitted Patient Data Collection Hospital Patient Admission Systems	Queensland Hospital Admitted Patient Data Collection Perinatal Data Collection	National Morbidity Database	Victorian Admitted Episodes Dataset	Hospital Morbidity Data Collection, Data Collections Directorate, Purchasing and System Performance Division, Department of Health WA
Measure	Proportion (%)	Proportion (%)	Rate per 1,000	Proportion (%)	Rate per 1,000
Risk adjusted	Various condition specific	Various condition specific	No	No	No

3.4 For what purposes are these indicators used in Australia?

As an outcome indicator, hospital readmission is commonly used to measure, monitor and improve the quality and safety of the care delivered in hospital as well as the effectiveness of care coordination at discharge and in the community. All states and territories have programs to measure, monitor and report hospital readmissions locally. In most cases, these are based on the PI 23 indicator and/or the CHBO14 indicators, with some variation in specifications to address local requirements, and the inclusion of additional indicators as shown in Table 11. Programs in Tasmania, Australian Capital Territory and the Northern Territory do not include condition-specific readmission indicators, only all-cause readmission indicators.

While the indicators currently in use in Australia share this common purpose, the purpose is variously stated depending on the level at which the purpose is defined. For example, the national performance indicator PI 23 aims to measure whether the government is achieving its objective to provide services that are high quality and well-coordinated to ensure continuity of care. It focuses on monitoring readmission related to complications associated with the specific procedures. The stated goal is for low or decreasing rates; however, there are no targets or performance incentives associated with these measures at a national level.

When applied at a jurisdictional level, the PI 23 indicator (as well as the CHBO14 indicators and other readmission indicators) are commonly used to drive improvement in performance more actively. This may be through the identification of specific readmission rate targets or year on year non-specific improvement targets. It may also be through identifying thresholds for performance variation relative to expected rates or statewide averages, with associated review and reporting requirements defined by local procedures. The readmission indicators may also be associated with specific improvement programs, such as the Integrated Care program implemented in NSW.

Data are mainly collected via admitted patient data collection and hospital patient admission systems, although the ACT bases their all-cause measure on medical record audit data (refer to Table 9). Data linkage capacity is a key consideration for accurately reporting readmissions. New South Wales and Victoria are limited to reporting same-hospital readmissions, which has been shown to underestimate unplanned readmissions.

The mapping of diagnoses for both index admission and readmissions (refer to Table 12 and [Appendix 1](#)) highlights the differences between the states and territories.

Table 10 summarises the statements from the literature that define the purpose/objectives of the indicators or the indicator program.

Table 10. Stated purpose of readmission indicators – Australian states and territories

Indicator	Purpose
<i>PI 23 (National)</i>	Measure of whether the government is achieving its objective to provide services that are of a high quality and well-coordinated to ensure continuity of care, specifically in relation to the selected surgical procedures.
<i>PI 23 (jurisdiction implementation WA)</i>	Measure of provision of effective treatment and restorative healthcare in WA; enables measurement and monitoring of performance at an individual hospital level to identify variance with statewide targets and support improvement through a structured review process.

Indicator	Purpose
<i>PI 23 ((jurisdiction implementation SA)</i>	Measure and monitor performance at an individual hospital level to inform local improvement in line with general targets to improve performance on the previous year
<i>CHBOI4 (Commission)</i>	Enable measurement, monitoring and action in relation to unplanned/unexpected readmission for further treatment of the same condition; treatment of a condition related to the one for which the patient was previously hospitalised, or a complication of the condition for which the patient was previously hospitalised.
<i>Queensland (VLAD) incorporating CHBOI, PI 23 and other indicators</i>	Measure and monitor performance at an individual hospital level to identify variance with statewide rates and support improvement through a structured review and reporting process
<i>New South Wales (including some CHBOI4 / PI 23 measures)</i>	Decrease the number of unplanned readmissions and increase the focus on the safe transfer of care, coordinated care in the community, and early intervention. Measure and monitor performance at an individual hospital level to identify opportunities for improvement, but with no specific targets or performance levels identified.
<i>Victoria (based on CHBOI4)</i>	Enable monitoring of performance at an individual hospital level to identify variance with statewide rates and support improvement through a review and reporting process.

Most jurisdictions include unplanned readmissions indicators within local Service Agreements as key performance indicators (KPIs) with specific targets and thresholds for performance management or general quality measures, or both (refer to Table 11). For example:

- Queensland uses performance variation levels to trigger an internal review and reporting to the Patient Safety Quality Improvement Service
- New South Wales incorporates KPIs and performance thresholds for all-cause unplanned readmissions, while also monitoring condition-specific unplanned readmissions for quality purposes
- In Victoria, rates of readmissions above the expected state rate prompt investigation by the hospital, with results to be shared with Safer Care Victoria
- In Western Australia, statewide targets per 1,000 admissions are set for each indicator. Performance thresholds in relation to the targets guide action accordingly
- In South Australia, the PI 23 indicators are reported for quality purposes, although with a target to improve compared to the previous year. No other readmission indicators are included as KPIs.

Public reporting of unplanned readmissions is limited: some jurisdictions report data publicly, mainly through annual reports or one-off reports regarding overall performance. None of the states and territories are applying financial penalties linked to unplanned hospital readmissions (refer to Table 11).

Table 11. Management approaches for condition/procedure-specific hospital readmission – Australian states / territories

	NSW (2017–18)	Qld VLAD Indicators 2014	SA (2017–18)	Vic (2017–18)	WA (2017–18)
MANAGEMENT					
Internal (hospital) reporting	Monthly	Monthly	Monthly	Quarterly	Quarterly
Public reporting	No	No	No	No	No
Targets / performance thresholds	KPI for all-cause readmission; not condition/procedure specific	Variations from state average. Thresholds for response.	Target improvement from previous year (not specific)	Improvement from previous period Variations from state average based on annual rate	Defined targets per procedure and performance thresholds
Financial incentives	No	No	No	No	No

Table 12. Condition and procedure specific unplanned readmission indicators – Australian states and territories

Indicator (Condition)	NSW (2017–18)		QLD (2014) VLAD Indicators		SA (2017–18) PI 23		VIC (2017–18) Based on CHBOI4		WA (2017–18) PI 23	
	Admission diagnosis	Readmission diagnosis & interval	Admission diagnosis	Readmission diagnosis & interval	Admission diagnosis	Readmission diagnosis & interval	Admission diagnosis	Readmission diagnosis & interval	Admission diagnosis	Readmission diagnosis & interval
Acute Myocardial Infarction (AMI)	AMI or unstable angina	AMI or unstable angina (28 days)	AMI	Numerous diagnoses relating to initial treatment (7 / 30 days)			AMI	AMI or NSTEMI (30 days)		
Heart failure	Heart failure	Heart failure (28 days)	Heart failure	Numerous diagnoses relating to initial treatment (30 days)			Heart failure	Heart failure (30 days)		
Ischaemic stroke	Cerebral infarction	Cerebral infarction (28 days)								
Pneumonia	Pneumonia (various types)	Pneumonia (various types) (28 days)								
Chronic Obstructive Pulmonary Disease (COPD)	COPD	COPD (28 days)								
Knee replacement	Knee replacement (various procedures)	Complication codes (PI-23) (28 days)	Hip and knee replacement (various procedures)	Numerous diagnoses relating to initial procedure (Diagnosis dependent)	Knee replacement (various procedures)	Complication codes (PI-23) (28 days)	Knee replacement	Complication codes (more specific / related to procedure (see document) (60 days)	Knee replacement (various procedures)	Complication codes (PI-23) (28 days)

	NSW (2017–18)		QLD (2014) VLAD Indicators		SA (2017–18) PI 23		VIC (2017–18) Based on CHBOI4		WA (2017–18) PI 23	
Indicator (Condition)	Admission diagnosis	Readmission diagnosis & interval	Admission diagnosis	Readmission diagnosis & interval	Admission diagnosis	Readmission diagnosis & interval	Admission diagnosis	Readmission diagnosis & interval	Admission diagnosis	Readmission diagnosis & interval
Hip replacement	Hip replacement (various procedures)	Complication codes (PI-23) (28 days)	Hip and knee replacement (various procedures)	Numerous diagnoses relating to initial procedure (Diagnosis dependent)	Hip replacement (various procedures)	Complication codes (PI-23) (28 days)	Hip replacement	Complication codes (more specific / related to procedure (see document) (60 days)	Hip replacement (various procedures)	Complication codes (PI-23) (28 days)
Tonsillectomy and adenoidectomy	Paediatric tonsillectomy and Adenoidectomy (various procedures)	Complication codes (PI-23) (28 days)	Paediatric tonsillectomy and Adenoidectomy (various procedures)	Complication codes (more specific / related to procedure (see VLAD) (15 days)	Tonsillectomy and Adenoidectomy (various procedures)	Complication codes (PI-23) (28 days)	Paediatric tonsillectomy and adenoidectomy	Complication codes (more specific / related to procedure (see document) (15 days)	Tonsillectomy and Adenoidectomy (various procedures)	Complication codes (PI-23) (28 days)
Hysterectomy					Hysterectomy (various procedures)	Complication codes (PI-23) (28 days)			Hysterectomy (various procedures)	Complication codes (PI-23) (28 days)
Prostatectomy					Prostatectomy (various procedures)	Complication codes (PI-23) (28 days)			Prostatectomy (various procedures)	Complication codes (PI-23) (28 days)
Cataract surgery					Cataract surgery (various procedures)	Complication codes (PI-23) (28 days)			Cataract surgery (various procedures)	Complication codes (PI-23) (28 days)
Appendectomy					Appendectomy (various procedures)	Complication codes (PI-23) (28 days)			Appendectomy (various procedures)	Complication codes (PI-23) (28 days)
Hip fracture surgery	Hip fracture (various procedures); external cause fall or tendency to	Complication codes (PI-23) (28 days)								

Indicator (Condition)	NSW (2017–18)		QLD (2014) VLAD Indicators		SA (2017–18) PI 23		VIC (2017–18) Based on CHBOI4		WA (2017–18) PI 23	
	Admission diagnosis	Readmission diagnosis & interval	Admission diagnosis	Readmission diagnosis & interval	Admission diagnosis	Readmission diagnosis & interval	Admission diagnosis	Readmission diagnosis & interval	Admission diagnosis	Readmission diagnosis & interval
	fall are present									
Laparoscopic cholecystectomy			Paediatric laparoscopic cholecystectomy (various procedures)	Complication codes (more specific / related to procedure)						

4. International jurisdictions' indicators for unplanned condition/procedure-specific readmissions

This section provides an overview of the readmission policies, programs and indicators currently in place internationally. This information was gained from a review of jurisdiction websites as well as from the peer reviewed literature.

4.1 Condition and procedure specific indicators in international jurisdictions, including readmission timeframes

Hospital readmission indicators have been introduced in several countries within the last two decades as part of quality and safety and healthcare performance programs. These include the US and Canada, New Zealand, the United Kingdom (England and Scotland), various European countries (for example Denmark, Germany, Spain, France, The Netherlands, Sweden, and Switzerland¹⁰¹) and Israel. The timeframe for readmission defined for the indicators is either 28 or 30 days (refer to Table 13).

For many of these countries, details of their readmission policies and programs are not available in English or are not accessible on the internet, so specific information about condition and procedure-specific indicators cannot be established in sufficient detail to answer the research questions. However, through this review, the following countries have been found to implement condition or procedure specific indicators: the US, Canada, England, Germany and Denmark.

In addition to condition/procedure specific indicators, some countries measure all-cause readmissions, including England, the US, Canada and New Zealand. New Zealand is currently reviewing its methodology. In the Netherlands, hospital readmission has been a long-standing primary care indicator. The country introduced all-cause readmission rates as an official quality indicator in hospitals in 2016.⁷

Table 13. Condition and procedure specific indicators in international jurisdictions, including readmission timeframes*

	Canada (CIHI)	Denmark	England (UK) (NHS)	Scotland (UK) (NHS)	United States (NQF, Medicare)
Index admission diagnoses					
Conditions					
Acute Myocardial Infarction (AMI)	30 days			30 days	30 days
Heart failure		30 days		30 days	30 days
Pneumonia		30 days			30 days
COPD		30 days			30 days
Stroke		30 days	28 days		30 days
Dehydration (R)		30 days			
Obstipation (R)		30 days			
Gastroenteritis (R)		30 days			
Nutritional anaemia (R)		30 days			

	Canada (CIHI)	Denmark	England (UK) (NHS)	Scotland (UK) (NHS)	United States (NQF, Medicare)
Arthritis		30 days			
Cystitis		30 days			
Fractures		30 days			
Procedures					
Knee replacement					30 days
Hip replacement			28 days		30 days
Tonsillectomy and adenoidectomy					
Hysterectomy			28 day		
Prostatectomy					
Cataract surgery					
Appendectomy					
Fractured proximal femur			28 days		
Angioplasty				30 days	
Coronary artery bypass graft (CABG)	30 days			30 days	30 days
Percutaneous coronary intervention (PCI)	30 days				
Other					
All-cause readmission	30 days (for patients <19y)		28 or 30 days	28 days	30 days

*Germany is excluded from this table, as they report on almost all conditions

In Germany, readmission indicators are reported for almost all conditions with exceptions defined at the DRG level.² About 23% of all DRGs are excluded as relevant readmissions; these include but are not limited to: maternal and newborn, ICU treatment, certain cancer cases, pain therapy, renal dialysis, all pre-major diagnostic categories DRGs, and error DRGs (surgery unrelated to the main diagnosis).

Unlike in Australia, most indicators include all causes of readmission associated with the given index admission diagnosis. An exception is the National Institute for Health and Clinical Excellence (NICE) indicator measuring rates of surgical site infection within 30 days of discharge from surgery. The focus is on conditions or procedures with high prevalence generally or high prevalence concerning readmissions. None of the indicators for which detailed specifications in English were available, use specific readmission diagnosis codes to identify avoidable readmissions.

To shift the focus towards unplanned readmissions, an algorithm was introduced in the US in 2014 to identify planned readmissions which are then excluded from the measure. In the UK, admissions associated with certain conditions are also excluded.

Policies for hospital readmission are undergoing ongoing development. England is currently revising its readmission indicators. The US is introducing amendments to its methodology based on experience to date and stakeholder feedback (refer to [Section 5](#)).

4.2 For what purposes are these indicators used internationally?

Readmission policies are positioned variously in different countries, but are commonly introduced with the purpose of improving the quality and efficiency of care, and ensuring transparency and accountability. How this is achieved, whether through internal reporting and target setting, public reporting or financial incentive programs varies. This reflects the aims of the programs as well as the structural differences of the healthcare systems within which they are implemented.

Table 14. Stated purpose of condition/procedures specific readmission indicators – International jurisdictions

Country	Indicators	Purpose
United States	<p><i>Hospital Inpatient Quality Reporting program (IQR)</i> 30-day readmission following index admission for:</p> <ul style="list-style-type: none"> • Acute Myocardial Infarction • Chronic Obstructive Pulmonary Disease • Coronary Artery Bypass Graft • Heart Failure • Pneumonia • Ischaemic Stroke • Total Hip and Knee Arthroplasty • Hospital-wide All-Cause Readmission 	<p>To enable consumers to make more informed decisions about healthcare options via the Hospital Compare website.</p> <p>To encourage hospitals and clinicians to improve the quality of inpatient care with reporting via the QualityNet Secure Portal..</p>
	<p><i>Indicators included in Hospital Readmission Reduction Program</i> As above except for stroke and Hospital-wide All-Cause Readmission indicator</p>	<p>To incentivise improvement by reducing payments to hospitals with excess readmissions.</p>
	<p><i>Joint Commission readmission indicators</i> As for CMS</p>	<p>Accredited health services required to implement quality and safety programs featuring monitoring of the indicators.</p>
England	<p><i>The Clinical Commissioning Group Outcomes Indicator Set (CCG OIS)</i></p> <ul style="list-style-type: none"> • Emergency readmissions within 30 days of discharge from hospital • Emergency alcohol-specific readmission to any hospital within 30 days of discharge following an alcohol-specific admission • Unplanned readmissions to mental health services within 30 days of a mental health inpatient discharge in people aged 17 and over 	<p>Measure outcomes at CCG level to help inform priority setting and drive local improvement. The CCG OIS does not set thresholds or levels of ambition.</p>

Country	Indicators	Purpose
England (cont)	<p>Compendium of Population Health Indicators</p> <ul style="list-style-type: none"> • Hospital care Indicator set <p>Emergency readmissions to hospital within 28 days of discharge for:</p> <ul style="list-style-type: none"> • Fractured proximal femur • Stroke • Hysterectomy • Primary hip replacement surgery. • All-cause emergency 30-day readmission 	<p>Help monitor NHS success in avoiding (or reducing to a minimum) readmission following discharge from hospital, when readmission was not part of the originally planned treatment'. The term 'emergency' is synonymous with 'unplanned'.</p>
Scotland	<p>Heart disease indicator set</p> <p>Emergency (unplanned readmission) within 30 days of:</p> <ul style="list-style-type: none"> • Emergency or urgent admission for congestive heart failure • Emergency or urgent admission for a heart attack • Emergency or urgent admission for angioplasty • Elective admission for angioplasty • Emergency or urgent admission for coronary artery bypass graft (CABG) • Elective admission for CABG. 	<p>Inform improvements in the quality of care and patient experience</p>
Canada	<ul style="list-style-type: none"> • 30-day readmission following AMI • 30-day all-cause readmission after isolated CABG • 30-day all-cause readmission after percutaneous coronary intervention (PCI) • 30-day readmission rate for mental illness • 30-day obstetric readmission rate • 30-day readmission for patients aged 19 and younger • 30-day surgical readmission rate • 30-day medical readmission rate. 	<p>The readmission indicators are positioned under the health system performance/appropriateness and effectiveness domain.</p> <p>Inform hospital improvement, and motivate improvement through public reporting.</p> <p>They are not linked to financial incentives.</p>

The indicators are generally implemented for comparative purposes, rather than assigning absolute targets for performance. Measures are commonly adjusted for age and sex to support fair comparison. Some indicators also adjust for relevant comorbidities. The US will shortly introduce adjustment for socioeconomic status based on hospital peer group analysis. Other jurisdictions, such as Canada, do not adjust for SES but stratify reports using disadvantage ratios.

The population focus of individual policies varies. Some, such as the US, focus on older adults and chronic conditions, seeking to address factors associated with both hospital and community care. Others focus on identifying adverse outcomes associated with in-hospital care such as surgical procedures.

Reporting is facilitated in jurisdictions with mature and integrated data systems and unique patient identifiers.

The UK and the US have introduced financial incentives associated with performance relative to national averages (refer to [Section 5](#)).

Table 15. Measurement characteristics for condition and procedure specific (unplanned) readmission indicators

	Canada (CIHI)	Denmark	England (UK) (NHS)	Scotland (UK) (NHS)	United States (CMS)*
MEASUREMENT					
Date commenced	2007	2002	1998	Not specified	2009
Readmission destination (in relation to initial admission)	Hospital of discharge	All hospitals	All hospitals	Not specified	All hospitals
Data source(s)	Discharge Abstract Database Hospital Morbidity Database National Ambulatory Care Reporting System Alberta Ambulatory Care Reporting System	National patient register including all hospitals admissions	Hospital Episode Statistics	Not specified	Medicare administrative claims and enrolment information for hospitalised patients
Measure	Rate (%)	Rate (%)	Rate (%)	Rate (%)	Ratio
Risk adjusted	Age, sex, comorbid diagnoses	Age, sex	Age, sex	Age, sex, deprivation	Age, comorbid diseases, patient frailty
Population	Not specified	>67	Not specified	Not specified	>65
MANAGEMENT					
Internal (hospital) reporting	Yes	Yes	Yes	Quarterly	Yes
Public reporting (Date commenced)	Yes (Not specified)	Yes (2006)	Yes (1998)	Yes (Not specified)	Yes (2009)
Targets/performance thresholds	National average	Hospital-specific	Locally agreed level	National average	National average
Financial incentives (Date commenced)	No	Yes (region-specific)	Yes (2011)	No	Yes (2012)

4.3 United States

Health system context – funding sources and quality leadership

The US health system is a hybrid system in which most health care is delivered privately, with funding from a mixture of private and public sources including private health funds (funded by individuals and businesses), and public sources including the federal, state and local governments.¹⁰²

The Centers for Medicare and Medicaid Services (CMS) administers Medicare, a federal program for adults 65 and older and some people with disabilities, and works in partnership with state governments to administer both Medicaid and the Children's Health Insurance Program, a conglomeration of federal–state programs for certain low-income populations.

The introduction of the *Patient Protection and Affordable Care Act* significantly expanded both eligibility for and federal funding of Medicaid. Private health insurance coverage is more prevalent than government coverage, at 67.5% and 37.3%, respectively in 2016. At that time, employer-based insurance covered the largest proportion of the population (55.7%), followed by Medicaid (19.4%), Medicare (16.7%), direct-purchase (16.2%), and military coverage (4.6 %).¹⁰³

The *National Quality Strategy*,^{104, 105} led by the Agency for Healthcare Research and Quality (AHRQ), provides the overarching framework for aligning public and private efforts at all levels. The strategy aims to: a) improve health care quality, b) improve the health of the US population, and c) reduce the costs of health care. Among the six priorities of the strategy is 'making care safer by reducing harm used in the delivery of care'. Three long term goals are to:

- Reduce preventable hospital admissions and readmissions
- Reduce the incidence of adverse health care-associated conditions
- Reduce harm from inappropriate or unnecessary care.

Measurement and feedback is a particular lever promoted through the strategy and includes efforts to align clinical quality measures nationally, through the *Working for Quality* program.¹⁰⁶ The AHRQ also produces tools and resources to support quality improvement including *The Hospital Guide to Reducing Medicaid Readmissions*.¹⁰⁷

The *Hospital Inpatient Quality Reporting Program* (IQR) is a CMS program aimed at driving quality improvement through measurement and public reporting. It is mandatory for publicly funded hospitals and aims to encourage hospitals and clinicians to improve the quality and cost of inpatient care by highlighting variation in practice. The program is a 'pay for reporting' program whereby hospitals participating and successfully meeting all requirements are paid more than hospitals that don't participate. CMS collects and reports data for several indicators.¹⁰⁸ These include condition and procedure specific readmission indicators, which are described in more detail below.¹⁰⁹ Some IQR data are also used in the CMS Value-Based Programs including:

- The Hospital Readmissions Reduction Program (HRRP)
- The Hospital Value-Based Purchasing (VBP) Program
- The Hospital-Acquired Condition (HAC) Reduction Program

Various other indicator programs incorporate readmission indicators as measures of quality and safety and are applied for various purposes.¹¹⁰ For example, the AHRQ indicators and supporting software facilitate the management of quality improvement for participating healthcare organisations. The AHRQ indicator sets relate to prevention, inpatient care, patient safety and paediatric care. The composite patient safety indicator (PSI) 90 provides

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an overview of hospital-level quality concerning a set of potentially preventable hospital-related events and includes several readmission diagnoses. This indicator has been included in a previous literature review.¹¹¹ The AHRQ indicators do not include separate condition/procedure specific unplanned readmission indicators.

The Joint Commission accredits and certifies healthcare organisations and programs that meet certain performance standards. The CMS and The Joint Commission have worked to align their quality measures, resulting in one common set of measure specifications known as the *Specifications Manual for National Hospital Inpatient Quality Measures*. In doing so, the aim is to improve quality, minimise data collection efforts for these common measures and focus on using data to improve the healthcare delivery process.¹¹²

The role of the National Quality Forum is to advise on and endorse various measures and facilitate improvement more broadly. It currently endorses a collection of 47 admission and readmission measures across various settings, including the CMS readmission indicators.¹¹³ ¹¹⁴ It also re-evaluates endorsed indicators and makes recommendations accordingly. This has included re-evaluation of the CMS indicators.

Readmission indicators (Hospital Inpatient Quality Reporting Program)¹¹⁵

The CMS readmission measures report hospital-level 30-day risk standardised readmission rates (RSRR) for selected conditions and procedures associated with the initial index admission for patients 65 years and older. Conditions are identified based on primary discharge diagnosis, not the DRG assigned to the hospitalisation.¹¹⁵

Readmission measures in the fiscal year 2018 IQR program include:

- Acute Myocardial Infarction (reported from 2009)
- Chronic Obstructive Pulmonary Disease (reported from 2014)
- Coronary Artery Bypass Graft (reported from 2015)
- Heart Failure (reported from 2009)
- Pneumonia (reported from 2009)
- Ischaemic Stroke (reported from 2014)
- Total Hip and Knee Arthroplasty (reported from 2013)
- Hospital-wide All-Cause Readmission (reporting from 2013).

The rationale and descriptions of the individual measures are detailed in comprehensive reports available on the [QualityNet](#) website.¹¹⁵ These reports are developed for CMS by Yale New Haven Health Services Corporation, Center for Outcomes Research and Evaluation. The measures are re-evaluated annually to respond to stakeholder input and incorporate advances in science or changes in coding, or to respond to recommendations of the National Quality Forum endorsement process. All reports are available via the CMS website. The latest report provides 2017 updates for AMI, COPD, heart failure, pneumonia and stroke.¹¹⁶ The most recent report for hip and knee arthroplasty is for 2014.¹¹⁷

The reports detail the rationale for various aspects of the indicator specifications. For example, the rationale for the use of a 30-day time frame is explained on the basis that older patients are more vulnerable to adverse health outcomes within 30 days of discharge. In addition, it is argued that readmission within 30 days may more likely be associated with hospital care or the early transition to a non-acute care setting, and that the 30-day time frame is a meaningful period for hospitals to collaborate with their communities to reduce readmissions.

Medicare originally applied an 'all-cause' definition of readmission for the given index diagnoses, with the rationale that, from a patient perspective, an unplanned readmission for any cause is an adverse event. It was also argued that making inferences about quality issues based solely on the documented cause of readmission is difficult. However, stakeholder feedback regarding the need to differentiate planned from unplanned admissions led to a change in policy from 2014. At that time, CMS began making an exception for 'planned' hospitalisations within the 30-day timeframe.

A specific algorithm defines planned readmissions, and these are no longer counted as readmissions.¹¹⁸ The algorithm is based on three principles:

- *“A few specific, limited types of care are always considered planned (transplant surgery, maintenance chemotherapy/immunotherapy, rehabilitation)*
- *Otherwise, a planned readmission is defined as a non-acute readmission for a scheduled procedure, and*
- *Admissions for an acute illness or for complications of care are never planned.”¹¹⁸*

Data sources and characteristics

The data source for the readmission measures is Medicare administrative claims and enrolment information for hospitalised patients. The datasets also contain associated inpatient, outpatient, and physician Medicare administrative claims for the 12 months before the index admission and one month after the index admission for patients admitted in this time period, which is used for risk-adjustment.

The measures adjust for variables that are clinically relevant and have relationships with the outcome (for example, age, comorbid diseases, and indicators of patient frailty). The measures currently do not adjust for SES. This is because the health outcomes can be due to different quality of care that that groups of patients with varying SES receive.¹¹⁹ The lack of adjustment for SES has been contentious, and the system will incorporate such adjustment, commencing in 2019 (refer to [Section 5.2](#)).

The measures estimate RSRR for each condition, being the ratio of the number of predicted readmissions within 30 days, based on a hospital's observed case mix, to the number of expected readmissions based on the nation's performance with that hospital's case mix, then multiplied by the national observed readmission rate. A ratio greater than 1.0 indicates excess readmissions.

CMS uses three years of Medicare fee-for-service claims data to calculate all readmission measures other than the Hospital-Wide Readmission measure, which uses only one year of data because its yearly cohort is sufficiently large.

In addition to Medicare data available through CMS, the [Nationwide Readmissions Database](#) supports various types of analyses of national readmission rates for all payers and the uninsured, and across all age groups. It includes discharge data for 27 participating states, accounting for 57.8% of the US population and 56.6% of hospitalisations. It informs decision-making at a national, state, and community levels. It is part of a suite of databases and software tools developed for the Healthcare Cost and Utilization Project (HCUP) and available for purchase.¹²⁰

Reporting

The public reporting of these measures is consistent with the priorities of the *National Quality Strategy* and fulfils federal mandates in the *Deficit Reduction Act of 2005* requiring the Secretary of Health and Human Services to make outcome and efficiency measures publicly available.¹⁰⁹

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Since 2009, CMS has posted individual hospital readmission rates on the [Hospital Compare](#) website, together with other measures of quality and patient satisfaction.¹²¹ The website provides comparisons of each hospital's Medicare readmission performance relative to the national average by indicating whether the hospital is 'better/worse/no different' than the US national rate (95% CI). In addition to readmissions following hospitalisations for selected diagnoses, the Hospital Compare website started reporting each hospital's overall Medicare readmission rates in 2013. The data are not reported if there are fewer than 25 cases in the reporting period. The results are posted annually.¹²²

The most recent national readmission data posted on the site (2018) shows the rates as follows for condition and procedure-specific readmissions:

- Heart failure 21.7%
- Chronic obstructive pulmonary disease 19.6%
- Pneumonia 16.7%
- Acute myocardial infarction 16.0%
- Coronary artery bypass graft 13.2%
- Ischaemic stroke 11.9%
- Total hip/ total knee replacement 4.2%

The national hospital-wide readmission rate in 2018 was 15.3%.

The *Medicare Hospital Quality Chartbook (2017)* provides a comprehensive overview of national performance on the CMS's hospital mortality, complication, and unplanned readmission measures, and investigates select hospital practices that may impact their performance on the measures.¹²³

Funding model

In 2012, the *Affordable Care Act (ACA)* established the Hospital Readmission Reduction Program (HRRP), which financially penalises hospitals if they have higher than expected (excess) risk-standardised 30-day readmission rates for various conditions (a ratio greater than 1.0). The details of the model, impacts and outcomes are discussed in [Section 5](#). Other funding models taking readmissions into account include the *Bundled Payments for Care Improvement Initiative*.¹²⁴

Interventions

Under the HRRP, resources are not provided to hospitals to fund interventions for readmission reduction. However, through complementary programs, the CMS has provided funding for improving transitional care. Some of these are described in [Section 6](#). AHRQ also offers information and tools for clinicians and patients to make the hospital discharge process safer and to prevent avoidable readmissions.

4.3 United Kingdom – England

National Health Service (NHS) Outcomes Framework

The *NHS Outcomes Framework* indicators provide national level accountability for the outcomes delivered by the NHS.¹²⁵ These are identified in five domains:

- *Domain 1 – Preventing people from dying prematurely*
- *Domain 2 – Enhancing quality of life for people with long-term conditions.*
- *Domain 3 – Helping people to recover from episodes of ill health or following injury*
- *Domain 4 – Ensuring that people have a positive experience of care*

- *Domain 5 – Treating and caring for people in a safe environment and protecting them from avoidable harm.*⁷

Domain 3 encompasses indicators for hospital readmission. Domain 5 is also relevant to readmissions, particularly for healthcare acquired infection.¹²⁵

A report of performance against various indicators is released publicly every quarter by NHS Digital, the department responsible for developing indicators and reporting outcomes. The content of the reports varies depending on timeframes for various indicator measurements. All indicators are reported at England level and are broken down, where possible, by age, lower tier local authority, upper tier local authority, region, religion, ethnicity, deprivation decile, sexual orientation, gender and condition.¹²⁶

NHS readmission indicators

NOTE: The [NHS Digital](#) website currently notes that the methodology for the readmission indicators is under review. The most recent data reported publicly is from 2012–13.

Clinical Commissioning Group Outcomes Indicator Set

The Clinical Commissioning Group Outcomes^{iv} Indicator Set (CCG OIS) provides information for CCGs about the quality of health services and the associated health outcomes. The indicators measure outcomes at CCG level to help inform priority setting and drive local improvement. The CCG OIS does not set thresholds or levels of ambition.¹²⁷

The CCG OIS contains readmission indicators for:

- Emergency readmissions within 30 days of discharge from hospital (P01845)¹²⁵
- Emergency alcohol-specific readmission to any hospital within 30 days of discharge following an alcohol-specific admission (P01862)¹²⁶
- Unplanned readmissions to mental health services within 30 days of a mental health inpatient discharge in people aged 17 and over (P01863).¹²⁸

Archived indicators relevant to readmission include:

- Elective readmissions following abdominal aortic aneurysm surgery (RA26)
- Emergency readmissions following gallbladder surgery (RA25)
- Emergency readmissions to hospital within 28 days of discharge (data relate to 16+ years old only) (RA01)
- Emergency readmissions to hospital within 28 days of discharge: fractured proximal femur (RA18)
- Emergency readmissions to hospital within 28 days of discharge: hip replacement surgery (RA17)
- Emergency readmissions to hospital within 28 days of discharge: hysterectomy (RA24)
- Emergency readmissions to hospital within 28 days of discharge: stroke (RA20).

The latter five now appear in the *Compendium of Population Indicators* described below, which are reported and managed more widely, including through public reporting.

^{iv}Clinical Commissioning Groups (CCGs) were created following the Health and Social Care Act in 2012, and replaced Primary Care Trusts on 1 April 2013. They are clinically-led statutory NHS bodies responsible for the planning and commissioning of health care services for their local area.

Compendium of Population Health Indicators

The Compendium is a collection of indicators that provides a comprehensive overview of population health at a national, regional and local level.¹²⁹ The Compendium includes the hospital care indicator set, which includes Emergency readmissions to hospital within 28 days of discharge for selected conditions/procedures, including.¹³⁰

- Fractured proximal femur
- Stroke
- Hysterectomy
- Primary hip replacement surgery.

All-cause emergency 30-day readmission is a further indicator in the set. This measure is used in the financial incentives scheme (refer to [Section 5](#)).¹³¹

The aim of these indicators is to “*help monitor NHS success in avoiding (or reducing to a minimum) readmission following discharge from hospital, when readmission was not part of the originally planned treatment*”.¹³⁰ The indicators relate to the index admission and measure the percentage of all emergency admissions to any hospital in England occurring within 28 days of the last, previous discharge from hospital after admission for the selected conditions/procedures. The term ‘emergency’ is synonymous with ‘unplanned’.

Data sources and characteristics

All *Hospital Care Compendium Indicators* are based on hospital administrative data. The *Hospital Episode Statistics* contains details of all admissions, outpatient appointments and emergency attendances at NHS hospitals in England.¹³² The calculation of readmission indicators is supported by the construction of continuous inpatient spells to create a linked dataset which identifies readmissions from the same or different hospitals.^{133, 134}

The indicator data are indirectly standardised by age and sex. The ratio of an organisation’s observed number of events and the number of events that would be expected if it had experienced the same event rates as those of patients in England, given the mix of age and sex of its patients is calculated. This standardised ratio is then converted into a rate by multiplying it by the overall event rate of patients in England. The percentage change in rates from a previous year, and the statistical significance of these changes, are calculated using 95% confidence intervals. A positive percentage represents an improvement and a negative percentage represents deterioration.

While the indicators aim to reduce avoidable readmissions, they do not adjust for other factors that may contribute to variation, including the severity of illness, comorbidities or socioeconomic status. They also do not attempt to assess whether the readmission was linked to the discharge in terms of diagnosis. They are therefore comparative indicators, acting as a proxy for the outcome and intended for comparison over time among comparable organisations. The indicators do not control for socioeconomic status; however, data are analysed by Index of Multiple Deprivation. Detailed statistical methodology is included in the specification and user guides.^{133, 134}

Reporting

Data for the 10years 2002–03 to 2012–13 are available via the NHS Digital website and are presented as reports based on age and gender. Readmission rates for individual medical consultants are also available via the NHS Choices website. Indicators are reported based on whether they are within the expected range, more than expected or less than expected, with comparisons possible with other consultants.¹³⁵ Table 16 shows data for the 10 years

2002–03 to 2011–12, highlighting increases in all readmissions except for those associated with primary hip replacement.¹³⁶

Table 16. Unplanned hospital readmissions, England 2002–03 to 2011–12

Condition/procedure	Readmission rate 2013	Estimated 'excess' readmissions (2013)	10-year comparison (2002–03 to 2011–12)
Fractured proximal femur	12.6%	429	Increased 32% (9.49 to 12.55)
Stroke	11.7%	539	Increased 36% (8.58 to 11.71%)
Hysterectomy	7.3%	327	Increased 27% (5.71 to 7.28)
Primary hip replacement	5.3%	491	Decreased 14% (6.22 to 5.32%)
All emergency readmissions	11.5%	42,355	Increased by 27% (9.01 to 11.45)

Source: Health and Social Care Information Centre. *Hospital Episode Statistics, Emergency readmissions to hospital within 28 days of discharge - Financial year 2011/12. 2013*¹³⁶

Most recently, data collected independently by *Healthwatch* show ongoing increases for the five years (2011/12 to 2016/17), with findings that¹³⁷:

- Overall emergency readmissions had risen by 22.8%
- Emergency readmissions within 24 hours of discharge had risen by 29.2%
- Readmissions within 48 hours accounted for 21.6% of readmissions.

Financial incentives

In light of the increases in readmissions, the introduction of incentives to reduce readmissions was announced in a NHS white paper, *Equity and excellence: Liberating the NHS (Department of Health, 2010)*.¹³⁸ Penalties for readmission were introduced by the Department of Health from 2011/12. The policy requires non-payment for any emergency readmissions to hospital within 30 days of discharge, with a limited number of exceptions agreed as planned readmissions. The policy and implementation are described in [Section 5](#).

Other readmission indicators

In addition to the NHS indicators, other indicators are used to inform quality practice and service delivery in England. For example, the National COPD Audit Programme examines outcomes from the clinical audit of COPD exacerbations admitted to acute units using Office of National Statistics and Hospital Episode Statistics relating to patients whose index admission with COPD occurred during the audit period. The latest report published in February 2017 (Feb–April 2014 data) analyses readmission data and makes recommendations regarding interventions to reduce readmissions.¹³⁹

NICE indicators also include a readmission indicator for rates of surgical site infection within 30 days of discharge from surgery.¹⁴⁰ The Health Protection Agency reports this and other indicators in the *National Point Prevalence Survey* on healthcare-associated infections.¹⁴¹ The NICE Standard also includes quality statements relating to the prevention of surgical site infection.¹⁴²

Interventions

Interventions in England appear to be mainly initiated and implemented at a local level, with funding for such initiatives linked to the non-payment for hospital readmissions as described in [Section 6](#).

4.4 United Kingdom – Scotland

Overview of quality strategy

The Healthcare Quality Strategy for NHS Scotland is underpinned by three quality ambitions, which include:¹⁴³

- **‘Safe** – *There will be no avoidable injury or harm to people from healthcare, and an appropriate, clean and safe environment will be provided for the delivery of healthcare services at all times*
- **Person-Centred** – *Mutually beneficial partnerships between patients, their families and those delivering healthcare services which respect individual needs and values and which demonstrates compassion, continuity, clear communication and shared decision-making*
- **Effective** – *The most appropriate treatments, interventions, support and services will be provided at the right time to everyone who will benefit, and wasteful or harmful variation will be eradicated.’*

Implementation of the strategy is supported by a *Quality Measurement Framework*¹⁴⁴ and *Scotland’s Efficiency and Productivity Framework*¹⁴⁵, with a focus on minimising waste and variation across NHS Scotland, including reducing unnecessary admissions and readmissions to hospital. *The Quality Measurement Framework* provides a structure for aligning the wide range of measurement undertaken in Scotland. Level 1 describes 12 Quality Outcome Indicators for national reporting; these are indicators of quality and do not have associated targets. Level 2 contains targeted action for specific short-term priority areas in support of the Quality Outcomes. Level 3 contains all other indicators/measures required for quality improvement and performance management and reporting, either by national programs or locally. Level 1 and Level 2 do not feature indicators for hospital readmission.¹⁴⁴

The Quality Indicators service area in Information Services Division (ISD) Scotland oversees and reports on indicators to inform quality improvement.¹⁴⁶

A national review of targets and indicators for health and social care was recently commissioned to ensure the approach to performance is outcome-based. The independent report by Sir Harry Burns was published in November 2017. While it has limited specific relevance to the questions posed by this review, it is a valuable review of principles for establishing a systematic and integrated approach to healthcare measurement and provides a useful overview of the range of indicators currently implemented.¹⁴⁷

Readmission indicators

Condition/procedure-specific readmission indicators appear to be limited to heart disease. The heart disease indicator set, published by the ISD, includes 18 indicators. Among these are the following relating to emergency (unplanned readmission) within 30 days of:¹⁴⁸

- *Emergency or urgent admission for congestive heart failure*
- *Emergency or urgent admission for a heart attack*
- *Emergency or urgent admission for angioplasty*
- *Elective admission for angioplasty*

- *Emergency or urgent admission for coronary artery bypass graft (CABG)*
- *Elective admission for CABG.*

The latest published report of the indicators was in 2015 and included 2013/14 data for standardised readmission proportions, which are indirectly standardised for age, sex and deprivation. The report also includes indicators for mortality and length of stay for these conditions. The data are presented as funnel plots to identify variation from the national average. The report includes links to detailed indicator specifications.¹⁴⁸

There appear to be no other condition/procedure specific readmission indicators; however, the general readmission indicators are described briefly below as the context of their implementation may be relevant to the Australian situation.

The [Hospital Scorecard](#) enables assessment of a range of indicators across domains such as patient safety, inpatient activity, infection control and patient experience. The system aims to achieve early identification of quality issues at a hospital level to support quality improvement. Among the indicators are two composite readmission indicators.¹⁴⁹

- Hospital Standardised Mortality Rates
- Medical readmissions
- Surgical readmissions
- Medical length of stay
- Surgical length of stay
- A and E waiting times
- C-Difficile infection rates
- SAB infection rates
- Patient experience survey.

The Scorecard is produced quarterly basis and compares hospital performance against the national average, identifying outliers that may warrant further investigation. Further information about indicator specifications appears not to be publicly available.

A general indicator, 'Readmission to hospital within 28 days', is one in a national suite of Primary Care Indicators, which is also positioned within a group of Health and Social Care Integration Indicators.¹⁵⁰ These indicators will be overseen by newly formed Integration Authorities (Integrated Joint Boards) and community care developments. The indicator is designed to contribute to the measurement of the following National Health and Wellbeing Outcomes:

- *'People, including those with disabilities or long-term conditions or who are frail are able to live, as far as reasonably practicable, independently and at home or in a homely setting in their community*
- *People who use health and social care services have positive experiences of those services, and have their dignity respected*
- *People using health and social care services are safe from harm*
- *Resources are used effectively and efficiently in the provision of health and social care services.'*

It is also a measure for specific quality improvement initiatives for managing unscheduled care.¹⁵¹

The rate is calculated from the number of readmissions to an acute hospital within 28 days of discharge per 1,000 population. While the definition of the indicator is still being finalised, it may be based on an average across GP practices to link directly into GP benchmarking.

Other data systems

Health service improvement is also facilitated through the use of the [NSS Discovery](#) system. This browser based system is hosted by NHS National Services Scotland (NSS) and enables reporting and benchmarking across a range of indicators.¹⁵² When the system was launched in 2015, the indicators covered; accident and emergency, admissions, readmissions, potentially preventable admissions, day case rates, cancellations, outpatients, length of stay and maternity. Further information about the nature and specifications of the indicators appears not to be publicly available.

An authorised user can drill down through indicators from a topology perspective (Level 1) to person centred information (Level 3) depending on user security access approvals. RAG (Red, Amber or Green) status is calculated using inter-quartile ranges and significance tests for most indicators.

Financial incentives

There is not a financial incentive policy currently in place in Scotland.

Interventions

Scotland also has national policies targeting admissions and readmissions for older people, specifically targeting improvements in the provision of integrated care (primary, secondary and community) for older people. To identify those at risk of repeated admission to acute hospitals ISD has developed the [Scottish Patients at Risk of Readmission and Admission](#) algorithm. This service is offered to health boards and their partners. It provides information to enable healthcare providers to target appropriate interventions so that at-risk patients are less likely to be admitted or readmitted to hospital.¹⁵³

4.5 Canada

Overview of quality strategy

Measurement of healthcare indicators at a national level is overseen by the Canadian Institute of Health Information (CIHI), which gathers, analyses and reports information about the health system to support quality improvement and transparency. *The Health System Performance Measurement Framework*,¹⁵⁴ developed by the CIHI, aims to coordinate and align the reporting of performance across Canadian jurisdictions. A further series of 'cascaded' frameworks for various aspects of the health system is also being developed, including for hospitals to ensure an integrated and consistent approach to quality improvement.¹⁵⁵

Canadian indicators are published in the CIHI Indicator Library.¹⁵⁶ Definitions, methodologies and characteristics such as reporting level are summarised in a standard template. Indicator results can also be accessed from hyperlinks provided in the library. The indicators in the library are organised according to CIHI's *Health System Performance Measurement Framework*,¹⁵⁴ but the tool also allows searching for indicators by areas of need and reporting levels.¹⁵⁷

Concerns regarding unplanned/avoidable readmissions have prioritised initiatives for measurement and management over the last decade. A report of all-cause admissions published in 2012 found that during 2010–11, a total of 181,551 patients were readmitted to acute inpatient care within a month of discharge, reflecting a 30-day all-cause readmission

rate of 8.5%. The medical patient group accounted for the highest proportion of all readmissions (64.9%). Readmissions for the surgical patient group accounted for 23.9% of all readmissions, while 7.1% were for paediatric patients and 4.1% were for obstetric patients.¹⁵⁸

A further report, *Measuring the level and determinants of health system efficiency in Canada*, identified that unplanned readmissions negatively impact on health system efficiency, with an increase of 10 percentage points in the rate of 30-day readmissions per 100 patients being associated with a reduction in efficiency of 19%.¹⁵⁹

Readmission indicators

The readmission indicators are positioned under the health system performance/appropriateness and effectiveness domain and include the following condition-specific indicators:

- 30-day readmission following AMI¹⁶⁰
- 30-day all-cause readmission after isolated CABG¹⁶¹
- 30-day all-cause readmission after percutaneous coronary intervention (PCI).¹⁶²

Other readmission indicators not considered within the scope of this review include:

- 30-day readmission rate for mental illness
- 30-day obstetric readmission rate
- 30-day readmission for patients aged 19 and younger
- 30-day surgical readmission rate
- 30-day medical readmission rate.

Data sources and characteristics

Hospitals in all jurisdictions (except Quebec) submit acute care and day procedure data to the Discharge Abstract Database and or the National Ambulatory Care Reporting System at the CIHI. Hospitals in Quebec submit data to Maintenance et Exploitation des Données pour l'Étude de la Clientèle Hospitalière (MED-ÉCHO), which are then submitted to CIHI, which integrates it into the Hospital Morbidity Database. The linkage methodology allows for linkage across Canada, except for in Quebec and Manitoba.¹⁵⁶

Hospitals are assigned to a peer group to enable peer group comparisons. Data are indirectly standardised, controlling for age, sex and selected pre-admission comorbid diagnoses applicable to the indicator. The risk-adjusted rate is calculated by dividing the observed number of cases by the expected number of cases and then multiplying that result by the Canadian average. As for the US, 95% confidence intervals are used to aid comparisons interpretation.

The indicators are reported by neighbourhood income quintiles, rather than being controlled for socioeconomic status. Two disparity measures are also calculated: the disparity rate ration (the ratio of the indicator rate for the least affluent income quartile to the most affluent) and the potential rate reduction (the reduction in indicator rate that would occur in the hypothetical case that each neighbourhood experienced the rate of the most affluent group, expressed as a percentage).¹⁵⁶

Reporting

The [Your Health System](#) website provides an interactive tool for both consumers and healthcare providers to access data and make comparisons between services. The

indicators are reported under the quality domains of access, person centredness, efficiency, appropriateness and effectiveness, safety, social determinants and health status.

For hospital readmissions (under the appropriateness and effectiveness domain), consumers can view data that identify hospital performance as above average, same as average, below average or no assessment. The comparisons are made with peer group hospitals, regionally, provincially and nationally, showing the rates (%) of readmissions for each.¹⁶⁰ Health services log in to the site to use the analytical tool for a deeper understanding of the indicator results.

A further tool enables comparison with Organisation for Economic Cooperation and Development (OECD) countries, although readmission indicators are not included in this tool.¹⁶¹

Interventions

Various interventions are implemented at a regional or provincial level.

Financial incentives

Canada does not currently apply financial incentives.

4.6 Other countries

A literature search for readmission indicator use in other countries such as Denmark and Germany was also conducted; however details and specifications are limited and are mostly extracted from secondary sources including commentaries, and general publications.

Denmark

In Denmark, readmission indicators appear to be applied in association with policies and programs to improve care for the elderly (persons aged 67 and over). Details of the individual indicator specifications are limited; however, they appear to be associated with the in-hospital clinical pathways based on a selection of diagnoses (see below). The time period during which a second admission is considered to be a readmission is 30 days from discharge.² The proportion of readmissions associated with each diagnosis is age and sex standardised and reported by geographical area via an interactive online system, [Statbank Denmark](#).¹⁶³⁻¹⁶⁵

The diagnoses, and percentage readmissions for 2017, are as follows include:

- Acute stroke (10.3%)
- Dehydration (21.9%)
- Obstipation (22.5%)
- Pneumonia (21.7%)
- Cystitis (19.2%)
- Chronic obstructive lung disease (27.1%)
- Heart failure (15.6%)
- Gastroenteritis (15.9%)
- Fractures (10.5%)
- Nutritional anaemia (20.2%)
- Arthritis (6.3%).

Denmark started measuring readmissions in 2002 with public reporting introduced in 2006. Information on readmissions is collected to inform payers and providers in the national hospital system. Financial incentives to reduce readmission exists in Denmark, though it appears to be region-specific.²

The search strategy did not yield any large-scale interventions initiatives in Denmark published in the English language.

Germany

In Germany, readmission indicators are reported for almost all conditions with exceptions defined at the DRG level.² About 23% of all DRGs are excluded as relevant readmissions; these include but are not limited to: maternal and newborn, ICU treatment, certain cancer cases, pain therapy, renal dialysis, all pre-major diagnostic categories DRGs, and error DRGs (surgery unrelated to the main diagnosis).²

Readmission indicators are collected and reported annually as part of a mandatory national quality assurance system.⁸ Measurement initiatives such as the *Qualitätssicherung mit Routinedaten*, which is operated by the *Allgemeine Ortskrankenkassen*, the largest sickness fund, calculates risk-adjusted outcome indicators, such as 30, 90, and 365 day mortality rates; readmission and reoperation rates; and a composite indicator for 14 medical conditions and procedures such as AMI, percutaneous coronary intervention, stroke, appendicitis, prostate surgery, and hip and knee implants.

Other measurement initiatives include the *Initiative Qualitätsmedizin* and *Qualitätskliniken.de*, both of which were initiated by leading private hospital chains.⁸ The *Initiative Qualitätsmedizin* calculates indicators for 40 treatment areas such as stroke, COPD, and spine surgery. It uses the German Inpatient Quality Indicator set, which is calculated with administrative inpatient data based on the AHRQ inpatient quality measures. *Qualitätskliniken.de* calculates process and outcome indicators such as blood infection post-surgery, pulmonary embolism post-surgery or colorectal cancer mortality rates, also based on administrative hospital data. The *Initiative Qualitätsmedizin* and *Qualitätskliniken.de*, as well as the mandatory quality assurance system, strongly emphasise peer reviews to facilitate quality improvement through error identification and best-practice adoption.⁸

5. Financial incentives to reduce unplanned hospital readmissions

This section of the report describes the financial incentive models in place for unplanned hospital readmissions in international jurisdictions where reasonable detail was able to be found about the current implementation. This information is limited mainly to the US and England; however, some reference is made to the German model based on information available in the peer reviewed literature.

For England and the US, information is provided regarding the development and implementation of the models as well as the impact on readmissions and other outcomes, and issues encountered, including unintended consequences. The US Hospital Readmission Reduction Program (HRRP) is well described in the grey literature and has been the subject of considerable research and commentary, including recent general reviews.¹¹⁻¹³

All policies operate within the broader context of other value-based initiatives, but these were not able to be addressed within the scope of this review.^{166, 167}

To what extent are these indicators used for hospital funding models?

England and the US introduced financial incentive programs for unplanned hospital readmissions at a similar time, 2011 and 2012 respectively. The systems vary considerably in terms of how performance is calculated and how penalties are applied, and their applicability across their respective health systems.

The US employs a rate-based system, which applies to Medicare-funded services, whereby performance and incentives are calculated relative to the national average for specific conditions and procedures. Hospital performance is measured by calculating excess readmission ratios (ERRs) for each of the condition/procedure readmission measures. An ERR is defined as the ratio of predicted-to-expected readmissions for a given measure. A result greater than 1.0 indicates that a hospital performed worse than the average performance of all hospitals. A payment adjustment factor formula is used to calculate the size of the payment reduction, which applies across the total Medicare payments to the hospital, not just to the readmissions. The calculation is based on the previous three years of readmission data and the penalties are capped. Medicare retains savings associated with the penalties.

The US policy has the advantage of being highly transparent and standardised across all hospitals in the country. However, a key challenge has been concerning the risk-adjustment; the methodology is responsive to stakeholder input and has evolved to address concerns such as risk-adjustment for socioeconomic status, as described above.

In the English system, incentives are based on all-cause readmissions (not condition or procedure-specific measures) and on thresholds for unplanned avoidable readmissions that are agreed locally based on clinical review of a sample of readmissions. For each patient in the review sample, the review team decides whether the readmission could have been avoided. This assessment of avoidability takes into consideration the actions at various levels of the health system, not just the hospital. For example, the primary care team, community health services or social services, or a body contracted to any of these organisations. The agreed threshold is the point at which the provider will not receive any payment for a given readmission. The amount of the penalty is the total price of the readmission. The savings are directed locally into improvement activities at a hospital and community level to improve care transitions and coordination.

The English system does not require risk-adjustment, which is an advantage given the difficulty in selecting appropriate factors; however, it lacks transparency and the criteria for determining avoidability are open to interpretation. The all-cause readmission measure may also make it more difficult to identify relevant clinical guidance to reduce readmissions for particular groups.

Table 17. Summary of incentive models for readmission to acute care hospitals

		UNITED STATES (Medicare) Publicly funded hospitals	UK – ENGLAND NHS – public hospitals	GERMANY
Purpose		Improve quality, safety and efficiency	Improve quality, safety and efficiency	Mitigate the impact of DRG-based payment system
Incentive model		Reduction in payment across all Medicare payments based on the rate of excess readmissions (above the national average). Penalties capped.	No reimbursement for the proportion of readmissions considered to be avoidable during clinical review sample of readmissions.	Hospitals receive only one DRG-based payment (readmitted patients are merged with the first admission for reimbursement purposes)
Definition of relevant readmissions		Second admission after discharge from admission for specified conditions and procedures	Emergency admissions after an emergency or elective index admission.	(1) A second admissions for the same reason (within the same base-DRG) (2) A second admission for the same reason (within same MDC) if the patient was first a medical case and is now treated with significant procedures (e.g. surgery) (3) A second admission for complications of treatment
Timeframe measurement		30 days from discharge	30 days from discharge	For (1) and (3) the relevant time period is the upper length of stay threshold of the relevant DRG (counted from the day of initial admission). The threshold depends on the specific DRG. E.g., it is four days for the DRG for certain ophthalmological surgeries and 70 days for the DRG for craniotomy with radiotherapy. For (2) within 30 days from initial admission
Benchmark	Definition	National average condition/procedure specific readmission rate	Locally agreed level of avoidable readmission based on all readmissions (not condition/procedure specific)	Not applicable (no benchmark)

		UNITED STATES (Medicare) Publicly funded hospitals	UK – ENGLAND NHS – public hospitals	GERMANY
Performance benchmark	Information source	National data for previous three years	Clinical review of readmissions at each hospital during a period of at least one week but up to three months determines the local level of avoidable readmissions	Not applicable (no benchmark)
	Risk-adjustment	Patient demographics, comorbidities, patient frailty Hospital peer group (from 2019) to adjust for socioeconomic factors	Not applicable	Not applicable (no benchmark)
Exceptions		'Planned admissions' as per the algorithm	HRGs that do not have a national tariff Maternity and childbirth Cancer, chemotherapy and radiotherapy patients Children under age four Patients who discharged themselves against clinical advice Emergency transfers from another provider Cross-border activity Patients receiving renal dialysis Transplant patients	About 23% of all DRGs are exempted from the policy Exceptions are defined at the DRG level. Maternal and newborn care DRGs with ICU treatment Certain cancer cases (haematological cancer, radiotherapy) Pain therapy Renal dialysis All pre-MDC DRGs (including transplants) Error DRGs (surgery unrelated to the main diagnosis)

5.1 Model details United States – Hospital Readmission Reduction Program

The *Affordable Care Act (ACA)* established the Hospital Readmission Reduction Program (HRRP) in 2012.^{12, 168, 169} Under this program, publicly funded hospitals are financially penalised if they have higher than expected (excess) risk-standardised 30-day readmission rates for various conditions.¹⁷⁰

The conditions initially included in the HRRP, based on their high volume and cost, were acute myocardial infarction, heart failure and pneumonia. These were expanded in 2015 to include patients with acute exacerbation of chronic obstructive pulmonary disease and patients admitted for elective total hip arthroplasty and total knee arthroplasty. For 2017 penalties, CMS expanded the types of pneumonia cases included in the HRRP to include aspirational pneumonia and sepsis patients coded with pneumonia present on admission. For the same year readmission rates following CABG surgery were also included.

Presently the program includes 30-day readmission measures for:

- Acute myocardial infarction (AMI) (introduced 2012)
- Pneumonia (introduced 2012)

- Heart failure (introduced 2012)
- Chronic obstructive pulmonary disease (introduced 2015)
- Elective primary total hip and/or knee arthroplasty (introduced 2015)
- Coronary artery bypass graft (introduced 2017).

It does not include the stroke or the Hospital-Wide All-Cause Readmission measures that are measured under the Hospital Inpatient Quality Reporting (IQR) program, as described in [Section 4.2](#). The methodology for the HRRP, in terms of identifying readmissions, is the same as that used for the Hospital IQR program; however, the hospitals included in the two programs differ slightly.

Participating hospitals

HRRP applies to most acute care hospitals, except for psychiatric, rehabilitation, long term care, children's, cancer, and critical access hospitals. Readmission is defined as an admission to an Inpatient Prospective Payment System (IPPS) acute care hospital within 30 days of a discharge from the same or a different IPPS acute care hospital.¹⁴ There are over 3,000 hospitals covered by the IPPS in the US.¹⁵

The HRRP system does not apply in the State of Maryland¹⁰, where a local system operates within a waiver agreement from the CMS. The Maryland Readmissions Reduction Program (RRIP) is more comprehensive than the HRRP as it includes all patients and payers, but generally aligns with CMS readmission indicators.¹⁷¹ To date, Maryland has experienced steady reductions in its readmission rates, though it remains higher than the national average.¹⁷¹ From January 2019, the *All-Payer Model – the Total Cost of Care Model*, will be implemented for a 10-year term.¹⁷²

Penalty calculations

The past and current policies concerning the HRRP penalty calculations are outlined on the Medicare website.¹⁷⁰ In brief, hospital performance is measured by calculating excess readmission ratios (ERRs) for each of the program measures (the ratio of predicted-to-expected readmissions). An ERR greater than 1.0 indicates performance worse than the average performance of all hospitals. For these hospitals, the payment adjustment factor formula is used to calculate the size of the payment reduction.

The penalty is a percentage of total Medicare payments to the hospital and is applied to all Medicare fee-for-service base operating DRG payments for the fiscal year. Payment reductions are capped (1% in (FY 2013, 2% for FY 2014 and 3% for FY 2015 and onward).

When calculating each hospital's readmission rate, CMS uses three full years of hospital data, for example, the 2017 penalties were based on hospital readmissions that occurred from July 2012 through June 2015. If a hospital has fewer than 25 eligible discharges for any measure in HRRP, CMS will not use the excess readmission rate for that measure in its payment adjustment calculation. Each year, CMS releases each hospital's penalty for the upcoming year in the Federal Register and posts this information on its Medicare website. The penalties assessed to hospitals are CMS' savings and are directed to ongoing funding of Medicare for all beneficiaries.¹⁷⁰

Amendment to incorporate adjustment for socioeconomic factors

The initial HRRP statute did not allow adjustments to the penalty calculations based on socioeconomic or community-level factors, and this has attracted widespread criticism due to the potential for unfair penalties for hospitals treating populations of low socioeconomic status.¹⁷³

However, CMS and other commentators argue that there is a need to be aware of disparities in healthcare outcomes between advantaged and disadvantaged populations, with some suggesting both adjusted and unadjusted rates should be reported.^{12, 174} The CMS has also argued that patients of lower socioeconomic status tend to be sicker and have a higher number of health conditions, and that this is taken into account in the original risk-adjustment.

The National Quality Forum (NQF) and the Medicare Payment Advisory Commission have recommended changes to the methodology to adjust for socioeconomic status.^{113, 114} A detailed discussion of the NQF deliberations is included in their recent technical report *All-cause admissions and readmissions 2015–2017*.¹¹³

The new *21st Century Cures Act* requires that hospitals be divided into peer groups based on proportions of Medicare and Medicaid funding and then determine each hospital's performance on readmissions relative to its peer group. The stratified methodology based on the new legislation will be introduced in the 2019 financial year.¹⁷⁵ Hospitals will be stratified into five peer groups and their performance will be assessed relative to the same peer group, based on the proportion of 'dual-eligible stays'.¹⁷⁶ A hospital's dual proportion is '*the proportion of Medicare fee-for-service and Medicare Advantage stays where the patient was dually eligible for Medicare and full-benefit Medicaid*'. The median ERR of hospitals within the peer group is used as the threshold to assess hospital performance, replacing the 1.0 threshold used to assess hospital performance under the non-stratified methodology. The median peer group ERR varies by measure. Measures with 25 or more eligible discharges and an ERR above the peer group median ERR enter the payment adjustment factor formula. A 'neutrality modifier' is applied to scale payment adjustments in order to retain a similar amount of Medicare saving under the stratified and non-stratified methodologies. The payment adjustment factor formula is used to calculate the size of the payment reduction. The payment reduction is capped at 3% (i.e. a minimum payment adjustment factor of 0.97). Payment reductions are applied to all Medicare fee-for-service base operating DRG payments for the fiscal year.¹⁷⁵ The new law also allows for the implementation of additional risk-adjustments in the future to enable greater responsiveness.

Financial outcomes for hospitals under this system

In 2017, the Kaiser Family Foundation published a comprehensive overview of financial outcomes for hospitals since the start of the program.¹⁷⁷ The authors, Boccuti and Casillas noted that:

- Seventy-nine per cent of hospitals were penalised in 2017, similar to the previous two years (78%).
- The average penalty in 2017 across the penalised hospitals was a 0.74% reduction in base Medicare payments, up from 0.61% and 0.63% in 2016 and 2015 respectively.
- The percentage of hospitals that were penalised to the maximum penalty level (3% of the Medicare payments) was 1.8% in 2017, compared to 1.2% in 2015 and 1.1% in 2016.
- The estimated total penalties were \$528 million in 2017, up from \$420 million in 2016 and \$428 million in 2015.

The increase in average and total penalties is due mostly to more medical conditions being included in the calculations for 2017.

While over three-quarters of hospitals (79%) experience some level of penalty, most individual stays attract no penalty or penalties of less than 1% of the hospital's Medicare

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inpatient payment. In addition, only a small proportion of hospitals (1.8% in 2017) receive the maximum penalty (3% reduction in Medicare payments).

There is also variation in penalties by type of hospital. For example, hospitals with a relatively higher proportion of low-income patients are more likely to incur penalties, reflecting the concerns about lack of adjustment for socioeconomic status expressed by other commentators.¹⁷⁸ Rural hospitals are also more likely to be penalised and to have higher average penalties.¹⁷⁷

5.2 Model details United Kingdom – England

The NHS in England introduced penalties for acute hospital readmission from the financial year 2011/12.^{179, 180} The 30-day readmission rule and other healthcare pricing is legislated under the *Health and Social Care Act 2012*.⁹

The original policy was similar to the German policy in that the NHS no longer reimbursed any readmission occurring within 30 days from discharge from an elective admission. However, since April 2012, the non-payment policy is based on the hospital-specific emergency readmission rate. Also, it makes a greater distinction between planned and unplanned readmissions, with local benchmarks being set on clinically determined thresholds for avoidable readmission, as described below. The savings generated from withholding payment for readmissions must be reinvested by payers into post-discharge services to prevent future readmissions.

The 2017/18 and 2018/19 *National Tariff Payment System* guidance sets out the process by which penalties for avoidable readmissions are agreed between providers and commissioners.¹⁷⁹ For the pricing system, an emergency readmission is defined as any readmission that occurs up to 30 days from discharge from initial admission, and that has an emergency admission method code and a national price.

Over time, some exclusions from the policy have been established, based on clinical advice, and are applied to emergency admissions following both elective and non-elective readmissions. These exclusions include:

- *‘Any that do not have a national price*
- *Maternity and childbirth*
- *Cancer, chemotherapy and radiotherapy*
- *Patients receiving renal dialysis*
- *Patients readmitted after an organ transplant*
- *Young children (under 4 years old at the time of readmission)*
- *Patients who are readmitted having self-discharged against clinical advice*
- *Emergency transfers of an admitted patient from another provider, where the admission at the transferring provider was an initial admission*
- *Cross-border activity where the initial admission or readmission is in Northern Ireland, Scotland or Wales’.*¹⁷⁹

Implementation of the rule by commissioners and providers involves:¹⁷⁹

- Conducting a clinical review of a sample of readmissions to determine avoidability;
- Setting an agreed threshold, above which readmissions will not be paid; and
- Determining the amount that will not be paid for each readmission above the threshold.

Acute providers and commissioners work together to conduct the clinical review. The review team must be independent and clinically lead, and will also include representatives from local primary care providers and social services.

The sample of readmissions is taken at the beginning of the financial year over a period from one week to three months. The review team decides whether each readmission could have been avoided, considering actions of the provider as well as the primary care team, community health services or social services, or a body contracted to any of these organisations. The aim is to identify actions by any relevant agency that could have prevented the readmission. The analysis also looks at whether there are particular local problems and how these should be addressed.

The clinical review determines the threshold for non-payment. Separate thresholds may be set for readmissions following elective or non-elective admissions. The amount that will not be paid is the total price associated with the continuous inpatient readmission. Where a patient is readmitted to a different provider, only the first provider is penalised.

5.3 Model details – Germany

Germany was the first to introduce financial incentives in 2004. The purpose of the program was to avoid unintended consequences of the introduction of DRG-based payment. The system operates at an individual patient level, whereby the patient records of the first admission and the relevant readmission are merged into a single case, and the hospital is paid as if there had been only one admission. Consequently, the hospital receives payment for only one DRG. Additional surcharges apply if the combined length of stay of the first admission and the readmission exceed the DRG specific length of stay threshold. Relevant readmissions include those where the diagnosis is the same as the original diagnosis, or is associated with a complication of the original admission, or relates to admission for surgical management of an original medical admission.⁸

The relevant time period is the upper length of stay threshold of the relevant DRG (counted from the day of initial admission) and thus varies by condition, as does the time to readmission.

5.4 Model details – Denmark

Denmark readmission policies aim at quality improvement and focus on readmission rates. In Denmark, readmission rates are publicly reported at the hospital and regional level and include both all-cause and condition-specific readmission rates for a limited number of conditions. Risk-adjusted readmission rates are reported publicly in web sites, search engines and reports on hospital performance, but payments are not adjusted in relation to readmissions.

Hospital reimbursement may be reduced at a regional level for hospitals that increase their 'treatment intensity', measured as the sum of the Diagnosis Related Group (DRG) value divided by the total number of patients. This approach provides an indirect incentive to reduce readmissions. Some types of readmissions are also funded through block grants, again creating an indirect incentive to reduce readmissions.²

6. Clinical and health system-based interventions for readmission reduction

This section of the report describes the evaluation of interventions to reduce avoidable hospital readmissions. While this review has sought specific information about interventions to prevent hospital readmissions associated with the named conditions and complications, much of the literature is more general in nature, with a significant focus on transitions of care from the hospital to the home. Sections are also included that relate to the main conditions/procedures addressed in the literature including cardiac failure, COPD, pneumonia and surgery.

Given the large volume of literature relating to readmission reduction, this review focussed on recent systematic reviews and large randomised control trials. Some examples of large-scale programs and initiatives to reduce hospital readmissions are also described in this section, with a focus on the US where programs have been introduced alongside the introduction of the financial incentives. However, due to limited availability of evaluation data and reports, and the complexity of the system in which they have operated, the success or failure for these programs and the reasons contributing to this, are difficult to establish.

What interventions have been introduced in an attempt to reduce avoidable readmissions?

Interventions to reduce hospital readmissions seek to address the factors contributing to readmission at a patient, clinician and system level. These include, for example:

- Patient-level – clinical instability and comorbidities, health literacy, capacity for self-care, social support, financial capacity
- Clinician-level – lack of compliance with treatment guidelines, lack of adequate discharge planning
- System-level – lack of structured discharge processes including medication reconciliation, lack of integration in the health system

The use of evidence-based medical/surgical therapies and involvement of the multidisciplinary team, both in-hospital and in the community are fundamental to reducing avoidable readmissions and should go hand in hand with specific readmission reduction strategies.

Attention to any individual hospital process measure is unlikely to have an impact on readmission because there are many aspects of care which, if provided to an inadequate standard, could result in readmission. However, within particular clinical areas, there are more likely to be some apparent candidates for action – for example, the prevention of infection and deep vein thrombosis in orthopaedic surgery.

Promising interventions specifically targeting readmission reduction include those related to the transition of care, including multicomponent interventions addressing discharge planning, medication reconciliation, patient and carer education regarding self-management, and follow-up. Interventions should begin in hospital and continue after discharge for best effect. There are useful taxonomies and frameworks that describe the elements of transitional care programs, including specific requirements for particular conditions.

Predictive tools are useful in identifying patients at highest risk of readmission; however, their discriminative abilities are variable. Their use needs to take into consideration the particular population and service context.

6.1 Interventions to reduce avoidable readmissions

Overview and frameworks

A considerable body of literature has explored the complex range of factors contributing to hospital readmissions and to what extent these are avoidable or unavoidable. Many have found that inadequate transitions of care between hospital and the home contribute to unplanned readmissions and this has therefore been the subject of considerable research to determine the effectiveness of various interventions. This work has led to the development of frameworks or taxonomies to support understanding of where in the processes of care various interventions may be directed.¹⁶⁻¹⁹

Hansen and colleagues initially described a taxonomy to classify transitional care.¹⁷ It was subsequently adapted by Leppin and colleagues and applied in a further systematic review by Braet and colleagues.^{16, 27} Most recently, Nuckols and colleagues have used a similar categorisation in a systematic review of economic evaluations of interventions to reduce hospital readmission.¹⁸ Burke and colleagues have also described a framework representing 'ideal transition of care'.¹⁹

The taxonomies commonly describe interventions according to three temporal domains: interventions that take place in the hospital before discharge (pre-discharge); those that are aimed at supporting the transition from hospital (bridging interventions) and those that are applied outside the hospital after discharge to support the care of the person (post-discharge). Interventions may comprise a single action, such as a follow-up call after discharge, or may comprise complex interventions, combining several activities across the three domains. Table 18 draws on the elements described by these authors to provide an overview of the types of interventions that have been applied and investigated in each of these domains.

A further model that supports understanding and evaluation of potential readmission reduction interventions is the cumulative complexity model developed by Shippee and colleagues.¹⁸¹ The model illustrates the relationship between patient workload (being a function of general life demands as well as the additional burden of treatment) and capacity for self-care (being a function of burden of the illness and access to resources) and how this can affect health outcomes. For example, patients recently discharged from the hospital are physiologically and psychologically vulnerable, and their capacity for self-care may be low.¹⁸¹ The provision of appropriate support will enhance patient and caregiver capacity but not overburden them with treatment demands or lead to a further decline in health that will impact on readmission risk.^{16, 181}

Given the large volume of literature relating to transition of care interventions, this review has focussed on the findings of recent systematic reviews. This includes five reviews encompassing transition of care more generally,^{16, 17, 25-27} and a further nine systematic reviews addressing specific interventions including medication reconciliation, readmission risk prediction tools, telephone follow-up, and the teach-back method of patient/carer education.^{18, 182-189} These reviews are summarised in [Appendix 2](#).

Many of the studies are limited by the inclusion of inadequately powered, single-site studies or quality improvement initiatives. Many of the included studies and interventions were also poorly described which limits real-world applicability.

Table 18. Taxonomy of transition of care interventions to reduce avoidable hospital readmissions

	Intervention components	Description of component
Pre-discharge	Assessment of readmission risk	Assessing patient at admission to predict their risk of readmission
	Education	Education of patient about diagnosis or treatment rationale but not focused on encouraging self-management.
	Discharge planning	Development of an individualised discharge plan prior to leaving hospital
	Medication intervention	Medication reconciliation (updating and creating an accurate list of all medications) or medication review (critical evaluation of all medications to optimise therapy)
	Appointment scheduling	Scheduling or facilitation of follow-up appointment for post-discharge
Intervention bridging the transition	Patient empowerment / self-management	Education or coaching focused on improving patients' ability to self-manage care needs
	Rehabilitation	Rehabilitation efforts aimed at improving functional status
	Streamlining / care coordination	Streamlining of services or logistical coordination (e.g. dedicated assignment of responsibility)
	Patient-centred discharge material	Adapted and individualised discharge materials or care plans used by patients
	Provision of personal health record	Providing the patient or caregiver with a personal record of diagnoses or treatments
	Clinician continuity / transition coach	Health provider involved with patient before and after discharge, providing a transition between inpatient and outpatient settings
Post-discharge	Multidisciplinary team collaboration	Collaboration of the multidisciplinary care team with primary care providers
	Home visit	Physical visitation by intervention provider to patient's place of residence
	Timely communication	Early engagement with primary care providers regarding patient's discharge and status
	Timely follow-up of patient	Follow-up visits or communication with patient in a timely manner
	Telephone follow-up	Patients or caregivers contacted by telephone after discharge
	Patient hotline	Presence of an open line for patient-initiated communication
	Telemonitoring	An automated process for the transmission of data on a patient's health status from home to the respective healthcare setting
	Engaging community support	Engagement with other community and social supports
	Other	Other interventions specific to patient situations (e.g. caregiver education, peer mentoring etc.)

Adapted from Leppin and colleagues (2014) Preventing 30-day hospital readmissions: a systematic review and meta-analysis of randomized trials.¹⁶ and Braet and colleagues (2016). Effectiveness of discharge interventions from hospital to home on hospital readmissions: a systematic review²⁷

Transition of care interventions may comprise a single component such as a telephone call after discharge, or multiple, complex components in a 'bundle'. Some examples of complex intervention programs are:

- [Care Transition Intervention](#): this model is based on the four pillars of medication self-management, patient-centred record, follow up and use of red flags which starts during admission and is followed by a home visit and follow-up telephone calls.
- [Ideal Transition Home Model](#): this model consists of four elements including admission assessment of post-discharge needs, teaching and learning, communication at discharge and timely post-acute care follow-up.
- [Better Outcomes for Older adults through Safe Transition \(BOOST\)](#): this program consists of identifying high-risk patients, education, scheduling follow-up appointments and medication reconciliation at discharge.

Single or multiple interventions

Hansen and colleagues examined single- and multi-component studies aimed at reducing rehospitalisation within 30 days of discharge.¹⁷ The authors found that no single intervention was regularly associated with reduced risk for 30-day readmission. Bundled interventions including patient education, discharge planning and telephone follow-up were found to successfully reduce readmissions in controlled trials.¹⁷

In a systematic review of transitions of care interventions in general medical and surgical patients, Kamermayer and colleagues also found that comprehensive discharge planning with multiple interventions was effective in reducing hospital readmission.²⁵ Their findings also supported a team-based approach.²⁵ Leppin and colleagues¹⁶, in their meta-analysis of 42 trials, found that complex interventions containing many unique components (>5) were more effective in reducing readmission than other interventions. These findings were also supported by Benbassat and colleagues.¹⁸⁶

Not all authors have concluded that multi-component interventions are more effective than single-component interventions. In a meta-analysis of 51 studies, Braet and colleagues found no difference in risk reduction after one month comparing multi- to single component interventions.²⁷ A difference in the classification of intervention components as single or multiple may contribute to this difference in findings.²⁷

While multi-component interventions can be effective, it is unclear whether they produce net savings or losses to the health system. Nuckols and colleagues economically evaluated quality improvement initiatives designed to reduce readmissions. They found that multi-component interventions reduced all-cause hospital readmission but did not consistently yield net savings to the health system.¹⁸ Interventions that engaged patients and caregivers were associated with higher net savings and value as they enhance the capacity for self-management, decreasing reliance on the health care system. However, they also inherently increase the burden of treatment and workload by patients and caregivers which may negatively affect patient health outcomes.¹⁸

Timing of interventions

Reviews that specifically examined the timing of interventions found those that start before discharge and continue after discharge were more effective in reducing hospital readmissions than interventions commencing after discharge.^{16, 25-27} They conclude that interventions to reduce hospital readmissions should start during the hospital stay, bridge the transition, and continue in the community.

The importance of self-care interventions

Braet and colleagues examined the impact of interventions beyond 30 days, hypothesising that effective discharge interventions would reduce hospital utilisation over a more extended period. They found that, while interventions encompassing discharge planning were more effective than those without, the difference in impact on readmissions did not persist to three months post discharge.²⁷ They suggest that training caregivers and introducing processes to raise patient capacity to self-care are important for reducing hospital readmission in the long term.²⁷

Consistent with this finding, Leppin and colleagues found that interventions that support the patients' capacity for self-care were 1.3 to 1.4 times more effective than other interventions as they assess and address contextual issues and limitations of patient capacity.¹⁶ For example, patient-friendly discharge instructions that included medication information, follow-up appointments, simple tips and instructions were effective in reducing readmissions. This approach was also found to impact positively on other outcome measures, including reduced mortality and increased patient satisfaction.^{16, 17} Braet and colleagues also found interventions that included elements to enhance patient empowerment were more effective in reducing hospital readmission than interventions without this element. This difference in effect was measurable one month and three months after discharge.²⁷

Ha Dinh and colleagues examined the effectiveness of the teach-back method on adherence and self-management for patients with chronic diseases.¹⁸³ Teach-back is a method that aims to increase people's understanding of the education information by asking them to repeat back key points of the instructions. Overall, the teach-back method showed a positive but inconsistent trend in improved self-care and reduction of hospital readmission rates. Studies in this systematic review also revealed improvements across a range of health care outcomes although these were not always statistically significant.¹⁸³

Other specific interventions

In terms of specific interventions, Jayakody and colleagues examined the effectiveness of telephone follow up in reducing 30-day hospital readmission for individuals with chronic diseases and found no evidence that telephone follow-up alone or in combination with telemedicine or post-discharge interventions was effective.¹⁸⁴ The outcomes could be affected by factors such as individual professional and patient actions and behaviour, social interactions and environmental settings, pointing to the potential importance of enhancing provider skills.¹⁸⁴

Medication reconciliation has been recognised as a major intervention focus tackling the burden of medication discrepancies and subsequent patient harm. Medication-related problems are estimated to be the most significant cause of hospital readmissions with approximately 14% being preventable.¹⁸² A meta-analysis on the effect of pharmacy-led medication reconciliation on readmission was conducted by Mekonnen and colleagues.¹⁸⁵ Their review of 17 studies concluded that pharmacist-led medication reconciliation programs are effective at reducing all-cause readmission, all-cause emergency department visits and adverse drug event related hospital revisits.¹⁸⁵

Rodrigues and colleagues conducted a systematic review on pharmacist-led transition of care interventions on 30-day readmission.¹⁸² They concluded that pharmacy-supported transition of care interventions have a meaningful effect on 30-day readmissions and are further enhanced by patient-centred follow-up care. The authors also suggest that future studies should examine the utility of pharmacy-supported intervention in other settings such as in the community.¹⁸²

Readmission risk prediction tools

Tools to enable prediction of readmission risk have been a focus of considerable research to direct preventative strategies towards patients at highest risk. A recent systematic review by Zhou and colleagues⁴³ examined 60 studies that evaluated 73 predictive models for predicting 28-day or 30-day readmission. They found that risk prediction models varied in their discriminative ability (C-statistic) ranging from 0.21 to 0.88. Most of the predictive models for general medical condition-related readmission exceeded C-statistic of 0.7. Two models, evaluated by Shams and colleagues⁴³ and Donze and colleagues,⁴⁴ targeting potentially avoidable unplanned hospital readmissions, had high discrimination ability of >0.8. The outcome measure of these models focused on the end-of-life patients⁴⁴ and pneumonia, heart failure, acute myocardial infarction and chronic obstructive pulmonary disease.⁴⁵

Predictive tools are limited by their lack of validation for particular populations and particular care settings. The cost of application is also a consideration if they are not sufficiently effective in targeting patients at most risk.

6.2 Condition-specific interventions

Heart failure readmission reduction interventions

Heart failure is a common reason for hospital admission and readmission, with around 25% of patients returning to acute care within 30 days of discharge. The primary cause of readmission is rapid decompensation and return of symptoms and is considered potentially preventable through appropriate transition and follow-up care.²⁸

Eleven systematic reviews have examined the effectiveness of readmission interventions for patients with heart failure and other cardiac conditions (Appendix 3). These differ in their focus: four studies examine transition of care interventions more generally,¹⁹⁰⁻¹⁹³ three focus on educational aspects,²⁹⁻³¹ one looks at written information as a discharge intervention;¹⁹⁴ two studies examine disease management programs,^{195, 196} and one study focuses on the impact of exercise programs.¹⁹⁷ One recent paper reviewing successful interventions for reducing readmissions in heart failure was also included though it is not a systematic review.¹⁹⁸ There are many other large-scale randomised controlled trials and cohort studies examining interventions in reducing readmissions in patients with heart failure which were not included in this report.

Sperry and colleagues proposed a comprehensive patient-centred intervention model, which describes six steps of management towards reducing readmission risk:¹⁹⁸

1. **Quality medical management**, including aggressively treating acute congestion, implementing evidence-based maintenance medications, considering device implantation, and referring to an advanced heart failure specialist or palliative care/hospice.
2. **Early reassessment**, including follow-up within one week of discharge, implementation of a discharge management program with a multidisciplinary team, frequent contact with patient via consultations of phone-based follow-up, and self-monitoring.
3. **Health literacy**, including assessing for cognitive impairment, basis heart failure education, intensive education for those with specific gaps in knowledge, and consideration of Teach Back techniques.
4. **Neuropsychological status**, including assessment for depression, anxiety, cognitive deficiency and social support, use of medications and support services if required, and referral for subspecialty consultation.

5. **Financial means**, including assessing financial need and insurance coverage, engaging social workers and case managers, and decreasing out-of-pocket costs.
6. **Functional status**, including assessing functional limitations, living situation and current support, consulting with social worker, case manager and physical therapist, referring for cardiac or general rehabilitation, and addressing the need for support services.¹⁹⁸

The model features interventions common to other transition of care frameworks while identifying important considerations for heart failure. It can be used to assess deficiencies in each of the categories and target interventions for specific patients.

All reviews highlight the importance of evidence based medical therapies to improve outcomes and reduce hospitalisation of patients with heart failure. Therapies that reduce hospitalisations should be expected to reduce readmissions as well.¹⁹⁹

Underpinning effective medical management is the involvement of the multidisciplinary team, operating across the continuum of care.^{31, 190, 192, 195, 199} Driscoll and colleagues systematically reviewed the impact of systems of care for heart failure and found that access to a specialist heart failure team/service reduced hospital readmissions and mortality¹⁹⁰. This was similarly reinforced by Oyanguren and colleagues¹⁹⁵ who found the number of members, the specialisation of the multidisciplinary team and the inclusion of specialist heart failure cardiologists and nurses were related to beneficial outcomes. In Driscoll's review, a collaborative model of care between the general practitioner and cardiologists or specialist teams in primary care was found to be beneficial.¹⁹⁰

The importance of nurse involvement is specifically addressed in a systematic review by Slyer and colleagues who found that nurse-coordinated transitioning of care from hospital to home resulted in a reduction in readmission rates.¹⁹² Interventions included patient education and comprehensive discharge planning coupled with telephone contact, home visits, or a combination of both post discharge interventions. The authors suggest that continuity of care and strengthening of the patient-nurse bond may add to the intensity of intervention and may be an important factor in the reduction of readmission rates. Furthermore, the more expertise the nurse has in caring for the complex needs of patients with heart failure, the greater the likelihood the intervention will be successful in reducing readmission rates.¹⁹²

Discharged patients with heart failure require timely outpatient follow-up. Ziaean and colleagues¹⁹⁹ found that hospitals with a greater proportion of patients receiving follow-up care within 7 days of discharge had a lower risk of 30-day mortality and readmission, controlling for patient and hospital factors.¹⁹⁹ Patients are more likely to be seen in a timely manner when follow-up appointments are made prior to discharge. However, the ideal type and frequency of outpatient contact to best manage heart failure and avoid hospital readmission is much debated.¹⁹⁸

Gorthi and colleagues¹⁹⁶ reviewed disease management programs for patients with heart failure and found no significant differences between home-based visits versus a walk-in specialty clinic, although the home-visit group had a shorter median length of hospital stay, which translated to lower overall healthcare cost. Other authors have also found that home-visiting programs significantly reduce the risk of readmissions for heart failure patients.^{191, 195}

The use of telemonitoring to support follow-up has also been specifically examined for heart failure.^{190, 191, 195, 196} Telemonitoring involves automated transmission of patient data to a central service and includes measures such as patient-measured weight, blood pressure, heart rate and heart rhythm.¹⁹⁰ In theory, increasing patient responsibility and ability to self-

care by monitoring their symptoms and managing their medications allows for day-to-day management that is not feasible in the outpatient setting.¹⁹⁸ Telemonitoring has the advantage of being able to reach large numbers of patients who live in geographically remote areas or who have other reasons for limited travel. However, telemonitoring has been used with mixed results. A limiting factor is that patients require a certain degree of health literacy to interact with the systems.^{196, 198} There is some evidence that interventions utilising structured telephone follow-up reduce risk of readmission^{191, 196}, although most studies were single-centred.

Patient-centred, self-care education aims to inform and empower patients to self-manage their condition and is seen as a key aspect of the care process for heart failure patients.^{30, 31, 183, 195} It is generally agreed that education should address the disease process, exacerbating factors, medications, lifestyle behaviours and symptom monitoring. Methods include providing written material, delivering nurse-led education, and using memory tools such as the 'teach-back' method, with more intensive educational programs offered to patients with deficiencies in health literacy.^{30, 31, 183, 195}

For example, Casimir and colleagues found that studies using patient-centred, self-care interventions such as needs assessment, counselling, support for patients and family, individualised instructions about medications, individualised advice and reinforcement, and development of exercise plans all showed trends towards readmission reduction.³⁰

In a more recent systematic review, Oyaguren and colleagues¹⁹⁵ however found that patient education and self-care was not significantly associated with a reduction of readmissions, but was associated with a reduction in the risk of morbidity and mortality. Some education components were identified as essential such as self-monitoring signs and symptoms, early care-seeking, keeping a self-care diary, understanding treatment and exercise, and care-giver inclusion.¹⁹⁵ Gavgani and colleagues also suggested that providing patients with information prescription in a written format should be considered as an indispensable part of the patient's care process.¹⁹⁴

The ideal method of patient education is debated. Rice and colleagues³¹ identified that face-to-face nurse-led education sessions for patients with heart failure contributed to reductions in hospital readmission and hospitalisation and were cost-effective. In another review, the 'teach-back' method showed an overall positive effect across a wide range of health care outcomes for heart failure patients, although these were not always statistically significant. There were also positive but inconsistent trends in improved self-care and reduction of hospital readmission rates. The authors conclude that evidence supports the use of the teach-back method in patient education, particularly for those with chronic disease.¹⁸³

Sperry and colleagues highlight that the knowledge base of heart failure patients is extremely diverse.¹⁹⁸ Some patients have a firm understanding of their condition, medications, and self-monitoring strategies, with appropriate diet and exercise. Others have difficulty with these concepts and may struggle with simple self-care skills such as remembering dosage and timing, and understanding fluid and diet recommendations. The authors note the importance of addressing the broader concept of health literacy.¹⁹⁸

They also note that financial limitations can be a barrier for patients in achieving quality health care. Patients who are unable to afford medications or follow-up appointments will more likely have deficits in other parts of the model and efforts should be made by healthcare systems to identify these patients and manage them appropriately.¹⁹⁸ Functional status is predictive of heart failure admission and readmission where patients with greater functional decline are more likely to be readmitted.¹⁹⁸

Neuropsychological status is a predictor of non-compliance with treatment, and thus readmission and mortality in heart failure.²⁰⁰ Addressing psychiatric disorders, dementia, and social support structures is an important area of focus. Sperry and colleagues also recommended screening for cognitive impairment to inform health literacy strategies.¹⁹⁸

Chronic obstructive pulmonary disease readmission reduction interventions

Of those patients hospitalised for an acute exacerbation of COPD, approximately one fifth are readmitted within 30 days of discharge.³² These patients often have complex comorbidities. Shah and colleagues, in an analysis of nearly 7 million Medicare admissions in the US, found that 50.6% of readmissions were due to respiratory-related causes – 28% for COPD.³² Heart failure was also a leading reason for readmission (6.2%) but there was a wide array of other reasons for readmission. According to Shah and colleagues, approximately 10% to 55% of readmissions after an index admission for an acute exacerbation of COPD may be preventable.³²

Several large-scale studies have revealed common patient-level and hospital-level factors associated with increased risk of readmission for COPD patients.^{32, 33, 35, 36, 201} Patient-level factors include, but are not limited to complex comorbidities such as congestive heart failure and frailty.^{32, 33, 35, 36, 201} In addition, Castillo and colleagues concluded that high-risk patients were frequently discharged with sub-optimal medication regimens and were not referred for outpatient rehabilitation.³⁵ Age and socioeconomic status were also found to be associated with increased risk of readmission.²⁰¹ Hospital-level factors include frequent admissions 12 months before to the index admission, longer length of stay and higher incidence of ICU use.^{32, 33, 35, 36, 201}

Four systematic reviews of studies relating specifically to interventions to reduce COPD readmissions were identified by the search strategy (Appendix 3).²⁰²⁻²⁰⁵ In addition, a Cochrane review,²⁰⁶ which included readmission as an outcome measure for patient self-management, is also discussed, together with other large-scale studies and general review publications.

As for other complex conditions such as heart failure, comprehensive disease management is likely to impact on readmission. Alshabanat and colleagues retrospectively analysed patient data of all COPD patients admitted across five hospitals from 2011 to 2014 following implementation of a comprehensive case management approach.²⁰⁷ The systems approach consisted of specialised teams recruited to identify, follow, and develop comprehensive care plans for all COPD patients. The program was associated with significant reductions in COPD-related admissions, length of days, emergency department visits and readmissions.²⁰⁷ Similarly, Press and colleagues found that interprofessional led programs with nurses or respiratory therapists show promise in reducing readmissions.²⁰¹

Self-management is a key aspect of such comprehensive programs and an important goal for COPD management. A Cochrane review undertaken in 2014 confirmed that successful self-management in COPD is associated with a reduction in both respiratory-related and all-cause readmissions.²⁰⁶

Transitional care is therefore a focus of much of the literature relating specifically to interventions to reduce hospital readmissions associated with COPD. In two recent systematic reviews of randomised controlled trials published before 2016, Yang and colleagues and Liu and colleagues examined the efficacy of transitional care interventions.^{203, 204} Yang and colleagues found that telemonitoring and nurse-led interventions (including health education, disease self-management, home visits or telephone follow-up) reduced all-cause readmissions over 6 to 12 months.²⁰³ Nurse-led interventions were also associated with reduced COPD-specific readmissions during 1-year

follow-up.²⁰³ Other beneficial components included a patient situation and homecare needs assessment before and after discharge, and a dedicated transition of care provider who undertook telephone or home visit follow-up.²⁰⁴ Statistically significant results were observed 6 and 18 months post-discharge.²⁰⁴ Both authors found that the duration of the transitional care intervention was a factor in determining success.^{203, 204}

A recent systematic review and meta-analysis by Pedersen and colleagues examined the effectiveness of a structured planned discharge intervention for patients with COPD.²⁰² The authors concluded that post-discharge support and transition of care interventions significantly reduced the readmission within 30 days post-discharge, and may significantly reduce readmissions up to 180 days after initial discharge. They found no evidence to recommend a single discharge intervention or package of interventions.²⁰² This was in line with earlier conclusions by Prieto and colleagues.²⁰⁵

Some authors recommend specific intervention components. Inhaler device training may be particularly important, as a large proportion of patients misuse respiratory inhalers.^{33, 34} In a randomised control trial, Press and colleagues found that patients receiving the teach-back method of inhaler education were eight times less likely to have one or more all-cause emergency department visits, hospitalisations or deaths within 30 days after discharge, compared to those receiving brief step-by-step instructions.³⁴

Early follow-up also appears to be an important component, as nearly one-third of patients returning to hospital within the 30-day window do so in the first week. In a large cohort study of Medicare beneficiaries, outpatient follow-up with a previously seen primary care provider or respiratory specialist within 30 days of discharge was found to significantly reduce the risk for emergency department visits and all-cause readmissions for COPD patients.²⁰⁸

Based on these findings, it appears that a general patient-centred approach to transition of care should be adopted, and supplemented with disease-specific interventions such as inhaler use.

Surgery readmission reduction interventions

While the factors influencing readmission associated with medical conditions are well studied, as are interventions to reduce readmissions for such conditions, readmission following surgery has received less attention in the research literature. Tsai and colleagues in 2013, however, found that nearly one in seven surgical patients were readmitted within 30 days of a major operation.³⁷

A large volume of literature is devoted to preventing surgical complications; however, only studies addressing readmission as a main outcome were included in this review. Two systematic reviews were identified; only one examined specific interventions for reducing hospital readmissions in this population.

Wiseman and colleagues systematically reviewed 39 studies of readmission within the surgical subspecialties of vascular, general, bariatric and colorectal surgery, published from 2009 to 2013.³⁸ The outcomes of interest were readmission rate, diagnoses upon readmission, predictors of readmission, and short and long-term mortality of readmission patients. The most frequent readmission diagnoses for surgical patients were related to the surgery (wound complications, gastrointestinal obstruction), rather than medical complications (cardiac, pulmonary, haematological). Wound and gastrointestinal complications were found to be common across all surgical subspecialties. Other diagnoses were common to their respective surgical specialties, for example, graft-related complications in vascular surgery and anastomotic complications in colorectal surgery.³⁸

Similarly, Merkow and colleagues extracted data from 498,875 surgeries conducted across 346 adult hospitals.²⁰⁹ They found that surgical site infection, followed by ileus or obstruction, were the two most common reasons for unplanned readmission following surgery. For total hip or knee arthroplasty, surgical site infection, followed by graft or prosthesis complications, and venous thromboembolism were the most common reasons for readmission. Furthermore, they found that readmissions after surgery were associated with new post-discharge complications related to the procedure and not an exacerbation of prior index hospitalisation complications.²⁰⁹

The findings point to the value of reducing surgical complications overall in order to reduce the rate of surgical readmissions.^{38, 209} Wiseman and colleagues recommended implementing system-wide changes such as early follow-up and monitoring of wounds for all surgical specialties and focused strategies or protocols for surgical specialties such as implementing a graft monitoring protocol after vascular surgery.³⁸

Jones and colleagues recently conducted a systematic review of transitional care interventions and their effect on hospital readmissions after surgery.²¹⁰ Findings point to patient education as one of the strongest components of transitional care programs. It significantly reduced readmissions by up to 14%, and is particularly effective when it is individualised for patient and procedure, begins early, and continues past discharge. Coordinated discharge planning driven by a comprehensive checklist or designated medical professional, home-visits, and primary care follow-up were also found to reduce readmissions by 4% to 11.5%. Follow-up phone calls, on the other hand, did not significantly reduce surgical readmissions.²¹⁰

Jones and colleagues also reported on the impact of transitional care interventions on readmission timing which yielded inconsistent results. They note that readmissions closer to discharge were more likely to be related to the index operation and that readmissions that occurred later were more likely due to patients' comorbidities and general health. This suggests that comprehensive discharge planning and follow-up home visits, which usually occur within two weeks post-discharge, are more likely to reduce readmissions related to index operation compared to interventions such as phone follow up at 1 to 6 months post-discharge.²¹⁰

While the studies reviewed lacked uniformity and are limited by study strength, findings by Merkow, Wiseman, and Jones indicate that broad patient-centred interventions after surgical discharge echo recommendations made to prevent readmission after medical discharges.^{38, 209, 210} Furthermore, gaining a better understanding of the predictors of readmission is also important in reducing avoidable readmissions after surgery.²⁰⁹

Pneumonia readmission reduction interventions

Among patients hospitalised for pneumonia, readmission rates within 30 days of discharge range from 17.8% to 20.0% in international studies. In most cases, pneumonia affects already frail populations, including the elderly and those with underlying chronic conditions such as diabetes mellitus, COPD and congestive heart failure. The reason for readmission is often associated with these comorbidities.²¹¹ In addition, rates of readmission vary depending on the type of pneumonia, with those with healthcare-acquired pneumonia more likely to require readmission than those with community-acquired pneumonia.²¹²

In exploring the potential to reduce avoidable pneumonia readmissions, De Alba and Amin identify a range of factors that can be targeted for interventions, including those related to the patient, physician or system.³⁹

At a patient level, these factors include adherence to medications or discharge plans, factors that are not specific to pneumonia. Financial or other barriers may also prevent patients from obtaining prescribed antibiotics at discharge. In addition, patients may not understand the discharge plan or may lack adequate social support to adhere to the medication regimen. Therefore, interventions aimed at addressing these barriers and improving transitions of care may positively impact pneumonia readmissions.³⁹

At a physician level, lack of compliance with treatment guidelines for pneumonia contributes significantly to the risk of readmission, thus interventions to address this issue, such as antibiotic stewardship strategies, formulary restrictions and education, may help decrease pneumonia readmission rates.³⁹

Clinical instability at discharge is also identified as a factor influencing readmission. A patient may be stable from a pneumonia perspective but not from the comorbidities perspective, thus a more general approach may be required to identify and manage clinical instability.³⁹

Predicting which patients admitted for pneumonia are at highest risk of readmission could enable hospitals to proactively identify patients and implement interventions to reduce readmissions. Weinreich and colleagues systematically reviewed 11 readmission risk prediction models for patients admitted for pneumonia.⁴⁰ They found that most models had poor to modest predictive ability with a median C-statistic of 0.63. Models that included more domains of predictors did not necessarily have better predictive ability; unlike for other disease-specific readmissions risk prediction models (e.g. heart failure). A potential explanation is that models did not adequately incorporate measures of pneumonia illness severity, which are strong predictors of mortality and have been shown to be associated with hospital readmission.⁴⁰

In relation to specific interventions to reduce readmissions associated with an initial admission for pneumonia, two systematic reviews were identified.^{41, 42} Both reviews examined the effectiveness of the discharge process on readmissions of patients with community acquired pneumonia. However, they were published in 2012 and 2013, so conclusions may be limited in their applicability.

In a systematic review of five studies, McLeod-Sordjan and colleagues examined the effect of patient-caregiver discharge learning interventions on readmissions within 30 days of elderly patients (65 years or older) with community-acquired pneumonia. They found statistically significant evidence to suggest that caregiver education interventions impact positively on decreasing the number of unexpected readmissions within 30 days.⁴²

Domingo and colleagues examined three randomised controlled trials involving patients admitted with community acquired pneumonia. The structured discharge process related to early patient engagement, patient care-giver intervention, transitional care, coordinated care and multidisciplinary team approach. While the evidence was insufficient to demonstrate a statistically significant effect of the structured discharge process on readmission, the authors recommend the incorporation of medication reconciliation with follow-up telephone calls either by an advanced practice nurse, care coordinator or a clinical pharmacist in reducing hospital readmission.⁴¹

In light of the limited research conducted specifically in relation to pneumonia, and the contribution of comorbidities to the risk of readmission, interventions aimed at improving all-cause readmission rates would be likely to have a significant impact on pneumonia readmission rates.³⁹

Other condition specific interventions

The literature search did not reveal any systematic reviews related to condition specific readmissions for pressure injury, infections, venous thromboembolism, renal failure, gastrointestinal bleeding, medication complications, delirium, nausea, vomiting, and constipation. There was also a lack of recent large-scale randomised controlled trials examining condition specific interventions in reducing readmissions. Most of the literature available pertained to general good clinical practice and governance in managing complications related to these conditions but was not discussed as it is beyond the scope of the report. Additionally, conditions such as surgical site infections, pressure injuries, gastrointestinal bleeding, nausea, vomiting and constipation were identified to be complications arising from surgery as mentioned earlier. Consequently, efforts on reducing inpatient surgical or medical-related complications overall will subsequently decrease the rate of these condition-specific readmissions.

6.3 Examples of jurisdictional intervention programs (United States)

This section describes a number of interventions implemented in the United States, where such interventions have been strongly driven by the financial incentive program. The interventions are described under three main headings: system / national level, local / regional level and hospital level. Some of the interventions described are also implemented in other jurisdictions; this is noted where applicable.

System / national level interventions

Partnership for Patients

Sponsored by the CMS, the [Partnership for Patients](#)²⁰ is a national-level initiative launched in April 2011 with the aim of making care safer by preventing hospital-acquired conditions and reducing readmissions by improving care transitions.

Central to the campaign was the investment of considerable CMS Innovation resources to create a learning community aimed at spreading best practices through five main strategies:

- engaging hospital executives and staff
- supporting changes in process of care
- building the capacity of hospitals to improve patient safety
- engaging patients and families
- building partnerships.

The initiative aligns federal programs and agencies, the Hospital Improvement Innovation Network (HIIN), and non-federal, private-public partners to achieve national reach.

Some key aspects of the partnerships include:

- [The Hospital Improvement Innovation Networks \(HIIN\)](#). These operate at the regional, state, national or hospital system level to reduce patient harm in the Medicare program, by identifying solutions that are already working and disseminating them to other hospitals and providers. More than 4,000 hospitals across 16 HIINs are participating in Partnership for Patients.
- [Patient and Family Engagement](#) initiatives seek to achieve system-wide adoption of patient and family engagement best practices. The Patient and Family Engagement Contractor has built a network of patients who tell their stories of harm to help motivate hospitals to act. They also link HIINs to appropriate patient speakers, develop case stories of hospitals successfully involving patients and families in patient safety, and provide relevant resources to promote patient-centred care.

- The [Community Based Care Transitions Program \(CCTP\)](#) is a program coordinated by the US Department of Health and Human Services. It tests models for improving care transitions from the hospital to other settings and for reducing readmissions for high-risk Medicare beneficiaries. The CCTP is described further below.

The NQF serves as Partnership for Patients' primary means to reach and influence private-sector organisations. The NQF founded the [National Priorities Partnership](#) – a partnership of 52 major national organisations which developed and implemented the National Quality Strategy, which is a national blueprint for achieving a high-value healthcare system. The activities of the partnership are described further below.

Community Based Care Transitions Program (CCTP)²¹

Created by *Section 3026 of the Affordable Care Act*, the [Community Based Care Transitions Program \(CCTP\)](#) was launched in 2011 as part of the larger federal Partnership for Patients program. The CCTP, through the CMS, allocated funds for community-based organisations, hospitals, and other healthcare providers. The funds were used to develop and test models for improving care transitions from the hospital to other care settings, improve quality of care and reduce readmissions for high-risk Medicare beneficiaries. The CCTP ran for five years, ending in January 2017.

During the program, community-based organisations partnered with a total of 448 hospitals and other organisations in their communities to deliver care transition services. These partnerships were referred to as 'CCTP sites'. A total of 101 sites were admitted into the program on a rolling basis. Out of these, 44 sites received at least a 1-year extension to participate in the CCTP beyond an initial 2-year period of performance.

A final evaluation report released in November 2017 detailed promising strategies and areas of further development from the CCTP.²¹³ The 44 extended sites that exhibited lower readmission rates were able to engage strategies to help overcome initial start-up challenges reported. These strategies included implementing the hospital-field worker approach to delivering care transition services to participants, having a seamless data process, using data to analyse readmissions to inform intervention adaptations that could address the unique needs of their targeted participants, using Coleman's Care Transitions Intervention²¹⁴ as their formal model and adapting it to the needs of their targeted population, targeting participants with non-diagnosis-based risk factors, and arranging supportive services for those who could benefit.

National Priorities Partnership²²

The [National Priorities Partnership](#), founded in 2008 by the NQF, is a partnership of 52 major national organisations with a shared vision to achieve better health, and a safe, equitable, and value-driven healthcare system. The partnership developed and implemented the National Quality Strategy, which is a national blueprint for achieving a high-value healthcare system. The partnership also helped spread innovative and scalable solutions; make connections across sectors and between organisations; and inspired people to take a focused, coordinated approach to achieve the goals of the National Quality Strategy.

The partnership formed action teams to address specific areas of focus: the Maternity Action Team, Readmissions Action Team and Patient and Family Engagement Action Team. Stakeholders were invited to attend quarterly meetings to collaborate results around patient safety. Quarterly Impact Reports were produced that describe best practices and contained successful initiatives and examples from stakeholders.²¹⁵

The aim of the Readmissions Action Team was to safely reduce avoidable readmissions across care settings – particularly in long-term and post-acute care. The team developed an action pathway to promote person-centred care for vulnerable populations. The Readmissions Action Pathway, published in 2014,²¹⁶ focused on identifying high-risk patients with psychosocial needs, and on leveraging patient, provider and community partnerships to address those needs. Action strategies include working together across stakeholder groups to enhance system improvement, collaboration, and patient and family engagement.

Updates on the activities and accomplishments of the action team members were highlighted in *National Quality Forum's Quarterly Impact Reports*, with the final report published in October 2014.²¹⁵

Local/ regional level interventions

A number of local-level initiatives which are not part of the federal initiative are described below:

State Action on Avoidable Rehospitalisation (STAAR)²³

Funded by the Commonwealth Fund, the Institute for Healthcare Improvement (IHI) launched STAAR in 2009. The [State Action on Avoidable Rehospitalisation \(STAAR\)](#) was a \$3.6 million program which aimed to reduce 30-day all-cause preventable hospital readmission rates by 20%–30% across Massachusetts, Michigan, and Washington states (with Ohio joining the initiative in 2010 as a self-funded participant). Through a cooperative, statewide approach, STAAR was led by each state's hospital association, with IHI providing technical assistance supported by the grant funds.

STAAR consisted of two major components to reduce readmissions:

- Improve transitions of care by cultivating a cross continuum learning collaborative. STAAR participants were required to engage partners from across the continuum of care and to focus on four key areas of improvement:
 - Perform a comprehensive assessment of post-hospital needs;
 - Provide patient and carer education;
 - Provide real-time, clear discharge information to patient, carer and community provider; and
 - Ensure timely follow up for medical and non-medical services
- Engage in state-level leadership to understand and mitigate systematic barriers to change.

STAAR engaged with multi-stakeholder leaders and steering committees which coordinated program implementation and were involved in identification and mitigation of barriers, such as policy and payment reforms.

Early evaluation of the STAAR initiative in 2011²¹⁷ revealed success in fostering collaboration with related care transition programs in states where there was a universal adoption of cross-continuum team concept. Prior to participating in STAAR, none of the hospitals had established a mechanism for routinely reviewing readmission events with their community-based colleagues. Since the STAAR initiative, more than 90% of participating hospitals had formed cross-continuum teams. An unanticipated outcome of the STAAR initiative has been the formation of partnerships with other existing care transition efforts, creating greater visibility and momentum for expanding STAAR as well as other projects.

The evaluation identified a number of limitations of the STAAR initiative, including inadequate resourcing, lack of access to readmission data to inform strategy development

and lack of use of available data in this regard.²¹⁷ The evaluation itself was limited in that it was unable to establish the impact of the program in the context of a variety of other policy and funding reforms to address hospital readmission.

A more recent review funded by the Commonwealth Fund was based on interviews with program participants in 2011.²¹⁸ The authors identified a number of challenges for the STAAR initiative. These included difficulties in developing collaborative relationships across care settings, gaps in evidence for effective interventions, and deficits in quality improvement capabilities and infrastructures among some organisations. A formal evaluation report of the STAAR program post-implementation is not available.

Hospital to Home (H2H)²⁴

Developed by the IHI and the American College of Cardiology, the [Hospital to Home \(H2H\) campaign](#) was launched in 2010, and aims to reduce cardiovascular-related preventable readmissions by improving the transition from inpatient care for individuals hospitalised with cardiovascular disease. The H2H recommends improvement in three core areas: ensuring appropriate medication and management post-discharge, arranging for early follow-up; and ensuring patients understand symptom management as a means of self-care.

The H2H project provides an online community for sharing ideas and is a central repository of information and tools, rather than imposing specific strategies. H2H has an active learning community covering over 1,000 facilities and over 2,000 individuals according to data from 2011.

The program has rolled out three self-improvement projects and provided participants with recommended strategies and tools to achieve small, attainable goals in their organisation:²⁴

- **See You in 7:** aimed to ensure all patients discharged with a diagnosis of heart failure or acute myocardial infarction have a follow-up appointment scheduled or cardiac rehabilitation referral made within seven days of hospital discharge
- **Mind Your Meds:** aimed to ensure clinicians work together with patients discharged with a diagnosis of heart failure or acute myocardial infarction to optimise medication management
- **Signs and Symptoms:** aimed to activate patients to recognise early warning signs and have a plan to address them.

System and patient complexity have presented challenges for implementation of this initiative.²¹⁹

Best Practices for Better Care campaign²²⁰

In 2011, the Association of American Medical Colleges partnered with University Healthsystems Consortium to launch the Best Practices for Better Care campaign. This was a collaborative measurement process that focused on improving quality and safety in three areas of academic medicine – medical education, patient care, and research. At the time, more than 200 medical schools, teaching hospitals, and health systems committed to implement the campaign's five components:

- Teaching quality and safety to the next generation of doctors
- Ensuring safer surgery through use of surgical checklists
- Reducing infections from central lines
- Reducing hospital readmissions for high-risk patients
- Researching, evaluating, and sharing new and improved practices.

Some of the suggested best practices from the Better Care Campaign for reducing readmissions included: implementing 7-day post discharge plan; performing risk assessment at admission; providing a readmission performance feedback loop; building cross-functional readmissions review teams; incorporating electronic medical records; and utilising case management. Detailed information about these best practices and other aspects of the Better Care Campaign are not publicly accessible and the campaign appears to be now conducted through the private provider Vizient.

Hospital-level interventions

The following section describes hospital-level programs or tools that were implemented in the past 10 years in the US.

Better Outcomes for Older Adults through Safe Transitions (BOOST)²²¹

In 2008, the Society of Hospital Medicine developed Project BOOST (Better Outcomes for Older Adults through Safe Transitions) to improve the care of patients as they transition from hospital to home. BOOST is a discharge-focused program containing five key components:

- *‘Standardised Risk Assessment: tool for identification of high-risk patients*
- *Patient-centred preparation for discharge: use of teach back techniques in patient education, medication reconciliation, patient-friendly discharge forms (e.g. warning signs and symptoms and how to respond, outpatient appointments)*
- *Standardised communication*
- *72 hours follow up call for high risk patients*
- *Mentored implementation.’*

122 sites have implemented BOOST in the US and Canada according to the latest data (2012). There has not been a national evaluation study on the effects of BOOST, although there are several site-specific studies. The AHRQ web site includes a quality tool to support implementation.²²¹

Interventions to Reduce Acute Care Transfers (INTERACT)²²²

In 2009, CMS launched this quality improvement program to *‘assist skilled nursing facilities with early identification, assessment, intervention, documentation, and communication of changes in a resident’s condition’*. The goal of INTERACT is to improve care and reduce the frequency of potentially avoidable transfers to the acute hospital.

The INTERACT program comprises four types of hospital-level tools:

- Communication tools (e.g. early warning tools, resident transfer forms);
- Decisions support tools for conditions which guide decisions about further evaluation of changes in condition;
- Advanced care planning tools such as guides to communication, examples of comfort care interventions; and
- Quality improvement tools such as acute care transfer logs and review documentation.

A review published in 2014²²³ identified three general characteristics shared by facilities that have successfully implemented the INTERACT Quality Improvement Program. These included: executive leadership support for the program; engagement of direct care staff by the facility based INTERACT Champion(s); and a culture dedicated to quality improvement. These same characteristics also provide the foundation for successfully overcoming common barriers to implementation.

The INTERACT program is also used in other countries including Canada, the United Kingdom and Singapore.

Project RED (Re-Engineered Discharge)²²⁴

[Project Re-Engineered Discharge](#) is a research group based at Boston University Medical Center. It develops and tests strategies to improve the hospital discharge process to promote patient safety and reduce hospital readmission rates.

The RED intervention targets 12-hospital level components in reducing readmission rates:²²⁴

- *“Ascertain need for and obtain language assistance*
- *Make appointments for follow-up medical appointments and post discharge tests/labs*
- *Plan for the follow-up of results from lab tests or studies that are pending at discharge*
- *Organize post-discharge outpatient services and medical equipment*
- *Identify the correct medicines and a plan for the patient to obtain and take them*
- *Reconcile the discharge plan with national guidelines*
- *Teach a written discharge plan the patient can understand*
- *Educate the patient about his or her diagnosis*
- *Assess the degree of the patient’s understanding of the discharge plan*
- *Review with the patient what to do if a problem arises*
- *Expedite transmission of the discharge summary to clinicians accepting care of the patient*
- *Provide telephone reinforcement of the Discharge Plan.”*

The *RED Toolkit* provides implementation guidance and tools to support implementation of the above components. Several case studies are published on the website.

7. Appendices

Appendix 1. Mapping of Australian list of avoidable hospital readmission versus existing indicator definition diagnoses

Index and readmission diagnoses of other existing Australian readmission indicators are mapped against the Australian list of avoidable hospital readmissions developed by the Commission. Direct comparisons between these indicators are not possible due to the differences in methodology and purpose of the indicators as highlighted in the report, however the mapping provides a useful overview of how these indicators are applied nationally.

Specifically, the Australian list of conditions has been developed for integration of safety and quality into pricing and funding for Australian hospital services. The other existing indicators all share the high-level purpose of improving quality and safety, and measuring performance to support improvement. The purpose of the indicators is however variously stated depending on the level of implementation, for example:

- **PI 23 (National)** – Measure of whether the government is achieving its objective to provide services that are of a high quality and well-coordinated to ensure continuity of care, specifically in relation to the selected surgical procedures
- **PI 23 (jurisdiction implementation WA)** – Measure of provision of effective treatment and restorative healthcare in WA; enables measurement and monitoring of performance at an individual hospital level to identify variance with statewide targets and support improvement through a structured review process
- **PI 23 (jurisdiction implementation SA)** – Measure and monitor performance at an individual hospital level to inform local improvement in line with general targets to improve performance on the previous year
- **CHBOI4 (Commission)** – Enable measurement, monitoring and action in relation to unplanned/unexpected readmission for further treatment of the same condition; treatment of a condition related to the one for which the patient was previously hospitalised, or a complication of the condition for which the patient was previously hospitalised
- **Queensland (VLAD) incorporating CHBOI, PI 23 and other indicators** – Measure and monitor performance at an individual hospital level to identify variance with statewide rates and support improvement through a structured review and reporting process
- **New South Wales (including some CHBOI4 / PI 23 measures)** – Decrease the number of unplanned readmissions and increase the focus on the safe transfer of care, coordinated care in the community, and early intervention. Measure and monitor performance at an individual hospital level to identify opportunities for improvement, but with no specific targets or performance levels identified
- **Victoria (based on CHBOI4)** – Enable monitoring of performance at an individual hospital level to identify variance with statewide rates and support improvement through a review and reporting process

Where an existing index admission diagnosis is similar or within the category of the Australian list this is described in terms of the index admission diagnosis and labeled (I). Where an existing readmission diagnosis is similar or within the category the Australian list, the index admission diagnosis of the indicator is noted and labeled (R).

Australian list of avoidable hospital readmissions			PI 23 NHA 2018, SA, WA (all 28 day readmission)	CHBOI4	QLD (VLAD)	NSW	VIC
Readmission condition	Readmission diagnosis	Readmission interval					
Pressure injury	Stage III ulcer	14 days		(R) 0-7 day AMI (CHBOI 4a)	(R) 7 day AMI		(R) 60 day knee replacement
	Stage IV ulcer	7 days		(R) 0-7 day knee, hip (CHBOI 4b, c)			(R) 60 day hip replacement
	Unspecified decubitus and pressure area	14 days					
Infections	Urinary tract infection	7 days		(R) 0-7 day AMI (CHBOI4a) (R) 60 day knee, hip, (CHBOI 4b,c)	(R) 60 day knee replacement (R) 60 day hip replacement (R) 7 or 30 day AMI		(R) 60 day knee replacement (R) 60 day hip replacement (R) 15 day paediatric tonsillectomy and adenoidectomy
	Surgical site infection	30 days					
	Pneumonia	7 days		(R) 0-7 day AMI (CHBOI4a)		(I) 30 day pneumonia	
	Blood stream infection	2 days					
	Central line and peripheral line associated blood stream infection	2 days	(R) Selected surgical procedures	(R) 0-7 day AMI (CHBOI4a)			
	Multi-resistant organism	2 days		(R) 0-7 day AMI (CHBOI4a) (R) 0-7 day knee, hip, tonsillectomy and adenoidectomy (CHBOI 4b,c,d)			
	Infection associated with devices, implants and grafts	90 days	(R) Selected surgical procedures	(R) 0-7 day AMI (CHBOI4a)			
Infection associated with prosthetic devices, implants and grafts in genital tract or urinary system	30 days	(R) Selected surgical procedures					

Australian list of avoidable hospital readmissions			PI 23 NHA 2018, SA, WA (all 28 day readmission)	CHBOI4	QLD (VLAD)	NSW	VIC
Readmission condition	Readmission diagnosis	Readmission interval					
	Infection associated with peritoneal dialysis catheter Gastrointestinal infections	2 days 28 days					
Surgical complications	Postoperative haemorrhage/haematoma Surgical wound dehiscence Anastomotic leak Pain following surgery Other surgical complications	28 days 28 days 28 days 14 days 28 days	(R) Selected surgical procedures	(R) 0-7 day AMI (CHBOI 4a) (R) 15-60 day knee, hip, tonsillectomy and adenoidectomy (CHBOI 4b,c,d)	(R) 30 day laparoscopic cholecystectomy (R) 7 or 30 day AMI		(R) 60 day knee replacement (R) 60 day hip replacement (R) 15 day paediatric tonsillectomy and adenoidectomy
Respiratory complications	Respiratory failure including acute respiratory distress syndromes Aspiration pneumonia	21 days 14 days	(R) Selected surgical procedures	(R) 0-7 day AMI (CHBOI 4a)	(R) 30 day laparoscopic cholecystectomy (R) 7 day AMI		(R) 60 day knee replacement (R) 60 day hip replacement (R) 15 day paediatric tonsillectomy and adenoidectomy
Venous thromboembolism	Venous thromboembolism	90 days	(R) Selected surgical procedures	(R) 0-7 day AMI (CHBOI 4a)	(R) 7 or 30 day AMI		(R) 60 day knee replacement (R) 60 day hip replacement
Renal failure	Renal failure	21 days		(R) 30 day AMI (CHBOI 4a)	(R) 30 day heart failure (R) 7 or 30 day AMI		
Gastrointestinal bleeding	Gastrointestinal bleeding	2 days	(R) Selected surgical procedures	(R) 30 day AMI (CHBO I4a)	(R) 30 day laparoscopic cholecystectomy		
Medication complications	Drug related respiratory complications / depression Hypoglycaemia	2 days 4 days		(R) 0-7 day knee, hip, tonsillectomy			(R) 60 day knee replacement (R) 60 day hip replacement

Australian list of avoidable hospital readmissions			PI 23 NHA 2018, SA, WA (all 28 day readmission)	CHBOI4	QLD (VLAD)	NSW	VIC
Readmission condition	Readmission diagnosis	Readmission interval					
				and adenoidectomy (CHBOI 4b,c,d)			
Delirium	Delirium	10 days	(R) Selected surgical procedures	(R) 0-7 day AMI (CHBOI 4a) (R) 0-7 day knee, hip (CHBOI 4b, c)	(R) 7 day AMI		
Cardiac complications	Heart failure and pulmonary oedema	30 days		(R ,I) 30 day AMI (CHBOI 4a) (R) 0-7 day knee, hip (CHBOI 4b, c)	(R, I) 30 day heart failure (R, I) 7 or 30 day AMI	(I) 30 day heart failure	(R, I) 30 day AMI (R, I) 30 day heart failure (R) 60 day knee replacement (R) 60 day hip replacement
	Ventricular arrhythmias and cardiac arrest	14 days		(R) 30 day AMI (CHBOI 4a) (R) 0-7 day knee, hip (CHBOI 4b, c)			
	Atrial tachycardia	14 days		(R) 30 day AMI (CHBOI 4a)			
	Acute coronary syndrome including unstable angina, STEMI and NSTEMI	30 days		(R) 30 day AMI (CHBOI 4a) (R) 0-7 day knee, hip (CHBOI 4b, c)			
Other	Constipation	14 days		(R) 30 day AMI (CHBOI 4a) (R) 0-7 day knee, hip (CHBOI 4b, c)	(R) 30 day laparoscopic cholecystectomy (R) 7 or 30 day AMI		(R) 15 day paediatric tonsillectomy and adenoidectomy
	Nausea and vomiting	7 days		(R) 0-7 day AMI (CHBOI 4a) (R) 0-7 day knee, hip, tonsillectomy and adenoidectomy (CHBOI 4b,c,d)			

Note:

- SA and WA use the same indicators as NHA2018
- ACT, NT, and TAS states do not have condition-specific indicators so are not included in the table

Appendix 2. Systematic reviews and meta-analyses of transition of care interventions for all-cause readmission

First Author	Year	Title	Studies included	Type of intervention	Aim and conclusion
Kamer Mayer	2017	The effectiveness of transitions-of-care interventions in reducing hospital readmissions and mortality	13 studies included from 1945 to August 2016	Transitions-of-care interventions	<p>Aim/objective: This systematic review examined the effectiveness of select evidence-based transitions-of-care interventions on reducing 30-day readmission rates, reducing emergency room visits, and reducing mortality rates.</p> <p>Conclusion: The findings of this review support the use of transitions-of-care interventions such as tailored discharge planning and post-discharge phone calls</p>
Nuckols [^]	2017	Economic evaluation of quality improvement interventions designed to prevent hospital readmission: A systematic review and meta-analysis	50 studies included from 1994–2016	Quality improvement interventions	<p>Aim/objective: To systematically review economic evaluations of QI interventions designed to reduce readmissions.</p> <p>Conclusion: Multicomponent QI interventions can be effective at reducing readmissions relative to the status quo, but net costs vary. Interventions that engage general populations of patients and their caregivers may offer greater value to the health system, but the implications for patients and caregivers are unknown</p>
Rodrigues [^]	2017	Effect of pharmacy-supported transition-of-care interventions on 30-day readmissions: A systematic review and meta-analysis	56 studies (n=61,858) from 1995–2015	Pharmacy-supported transition-of-care interventions	<p>Aim/objective: To describe pharmacy-supported transition-of-care (TOC) interventions and determine their effect on 30-day all-cause readmissions.</p> <p>Conclusions: Pharmacy-supported TOC programs were associated with a significant reduction in the odds of 30-day readmissions.</p>
Braet	2016	Effectiveness of discharge interventions from hospital to home on hospital readmissions: a systematic review	47 studies from 1990 to July 2014	Hospital to home discharge interventions	<p>Aim/objective: The objective of this review was to identify discharge interventions from hospital to home that reduce hospital readmissions within three months and to understand their effect on secondary outcome measures.</p> <p>Conclusion: Interventions to reduce hospital readmissions should start during hospital stay and continue in the community (grade A recommendation). This requires financial systems to support and facilitate collaboration between hospitals and home care. Interventions that support patient empowerment are more effective in reducing hospital readmissions (grade B recommendation). To promote patient empowerment caregivers must be trained to increase patients' capacity to self-care.</p>
Ha Dinh	2016	The effectiveness of the teach-back method on adherence and self-management in health education for people with chronic disease: a systematic review.	10 studies included in final review, from database inception to August 2013	Teach-back method	<p>Aim/objective: This systematic review examined the evidence on using the teach-back method in health education programs for improving adherence and self-management of people with chronic disease.</p> <p>Conclusion: Overall, the teach-back method showed positive effects in a wide range of health care outcomes although these were not always statistically significant. Studies in this systematic review revealed improved outcomes in disease-specific knowledge, adherence, self-efficacy and the inhaler technique. There was a positive but inconsistent trend also seen in improved self-care and reduction of hospital readmission rates. There was limited evidence on improvement in quality of life or disease related knowledge retention. Evidence from the systematic review supports the use of the teach-back method in educating people with chronic</p>

First Author	Year	Title	Studies included	Type of intervention	Aim and conclusion
					disease to maximize their disease understanding and promote knowledge, adherence, self-efficacy and self-care skills
Jayakody	2016	Effectiveness of interventions utilising telephone follow up in reducing hospital readmission within 30 days for individuals with chronic disease: a systematic review.	10 studies, from database inception to May 2015	Telephone follow up	<p>Aim/objective: This systematic review aimed to determine the methodological quality and effectiveness of interventions utilising telephone follow up (TFU) alone or in combination with other components in reducing readmission within 30 days amongst patients with cardiovascular disease, chronic respiratory disease and diabetes.</p> <p>Conclusion: Overall, the methodological quality of included studies was poor. All identified studies combined TFU with other intervention components. Interventions that were effective included three studies which provided TFU in addition to pre-discharge support; and two studies which provided TFU with both pre- and post-discharge support which included education, discharge planning, physical therapy and dietary consults, medication assessment, home visits and a resident curriculum. There was no evidence that TFU and telemedicine or TFU and post-discharge interventions was effective, however, only one to two studies examined each of these types of interventions.</p>
Mekonnen [^]	2016	Effectiveness of pharmacist-led medication reconciliation programmes on clinical outcomes at hospital transitions: a systematic review and meta-analysis	17 studies (n=21,342), from database inception to December 2014	Pharmacist-led medication reconciliation	<p>Aim/objective: the aim of this study was to systematically investigate the effect of pharmacist-led medication reconciliation programmes on clinical outcomes at hospital transitions.</p> <p>Conclusion: Pharmacist-led medication reconciliation programmes are effective at improving post-hospital healthcare utilisation. This review supports the implementation of pharmacist-led medication reconciliation programmes that include some component aimed at improving medication safety.</p>
Leppin [^]	2014	Preventing 30-day hospital readmissions: A systematic review and meta-analysis of randomized trials	47 studies from 1990 to April 2013	Transitions-of-care interventions	<p>Aim/objective: To synthesize the evidence of the efficacy of interventions to reduce early hospital readmissions and identify intervention features – including their impact on treatment burden and on patients' capacity to enact postdischarge self-care – that might explain their varying effects.</p> <p>Conclusion: In 42 trials, the tested interventions prevented early readmissions, a finding that was consistent across patient subgroups. Trials published before 2002 reported interventions that were 1.6 times more effective than those tested later. In exploratory subgroup analyses, interventions with many components, involving more individuals in care delivery, and supporting patient capacity for self-care were 1.4, 1.3, and 1.3 times more effective than other interventions, respectively. A post hoc regression model showed incremental value in providing comprehensive, postdischarge support to patients and caregivers. Tested interventions are effective at reducing readmissions, but more effective interventions are complex and support patient capacity for self-care. Interventions tested more recently are less effective.</p>
Benbassat [^]	2013	The effect of clinical interventions on hospital readmissions: a meta-review of published meta-analyses	99 studies included from database inception to September 2012	Hospital and community-based interventions	<p>Aim/objective: To assess the efficacy of broad clinical interventions in preventing hospital readmission rate of patients with chronic diseases</p> <p>Conclusion: Meta-analyses of RCTs have consistently found that, in the community, disease management programs significantly reduced HRR in patients with heart failure, coronary heart disease and bronchial asthma, but not in patients with stroke and in selected patients with chronic disorders. In hospital interventions, such as discharge planning, pharmacological consultations and multidisciplinary care, and community interventions in patients with chronic</p>

First Author	Year	Title	Studies included	Type of intervention	Aim and conclusion
					obstructive pulmonary diseases had an inconsistent effect on HRR. The efficacy of in-hospital interventions in reducing HRR is in need of further study. In patients with heart diseases and bronchial asthma, HRR may be considered as a publicly reported quality indicator of community care, provided that future research confirms that efforts to reduce HRR do not adversely affect other patients' outcomes, such as mortality, functional capacity and quality of life. Future research should also focus on the reasons for the higher efficacy of community interventions in patients with heart diseases and bronchial asthma than in those with other chronic diseases.
Stratton [^]	2013	A systematic review and meta-analysis of the impact of oral nutritional supplements on hospital readmissions	9 studies included. From database inception to November 2012	Oral nutritional supplements (ONS)	Aim/objective: This systematic review (9 RCT, N = 1190) examined the effects of oral nutritional supplements (ONS) on hospital readmissions. Meta-analysis of 6 RCT (N = 852) with data on the proportion of patients readmitted to hospital showed significant reductions with ONS vs. routine care, including 5 RCT (N = 826) that recorded readmissions. The significant reduction in readmissions was found in meta-analyses of ONS trials in various settings and in patients with DRM or of varied nutritional status. A larger meta-analysis (8 RCT, N = 999) that combined other readmissions data using standardised differences also showed a significant reduction with ONS. Most of these trials (75%) were in older people aged ≥65 years. This systematic review shows that ONS significantly reduce hospital readmissions, particularly in older patient groups, with economic implications for health care.
Hesselink	2012	Improving patient handovers from hospital to primary care: a systematic review	36 studies, from January 1990 to March 2011	Transitions-of-care interventions	Aim: To systematically review interventions that aim to improve patient discharge from hospital to primary care. Result: Effective interventions included medication reconciliation; electronic tools to facilitate quick, clear, and structured summary generation; discharge planning; shared involvement in follow-up by hospital and community care providers; use of electronic discharge notifications; and Web-based access to discharge information for general practitioners. Statistically significant effects were mostly found in reducing hospital use (for example, rehospitalisations), improvement of continuity of care (for example, accurate discharge information), and improvement of patient status after discharge (for example, satisfaction).
Santomassino	2012	A systematic review on the effectiveness of continuity of care and its role in patient satisfaction and decreased hospital readmissions in the adult patient receiving home care services	4 studies included, from database inception to November 2011	Home care	Aim/objective: To examine and synthesize the best available evidence related to the effectiveness of continuity of care interventions and their impact on patient satisfaction and all-cause hospital readmissions rates in the adult patient who is receiving home care services. Conclusion: Home care interventions that include nurses and advanced practice nurses with specialised training in the care of the population served as the direct provider along with collaboration with an interdisciplinary team in a high-risk patient populations contributed to reduced hospital readmission rates. The outcomes of the included studies suggest that consistently scheduled home care services promote patient satisfaction.
Hansen	2011	Interventions to Reduce 30-Day Rehospitalisation: A Systematic Review	43 studies, from January 1975 to January 2011	Transitions-of-care interventions	Aim/objective: To describe interventions evaluated in studies aimed at reducing rehospitalisation within 30 days of discharge. Conclusion: Pre-discharge interventions included patient education, medication reconciliation, discharge planning, and scheduling of a follow-up appointment before discharge. Post discharge interventions included follow-up telephone calls, patient activated hotlines, timely communication with ambulatory providers, timely ambulatory provider follow-up, and post-

First Author	Year	Title	Studies included	Type of intervention	Aim and conclusion
					discharge home visits. Bridging interventions included transition coaches, physician continuity across the inpatient and outpatient setting, and patient centred discharge instruction. No single intervention implemented alone was regularly associated with reduced risk for 30-day rehospitalisation
Linertova	2011	Interventions to reduce hospital readmissions in the elderly: in-hospital or home care. A systematic review	32 studies, from database inception to October 2009	In-hospital or home care	<p>Aim/objective: The objective of this systematic review was to identify interventions that effectively reduce the risk of hospital readmissions in patients of 75 years and older, and to assess the role of home follow-up.</p> <p>Conclusion: Most of the interventions evaluated did not have any effect on the readmission of elderly patients. However, those interventions that included home care components seem to be more likely to reduce readmissions in the elderly.</p>
<i>^includes meta-analyses</i>					

Appendix 3. Systematic reviews and meta-analyses of condition specific interventions to reduce readmissions

First Author	Year	Title	Studies included	Condition	Type of intervention	Aim and conclusion
Rice	2017	The effect of nurse-led education on hospitalisation, readmission, quality of life and cost in adults with heart failure. A systematic review	7 RCTs (3,549 participants) 2008–2015	Cardiac: heart failure	Nurse led education	<p>Aim/objective: The purpose of this systematic review was to highlight the effect of nurse-led 1:1 patient education sessions on Quality of Life (QoL), readmission rates and healthcare costs for adults with heart failure (HF) living independently in the community.</p> <p>Conclusion: The results of this review identified nurse-led education sessions for adults with HF contribute to reduction in hospital readmissions, reduction in hospitalisation and a cost benefit. Additionally, higher functioning and improved QoL were also identified. These results suggest that nurse-led patient education for adults with HF improves QoL and reduces hospital admissions and readmissions.</p>
Driscoll	2016	What is the impact of systems of care for heart failure on patients diagnosed with heart failure: a systematic review	29 studies	Cardiac: Heart failure	Systems of care	<p>Aim/objective: The aim of the review was to examine systems of care for heart failure that reduce hospital readmissions and/or mortality.</p> <p>Conclusion: Several studies found that access to a specialist heart failure team/service reduced hospital readmissions and mortality. In primary care, a collaborative model of care where the primary physician shared the care with a cardiologist, improved patient outcomes compared to a primary physician only. During hospitalisation, quality improvement programs improved the quality of inpatient care resulting in reduced hospital readmissions and mortality. In the transitional care phase, heart failure programs, nurse-led clinics, and early outpatient follow-up reduced hospital readmissions. There was a lack of evidence as to the efficacy of telemonitoring with many studies finding conflicting evidence. Redesigning systems of care aimed at improving the translation of evidence into clinical practice and transitional care can potentially improve patient outcomes in a cohort of patients known for high readmission rates and mortality.</p>
Goyal	2016	Impact of Exercise Programs on Hospital Readmission Following Hospitalisation for Heart Failure: A Systematic Review	1 RCT (105 patients)	Cardiac: Heart failure	Exercise programs	<p>Aim/objective: To examine the impact of exercise programs on hospital readmissions among patients recently hospitalised for heart failure</p> <p>Conclusion: Among 1213 unique publications identified, only one study fulfilled inclusion criteria. This study was a single-site randomized controlled trial that consisted of a 12-week exercise program in a cohort of 105 patients with a principal diagnosis of HF at a metropolitan hospital in Australia. This study revealed a reduction in 12-month all-cause and cardiovascular-related hospitalisation rates. However, inferences were limited by its single-site study design, small sample size, premature termination, and high risk for selection, performance, and detection bias. As no studies have built upon the findings of this study, it remains unknown whether exercise programs can improve readmission rates among patients recently hospitalised for heart failure, a significant gap in the literature.</p>

First Author	Year	Title	Studies included	Condition	Type of intervention	Aim and conclusion
Oyanguren [^]	2016	Effectiveness and Factors Determining the Success of Management Programs for Patients With Heart Failure: A Systematic Review and Meta-analysis	66 RCTs (n=13,535) 1990–2014	Cardiac: Heart failure	Disease management program	<p>Aim/objective: The aim of the present study was to update our understanding of the reductions in mortality and readmissions produced by these programs, elucidate their components, and identify the factors determining program success.</p> <p>Conclusion: Factors associated with program success were implementation after 2001, program location outside the United States, greater baseline use of angiotensin-converting enzyme inhibitors/angiotensin receptor blockers, a higher number of intervention team members and components, specialized heart failure cardiologists and nurses, protocol-driven education and its assessment, self-monitoring of signs and symptoms, detection of deterioration, flexible diuretic regimen, early care-seeking among patients and prompt health care response, psychosocial intervention, professional coordination, and program duration.</p>
Gavvani [^]	2015	The Efficacy of Written Information Intervention in Reduction of Hospital Re-admission Cost in Patients With Heart Failure; A Systematic Review and Meta-Analysis	3 RCTs (n=154), 1993–2013	Cardiac: heart failure	Written information	<p>Aim/objective: To assess the efficacy of written information versus non-written information intervention in reducing hospital readmission cost, if prescribed or presented to the patients with HF.</p> <p>Conclusion: One of the effective factors in minimizing the healthcare cost and preventing from hospital re-admission is providing the patients with information prescription in a written format. It is suggested that hospital management, Medicare organisations, policy makers and individual physicians consider the prescription of appropriate medical information as the indispensable part of patient's care process.</p>
Casimir	2014	The effectiveness of patient-centred self-care education for adults with heart failure on knowledge, self-care behaviors, quality of life, and readmissions: a systematic review	7 RCTs, 1990–2013	Cardiac: heart failure	Education	<p>Aim/objective: To evaluate the effectiveness of patient-centred self-care education for adults with heart failure on knowledge, self-care behaviors, quality of life, and readmissions.</p> <p>Conclusion: Patient-centred self-care education for adult patients with heart failure may have a positive benefit in reducing heart failure readmissions and improving heart failure-related knowledge, self-care behaviors, and quality of life. Factors that may influence outcomes include a multidisciplinary team approach and reinforcement of individualized advice with emphasis during care transitions. Utilization of a multidisciplinary team in a variety of settings with ongoing reinforcement of individualized goals and objectives, while continually assessing patient-specific needs, may be necessary in effecting care delivery.</p>
Feltner [^]	2014	Transitional Care Interventions to Prevent Readmissions for Persons With Heart Failure: A Systematic Review and Meta-analysis	47 RCTs, 1990–2013	Cardiac: heart failure	Transitional care	<p>Aim/objective: To assess the efficacy, comparative effectiveness, and harms of transitional care interventions to reduce readmission and mortality rates for adults hospitalised with HF.</p> <p>Conclusion: Home-visiting programs and multidisciplinary heart failure clinics reduced all-cause readmission and mortality; structured telephone support reduced HF-specific readmission and mortality. These interventions should receive the greatest consideration by systems or providers seeking to implement transitional care interventions for persons with HF</p>

First Author	Year	Title	Studies included	Condition	Type of intervention	Aim and conclusion
Gorthi	2014	Reducing Heart Failure Hospital Readmissions: A Systematic Review of Disease Management Programs	1975–2014	Cardiac: heart failure	Disease management programs	<p>Aim/objective: This systematic review identified randomized controlled trials of HF DMPs which included home care, outpatient clinic interventions, structured telephone support, and non-invasive and invasive telemonitoring.</p> <p>Conclusion: These different types of DMPs have been associated with conflicting results. No specific type of DMP has produced consistent benefit in reducing HF hospitalisations. The efficacy of HF DMPs is associated with inconsistent results. Our review should not be interpreted to indicate that HF DMPs are universally ineffective. Rather, our data suggest that one approach applied to a broad spectrum of different patient types may produce an erratic impact on readmissions and clinical outcomes. HF DMPs should include the flexibility to meet the individualized needs of specific patients.</p>
Slyer	2011	A systematic review of the effectiveness of nurse coordinated transitioning of care on readmission rates for patients with heart failure	16 RCTs, 1975 to 2010	Cardiac: heart failure	Transition of care	<p>Aim: The objective of the systematic review was to identify the best available evidence on the effectiveness of nurse coordinated transitioning of care between hospital and home on hospital readmission rates for all causes in adult patients hospitalised with heart failure.</p> <p>Conclusion: Reduced readmissions occur when transitioning of care interventions are carried out by a heart failure trained nurse who conducts at least one home visit and follows the patient at least weekly for a minimum of 30 days post discharge with either additional home visits or telephone contact.</p>
Ditewig	2010	Effectiveness of self-management interventions on mortality, hospital readmissions, chronic heart failure hospitalisation rate and quality of life in patients with chronic heart failure: A systematic review	19 RCTs, 1996–2009	Cardiac: heart failure	Education	<p>Aim/objective: This review examined the effectiveness of self-management interventions compared to usual care on mortality, all-cause hospital readmissions, chronic heart failure hospitalisation rate and quality of life in patients with chronic heart failure.'</p> <p>Conclusion: This systematic review found that current available published studies show methodological shortcomings impairing validation of the effectiveness of self-management interventions on mortality, all-cause hospital readmissions, chronic heart failure hospitalisation rate and quality of life in patients with chronic heart failure</p>
Bettger	2012	Transitional Care After hospitalisation for Acute Stroke or Myocardial Infarction	66 studies, 2000–2012	Cardiac: heart failure and AMI	Transition of care	<p>Aim: To describe transitional care interventions and evidence of benefit or harm in patients hospitalised for acute stroke or myocardial infarction (MI).</p> <p>Conclusion: Available evidence shows that hospital-initiated transitional care can improve some outcomes in adults hospitalised for stroke or MI. Finding additional transitional care interventions that improve functional outcomes and prevent rehospitalisations and adverse events is a high priority for the growing population of patients who have an MI or a stroke.</p>
Pedersen	2017	Effectiveness of structured planned post discharge support to patients with chronic obstructive pulmonary disease	10 studies, 1990–2015	COPD	Discharge process	<p>Aim/objective: This review aimed to identify, appraise and synthesize the best available evidence on the effectiveness of discharge interventions that can reduce readmission of patients with COPD.</p> <p>Conclusion: Post discharge support and interventions in patients with COPD significantly reduce the readmission rate within 30 days after discharge from</p>

First Author	Year	Title	Studies included	Condition	Type of intervention	Aim and conclusion
		for reducing readmission rates: a systematic review				hospital and the interventions may significantly reduce readmission up to 180 days after initial discharge. This is a significant finding from the clinical and practical perspective.
Yang^	2017	Continuity of Care to Prevent Readmissions for Patients with Chronic Obstructive Pulmonary Disease: A Systematic Review and Meta-Analysis	31 studies, published before 2015	COPD	Transition of care	Aim: This meta-analysis was aimed to assess the efficacy of continuity of care as interventions, which reduced readmission and mortality rates of such patients. Result: The results showed that health education reduced all-cause readmission at three months. In addition, health education, comprehensive nursing intervention (CNI) and telemonitoring reduced all-cause readmissions over 6–12 months, and the effect of CNI was best because CNI also reduced COPD-specific readmissions. Home visits also reduced COPD-specific readmissions (the quality more than moderate), but it did not reduce the risk for all-cause readmissions (risk ratios (RRs), 0.92 [95% CI, 0.82–1.04]; moderate quality). There was no statistically significant difference in reducing mortality and quality of life (QOL) among various continued cares. In conclusion, CNI, telemonitoring, health education and home visits should receive more consideration than other interventions by caregivers seeking to implement continued care interventions for patients with COPD.
Liu^	2017	Transitional care interventions to reduce readmission in patients with chronic obstructive pulmonary disease: A meta-analysis of randomized controlled trials	7 RCTs (n=1879), published from January 1990 to April 2016	COPD	Transition of care	Aim: To objectively assess the effect of transitional care on readmission for patients with chronic obstructive pulmonary disease. Result: Transitional care is beneficial to reducing readmission for patients with COPD. Duration of 6 and 18 months are more effective, and the effect weakens over intervention time, especially after the end of intervention. Both durations point to the importance of ongoing intervention and reinforcement after the end of intervention.
Prieto-Centurion	2014	Interventions to Reduce Rehospitalisations after Chronic Obstructive Pulmonary Disease Exacerbations A Systematic Review	5 studies (n=1,393), 1966–2013	COPD	General	Aim/objective: To report the results of a systematic review of randomized clinical trials evaluating interventions to reduce the rehospitalisations after COPD exacerbations. Conclusion: The evidence base is inadequate to recommend specific interventions to reduce rehospitalisations in this population and does not justify penalizing hospitals for high 30-day rehospitalisation rates after COPD exacerbations.
Domingo	2012	Effectiveness of structured discharge process in reducing hospital readmission of adult patients with community acquired pneumonia: A systematic review	3 studies, no date limiters	Pneumonia	Discharge process	Aim: To examine and synthesise the best available evidence related to effectiveness of structured discharge process in reducing hospital readmission of adult patients with community acquired pneumonia. Conclusion: Medication reconciliation with the addition of follow-up telephone calls and incorporation of either an advanced practice nurse, care coordinator, or a clinical pharmacist using a multidisciplinary team approach may have implications in existing coordination of care of adult patients with community acquired pneumonia
McLeod-Sordjan	2011	Effectiveness of patient-caregiver dyad discharge interventions on hospital readmissions of elderly patients	5 studies, 1991–2010	Pneumonia	Discharge process	Aim: The objective of this systematic review was to identify the effect of patient-caregiver dyad discharge learning need interventions on unexpected readmissions within thirty days of elderly patients (65 years or older) with community acquired pneumonia. Conclusion: We found statistically significant results that caregiver education

First Author	Year	Title	Studies included	Condition	Type of intervention	Aim and conclusion
		with community acquired pneumonia: a systematic review				interventions impact positively on decreasing unplanned readmissions. Two randomized control trials and one quasi-experimental study were identified that addressed a multidisciplinary discharge education intervention which included caregivers of elderly pneumonia patients. Multidisciplinary care transition intervention was associated with fewer readmissions in thirty days. One case control study and one quasi experimental study identified lack of documented patient or family education as independently associated with unplanned readmissions within thirty days in elderly patient populations that included chronic lung disease
<i>^includes meta-analyses</i>						

References

1. Council of Australian Governments. Addendum to the National Health Reform Agreement. 2017.
2. Kristensen S, Bech M, Quentin W. A roadmap for comparing readmission policies with application to Denmark, England, Germany and the United States. *Health Policy*. 2015;119:264-73.
3. Ashton C, Wray N. A conceptual framework for the study of early readmission as an indicator of quality of care. *Soc Sci Med*. 1996;43(11):1533-41.
4. Australian Institute of Health and Welfare. National Healthcare Agreement. Canberra: AIHW; 2018.
5. Productivity Commission. Report on Government Services, Chapter 12 - Public hospitals. Canberra; 2018.
6. Australian Commission on Safety and Quality in Healthcare. Core, Hospital-based Outcome Indicators [cited 2018. Available from: <https://www.safetyandquality.gov.au/our-work/indicators/core-hospital-based-outcome-indicators/>].
7. van Galen L. Patient safety in the acute healthcare chain: Is it safer@home? ; 2017.
8. Pross C, Geissler A, Busse R. Measuring, Reporting, and Rewarding Quality of Care in 5 Nations: 5 Policy Levers to Enhance Hospital Quality Accountability. 2017;95(1).
9. The National Archives. Health and Social Care Act 2012 2012 [cited 2018 10 April]. Available from: <http://www.legislation.gov.uk/ukpga/2012/7/contents/enacted>.
10. Centers for Medicare & Medicaid Services (CMS). Maryland All-Payer Model [Available from: <https://innovation.cms.gov/initiatives/Maryland-All-Payer-Model/>].
11. Burgess J, Hockenberry J. Can all cause readmission policy improve quality or lower expenditures? A historical perspective on current initiatives. *Health Economics, Policy and Law*. 2014;9:193-213.
12. McIvannan C, Eapen Z, Allen L. Hospital Readmissions Reduction Program. *Circulation*. 2015;131(20):1796-803.
13. Staudenmayer K, Hawn M. The Hospital Readmission Reduction Program for Surgical Conditions: Impactful or Harmful? *Annals of Surgery*. 2018;267(4):606-7.
14. Department of Health and Human Services, Centers for Medicare & Medicaid Services. Acute Care Hospital Inpatient Prospective Payment System. December 2016.
15. Centers for Medicare & Medicaid Services (CMS). Medicare Provider Utilization and Payment Data: Inpatient [Available from: <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Provider-Charge-Data/Inpatient.html>].
16. Leppin A, Gionfriddo M, Kessle rM, Brito J, Mair F, Gallacher K, et al. Preventing 30-day hospital readmissions: a systematic review and meta-analysis of randomized trials. *JAMA Intern Med*. 2014;174(7):1095-107.
17. Hansen L, Young R, Hinami K, Leung A, Williams M. Interventions to reduce 30-day rehospitalization: a systematic review. *Ann Intern Med*. 2011;155(8):520-8.
18. Nuckols T, Keeler E, Morton S, Anderson L, Doyle B, Pevnick J, et al. Economic Evaluation of Quality Improvement Interventions Designed to Prevent Hospital Readmission: A Systematic Review and Meta-analysis. *JAMA Intern Med*. 2017;177(7):975-85.
19. Burke R, Kripalani S, Vasilevskis E, Schnipper J. Moving beyond readmission penalties: creating an ideal process to improve transitional care. 2013;8(2):102-9.
20. Centers for Medicare & Medicaid Services. Partnership for Patients [Available from: <https://partnershipforpatients.cms.gov/>].
21. Centers for Medicare & Medicaid Services (CMS). Community-based Care Transitions Program (CCTP) [Available from: <https://innovation.cms.gov/initiatives/CCTP/>].
22. National Quality Forum. National Priorities Partnership [Available from: http://www.qualityforum.org/Show_Content.aspx?id=59894].

23. Institute for Healthcare Improvement (IHI). STate Action on Avoidable Rehospitalization (STAAR) [Available from: <http://www.ihl.org/Engage/Initiatives/Completed/STAAR/Pages/default.aspx>.
24. Quality Improvement for Institutions. Hospital to Home (H2H) [Available from: <https://cvquality.acc.org/initiatives/hospital-to-home>.
25. Kamermayer A, Leasure A, Anderson L. The Effectiveness of Transitions-of-Care Interventions in Reducing Hospital Readmissions and Mortality: A Systematic Review. *Dimens Crit Care Nurs*. 2017;36(6):311-6.
26. Hesselink G, Schoonhoven L, Barach P, Spijker A, Gademan P, Kalkman C, et al. Improving Patient Handovers From Hospital to Primary Care: A Systematic Review. *Ann Intern Med*. 2012;157:417-28.
27. Braet A, Weltens C, Sermeus W. Effectiveness of discharge interventions from hospital to home on hospital readmissions: a systematic review. *JBIC Database of Systematic Reviews & Implementation Reports*. 2016;14(2):106-73.
28. Adamson P, Abraham W, Stevenson L, Desai A, Lindenfeld J, Bourge R, et al. Pulmonary Artery Pressure–Guided Heart Failure Management Reduces 30-Day Readmissions. *Circ Heart Fail*. 2016;9:e002600.
29. Ditewig J, Blok H, Havers J, van Veenendaal H. Effectiveness of self-management interventions on mortality, hospital readmissions, chronic heart failure hospitalization rate and quality of life in patients with chronic heart failure: A systematic review. *Patient Education and Counseling*. 2010;78:297-315.
30. Casimir Y, Williams M, Liang M, Pitakmongkolkul S, Slyer J. The effectiveness of patient-centered self-care education for adults with heart failure on knowledge, self-care behaviors, quality of life, and readmissions: a systematic review. *JBIC Database of Systematic Reviews and Implementation Reports*. 2014;12(2):188-262.
31. Rice H, Saya R, Betihavas V. The effect of nurse-led education on hospitalisation, readmission, quality of life and cost in adults with heart failure. A systematic review. *Patient Education and Counseling*. 2017;<https://doi.org/10.1016/j.pec.2017.10.002>.
32. Shah T, Churpek M, Perrailon M, Konetzka R. Understanding Why Patients With COPD Get Readmitted: A Large National Study to Delineate the Medicare Population for the Readmissions Penalty Expansion. *Chest*. 2015;147(5):1219-26.
33. Shah T, Press VG, Huisingh-Scheetz M, White SR. COPD Readmissions: Addressing COPD in the Era of Value-based Health Care. 2016;150(4).
34. Press V, Arora V, Shah L, Lewis S, Charbeneau J, Naureckas E, et al. Teaching the use of respiratory inhalers to hospitalized patients with asthma or COPD: a randomized trial. 2012;27(10).
35. Castillo A, Edriss H, Selvan K, Nugent K. Characteristics of Patients With Congestive Heart Failure or Chronic Obstructive Pulmonary Disease Readmissions Within 30 Days Following an Acute Exacerbation. 2017;26(3).
36. Harries TH, Thornton H, Crichton S, Schofield P, Gilkes A, White PT. Hospital readmissions for COPD: a retrospective longitudinal study. 2017;27(31).
37. Tsai T, Joynt K, Orav E, Gawande A, Jha A. Variation in Surgical-Readmission Rates and Quality of Hospital Care. *N Engl J Med*. 2013;369(12):1134-42.
38. Wiseman J, Guzman A, Fernandes-Taylor S, Engelbert T, Saunders R, Kent K. General and Vascular Surgery Readmissions: A Systematic Review. *J Am Coll Surg*. 2014;219(3):552-69.
39. Alba ID, Amin A. Pneumonia Readmissions: Risk Factors and Implications. 2014;14:649-54.
40. Weinreich M, Nguyen O, Wang D, Mayo H, Mortensen E, Halm E, et al. Predicting the Risk of Readmission in Pneumonia: A Systematic Review of Model Performance. *Ann Am Thorac Soc*. 2016;13(9):1607-14.
41. Domingo G, Reyes F, Thompson F, Johnson P, Shortridge-Baggett L. Effectiveness of structured discharge process in reducing hospital readmission of adult patients with

- community acquired pneumonia: A systematic review. *JB Libr Syst Rev.* 2012;10(18):1086-121.
42. McLeod-Sordjan R, Krajewski B, Jean-Baptiste P, Barone J, Worrall P. Effectiveness of patient-caregiver dyad discharge interventions on hospital readmissions of elderly patients with community acquired pneumonia: a systematic review. *JB Libr Syst Rev.* 2011;9(14):437-63.
43. Zhou H, Della PR, Roberts P, Goh L, Dhaliwal SS. Utility of models to predict 28-day or 30-day unplanned hospital readmissions: an updated systematic review. 2016;6.
44. Donzé J, Aujesky D, Williams D, Schnipper JL. Potentially Avoidable 30-Day Hospital Readmissions in Medical Patients Derivation and Validation of a Prediction Model. 2013;173(8):632-8.
45. Shams I, Ajorlou S, Yang K. A predictive analytics approach to reducing 30-day avoidable readmissions among patients with heart failure, acute myocardial infarction, pneumonia, or COPD. 2015;18(1):19-34.
46. Fingar KR, Barrett ML, Jiang HJ. A Comparison of All-Cause 7-Day and 30-Day Readmissions, 2014. Agency for Healthcare Research and Quality; October 2017.
47. Bureau of Health Information. Return to acute care following hospitalisation: Spotlight on readmissions. Sydney: BHI; 2015.
48. van Walraven C, Jennings A, Forster A. A meta-analysis of hospital 30-day avoidable readmission rates. *Journal of Evaluation in Clinical Practice.* 2011;18:1211-8.
49. Van Walraven C, Bennett C, Jennings A, Austin PC, Forster A. Proportion of hospital readmissions deemed avoidable: a systematic review. *CMAJ.* 2011;183(7):E391-E402.
50. Jencks S, Brock J. Hospital accountability and population health: lessons from measuring readmission rates. *Ann Intern Med.* 2013;159(9):629-30.
51. Nolte E, Roland M, Guthrie S, Brereton L. Preventing emergency readmissions to hospital A scoping review. Santa Monica, CA: RAND Corporation; 2012.
52. Averill RF, Hughes JS, Goldfield NI. Paying for outcomes, not performance: lessons from the Medicare Inpatient Prospective Payment System. *Joint Commission journal on quality and patient safety.* 2011;37(4):184-92, 45.
53. Australian Institute of Health and Welfare. Admitted patient care 2015–16: Australian hospital statistics. Canberra: AIHW; 2017. Contract No.: Cat. no. HSE 185.
54. Australian Commission on Safety and Quality in Healthcare. Indicators of Safety and Quality [cited 2018 3 April]. Available from: <https://www.safetyandquality.gov.au/our-work/indicators/>.
55. Australian Commission on Safety and Quality in Healthcare. National core, hospital-based outcome indicator specification. Sydney: ACSQH; 2015.
56. Queensland Health. My health, Queensland's future: Advancing health 2026. 2016.
57. Queensland Health. Service delivery statements 2017-18. Queensland Health; 2017.
58. Queensland Health. Guideline for Variable Life Adjusted Display and other National Patient Safety Indicators. 2017.
59. Centre for Healthcare Improvement. Paediatric Tonsillectomy and Adenoidectomy VLAD Indicator Working Group: Summary of Activities To-date: April 2010 – September 2010. CHI; 2010.
60. Centre for Healthcare Improvement. Report on the VLAD Heart Failure Indicator Review: Final Summary of Activities. CHI; 2012.
61. Centre for Healthcare Improvement. Report on the VLAD Laparoscopic Cholecystectomy Indicator Review: Summary of Activities. CHI; 2012.
62. Queensland Department of Health. Report on the Orthopaedic VLAD Indicator Review: Summary of Activity. Queensland Government; 2012.
63. Queensland Department of Health. Report on the Acute Myocardial Infarction VLAD Indicator Review: Summary of Activity. Queensland Government; 2012.
64. NSW Ministry of Health. NSW State Health Plan: Towards 2021. North Sydney: NSW Health; 2014.

65. NSW Health. Integrated care in NSW 2017 [cited 2018 3 April]. Available from: <http://www.health.nsw.gov.au/integratedcare/Pages/default.aspx>.
66. NSW Health. NSW Health Service Agreement – 2017/18. 2018.
67. NSW Ministry of Health. NSW Health Performance Framework. North Sydney: NSW Health; 2017.
68. NSW Health. 2016/17 Service Agreement Key Performance Indicators and Service Measures Data Dictionary. North Sydney: Health System Information & Performance Reporting; 2017.
69. Audit Office of NSW. Managing length of stay and unplanned readmissions in NSW public hospitals. Sydney; 2015.
70. Bureau of Health Information. Exploring clinical variation in mortality and readmission: An overview July 2012 – June 2015. Sydney: BHI; 2017.
71. Bureau of Health Information. Exploring clinical variation in readmission: Return to acute care following discharge from hospital, eight clinical conditions, NSW July 2012 – June 2015. Sydney: BHI; 2017.
72. Bureau of Health Information. Exploring clinical variation in readmission - Return to acute care following discharge from hospital, eight clinical conditions, NSW, July 2012 – June 2015 2017 [cited 2018 3 April]. Available from: http://www.bhi.nsw.gov.au/BHI_reports/Insights_Series/clinical-variation-in-readmission/nocache#individual_hospitals.
73. Bureau of Health Information. Using predictive risk modelling for performance measurement. Sydney: BHI; 2018.
74. Review of hospital safety and quality assurance in Victoria. Targeting zero: Supporting the Victorian hospital system to eliminate avoidable harm and strengthen quality of care. Melbourne: Department of Health and Human Services; 2016.
75. Victorian Department of Health and Human Services. Victorian health services performance monitoring framework: Indicators business rules 2017-18. Melbourne: Victorian Government; 2017.
76. Commission for Hospital Improvement. Bairnsdale Regional Health Service: Reducing readmissions in a rural hospital. Melbourne: Victorian Government; 2014.
77. Commission for Hospital Improvement. Eastern@Home: Unplanned readmission reviews are a valuable tool in improving patient care and clinical governance. Melbourne: Victorian Government; 2014.
78. Commission for Hospital Improvement. Goulburn Valley Health: Simple interventions to reduce unplanned hospital readmissions. Melbourne: Victorian Government; 2014.
79. WA Department of Health. Performance Policy Framework. 2018.
80. WA Department of Health. Performance Management Policy 2017-18. 2018.
81. Western Australia Department of Health. Performance Management Policy Information Compendium. 2017.
82. Western Australia Department of Health. Data Quality Statement: 2017/18 Outcome Based Management Key Performance Indicators. 2017.
83. Western Australia Department of Health. 2017/18 Outcome Based Management Key Performance Indicator Data Definition Manual. 2017.
84. SA Health. Performance Framework 2016 - 17. 2016.
85. SA Department for Health and Ageing. Department for Health and Ageing Annual Report 2015-16. Adelaide: SA Health; 2016.
86. ACT Health. Annual Report 2015-16. Canberra; 2017.
87. Australian Council on Healthcare Standards. Australasian Clinical Indicator Report: 2009–2016: 18th Edition. Sydney: ACHS; 2017.
88. ACT Health. Annual reports 2017 [cited 2018 3 April]. Available from: <http://www.health.act.gov.au/datapublications/reports/annual-reports>.
89. ACT Health. ACT Public Health Services Quarterly Performance Report 2016 [cited 2018 3 April]. Available from: <http://www.health.act.gov.au/datapublications/reports/act-public-health-services-quarterly-performance-report>.

90. NT Department of Health. Central Australia Health Service Service Delivery Agreement 2017/18. Casuarina: NT Government; 2017.
91. NT Department of Health. Top End Health Service Service Delivery Agreement 2017/18. Casuarina: NT Government; 2017.
92. NT Department of Health. Northern Territory Renal Services Strategy 2017 – 2022. Casuarina: NT Government; 2017.
93. Diplock G, Ward J, Stewart S, Scuffham P, Stewart P, Reeve C, et al. The Alice Springs Hospital Readmission Prevention Project (ASHRAPP): a randomised control trial. BMC Health Services Research. 2017;17:153.
94. Services TDoHaH. Tasmanian Health Service Performance Framework. Tasmanian Government; 2017.
95. Services TDoHaH. 2017-18 Service Agreement between the Minister for Health and the Tasmanian Health Service. Tasmanian Government; 2017.
96. Tasmanian Health Service. Tasmanian Health Service Annual Report 2016-17. Tasmanian Government; 2017.
97. Heart Foundation of Australia. Improving the Hearts of Tasmanians: Tasmanian Statewide Cardiac Services Plan 2018-2022. 2017.
98. Royal Australasian College of Surgeons, Medibank. Surgical Variance Report - General Surgery. 2016.
99. Royal Australasian College of Surgeons, Medibank. Surgical Variance Report 2017 - Orthopaedic Surgery. 2016.
100. Royal Australasian College of Surgeons, Medibank. Surgical Variance Report - Urology. 2016.
101. Fischer C. Quality indicators for hospital care: reliability and validity. 2015.
102. The Commonwealth Fund. The U.S. Health Care System: The Commonwealth Fund; [Available from: https://international.commonwealthfund.org/countries/united_states/].
103. Barnett JC, Berchick ER. Current Population Reports. Washington, DC; 2017.
104. Agency for Healthcare Research and Quality. About the National Quality Strategy 2017 [cited 2018 5 April]. Available from: <https://www.ahrq.gov/workingforquality/about/index.html>.
105. Agency for Healthcare Research and Quality (AHRQ). The National Quality Strategy: Fact Sheet [Available from: <https://www.ahrq.gov/workingforquality/about/nqs-fact-sheets/fact-sheet.html>].
106. Agency for Healthcare Research and Quality (AHRQ). Priorities in Focus—Patient Safety 2016 [Available from: <https://www.ahrq.gov/workingforquality/reports/priorities-in-focus/patient-safety.html>].
107. Agency for Healthcare Research and Quality (AHRQ). Designing and Delivering Whole-Person Transitional Care: The Hospital Guide to Reducing Medicaid Readmissions September 2016.
108. Centers for Medicare & Medicaid Services (CMS). Hospital IQR Program Reference Checklist: FY 2020 Payment Determination CY 2018 Reporting Period. June 2018.
109. Centers for Medicare & Medicaid Services. Hospital Inpatient Quality Reporting Program 2017 [cited 2018 5 April]. Available from: <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/HospitalRHQDAPU.html>.
110. Agency for Healthcare Research and Quality. Selecting Quality and Resource Use Measures: A Decision Guide for Community Quality Collaboratives 2014 [cited 2018 5 April]. Available from: <https://www.ahrq.gov/professionals/quality-patient-safety/quality-resources/tools/perfmeasguide/perfmeaspt2tab5.html>.
111. Agency for Healthcare Research and Quality. PSI 90 Fact Sheet. AHRQ; 2016.
112. The Joint Commission. National Hospital Inpatient Quality Reporting Measures Specifications Manual Release Notes 2017.
113. National Quality Forum. All-Cause Admissions and Readmissions 2015-2017: Technical Report. April 2017.

114. National Quality Forum. All-Cause Admissions and Readmissions 2017: Technical Report. September 2017.
115. QualityNet. Readmission Measures [cited 2018 5 April]. Available from: <https://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier3&cid=1219069855273>.
116. Yale New Haven Health Services Corporation, Center for Outcomes Research and Evaluation. 2017 Condition-Specific Measures Updates and Specifications Report Hospital-Level 30-Day Risk-Standardized Readmission Measures: Acute Myocardial Infarction – Version 10.0, Chronic Obstructive Pulmonary Disease – Version 6.0, Heart Failure – Version 10.0, Pneumonia – Version 10.0, Stroke – Version 6.0. 2017.
117. Yale New Haven Health Services Corporation, Center for Outcomes Research and Evaluation. 2014 Procedure-Specific Readmission Measure Updates and Specifications Report: Elective Primary Total Hip Arthroplasty (THA) and/or Total Knee Arthroplasty (TKA) – Version 3.0. 2014.
118. Yale New Haven Health Services Corporation, Center for Outcomes Research and Evaluation. Hospital-Wide (All-Condition) 30-Day Risk-Standardized Readmission Measure: DRAFT Measure Methodology Report. 2011.
119. Yale New Haven Health Services Corporation, Center for Outcomes Research and Evaluation. 2017 Procedure-Specific Measures Updates and Specifications Report Hospital-Level 30-Day Risk-Standardized Readmission Measures: Isolated Coronary Artery Bypass Graft (CABG) Surgery – Version 4.0, Elective Primary Total Hip Arthroplasty (THA) and/or Total Knee Arthroplasty (TKA) – Version 6.0. 2017.
120. Healthcare Cost and Utilization Project (HCUP). Overview of the Nationwide Readmissions Database (NRD) Rockville, MD: Agency for Healthcare Research and Quality; 2017 [cited 2018 5 April]. Available from: <https://www.hcup-us.ahrq.gov/nrdoverview.jsp>.
121. Centers for Medicare & Medicaid Services. Hospital Compare [cited 2018 5 April]. Available from: <https://www.medicare.gov/hospitalcompare/search.html>.
122. Centers for Medicare & Medicaid Services. Hospital Compare - Measures and current data collection periods [cited 2018 5 April]. Available from: <https://www.medicare.gov/hospitalCompare/Data/data-updated.html#MG16>.
123. Yale New Haven Health Services Corporation, Center for Outcomes Research and Evaluation. Medicare Hospital Quality Chartbook 2017. 2017.
124. Centers for Medicare & Medicaid Services (CMS). Bundled Payments for Care Improvement (BPCI) Initiative: General Information [Available from: <https://innovation.cms.gov/initiatives/bundled-payments/>].
125. NHS Digital. NHS Outcomes Framework 2018 [cited 2018 5 April]. Available from: <https://beta.digital.nhs.uk/data-and-information/publications/ci-hub/nhs-outcomes-framework>.
126. NHS Digital. NHS Outcomes 2018 [cited 2018 5 April]. Available from: <https://digital.nhs.uk/article/6731/Outcomes>.
127. NHS Digital. CCG Outcomes Indicator Set 2018 [cited 2018 5 April]. Available from: <https://beta.digital.nhs.uk/data-and-information/publications/clinical-indicators/ccg-outcomes-indicator-set/current>.
128. NHS Digital. 3.16 Unplanned readmissions to mental health services within 30 days of a mental health inpatient discharge in people aged 17 and over 2018 [cited 2018 5 April]. Available from: <https://beta.digital.nhs.uk/data-and-information/publications/clinical-indicators/ccg-outcomes-indicator-set/current/domain-3-helping-people-to-recover-from-episodes-of-ill-health-or-following-injury-ccg/3-16-unplanned-readmissions-to-mental-health-services-within-30-days-of-a-mental-health-inpatient-discharge-in-people-aged-17-and-over>.
129. NHS Digital. Compendium - Hospital care indicators 2018 [cited 2018 5 April]. Available from: <https://beta.digital.nhs.uk/data-and-information/publications/clinical-indicators/compendium-of-population-health-indicators/compendium-hospital-care/current>.
130. NHS Digital. Compendium - Emergency readmissions to hospital within 28 days of discharge 2018 [cited 2018 5 April]. Available from: <https://beta.digital.nhs.uk/data-and-information/publications/clinical-indicators/compendium-of-population-health>.

[indicators/compendium-hospital-care/current/emergency-readmissions-to-hospital-within-28-days-of-discharge](#).

131. NHS Digital. 3b Emergency readmissions within 30 days of discharge from hospital 2018 [cited 2018 5 April]. Available from: <https://beta.digital.nhs.uk/data-and-information/publications/clinical-indicators/nhs-outcomes-framework/current/domain-3-helping-people-to-recover-from-episodes-of-ill-health-or-following-injury-nof/3b-emergency-readmissions-within-30-days-of-discharge-from-hospital>.
132. NHS Digital. Hospital Episode Statistics 2018 [cited 2018 5 April]. Available from: <https://digital.nhs.uk/data-services/hospital-episode-statistics>.
133. Health and Social Care Information Centre. Methodology to create provider and CIP spells from HES APC data. 2014.
134. National Centre for Health Outcomes Development. Annex 4: Hospital Episodes Statistics (HES) - Construction of Continuous Inpatient (CIP) spells and assessment of data quality. 2009.
135. NHS Choices. Service search - Consultants 2018 [cited 2018 5 April]. Available from: <https://www.nhs.uk/Service-Search/Consultants/Indicators/Service/5550015/4614412>.
136. Health and Social Care Information Centre. Hospital Episode Statistics, Emergency readmissions to hospital within 28 days of discharge - Financial year 2011/12. 2013.
137. Healthwatch. What do the numbers say about emergency readmissions to hospital? ; October 2017.
138. NHS, Department of Health. Equity and excellence: Liberating the NHS. 2010.
139. Stone R, Holzhauser-Barrie J, Lowe D, McMillan V, Saleem Khan M, Searle L, et al. COPD: Who cares when it matters most? National Chronic Obstructive Pulmonary Disease (COPD) Audit Programme: Outcomes from the clinical audit of COPD exacerbations admitted to acute units in England 2014. London: RCP; February 2017.
140. National Institute for Health and Care Excellence. Surgical site infection. October 2013.
141. Public Health England. Healthcare associated infections (HAI): point prevalence survey, England 2016 [cited 2018 5 April]. Available from: <https://www.gov.uk/government/publications/healthcare-associated-infections-hcai-point-prevalence-survey-england>.
142. National Institute for Health and Care Excellence. The NICE menu of general practice and clinical commissioning group indicators. August 2017.
143. NHS Scotland. The Healthcare Quality Strategy for NHSScotland. Edinburgh: The Scottish Government; May 2010.
144. The Scottish Government. The Quality Measurement Framework [cited 2018 5 April]. Available from: <http://www.gov.scot/Topics/Health/Policy/Quality-Strategy/Quality-Measurement-Framework>.
145. NHS Scotland. NHSScotland Efficiency and Productivity: Framework for SR10. Edinburgh: The Scottish Government; 2011.
146. ISD Scotland. Quality Indicators [cited 2018 5 April]. Available from: <http://www.isdscotland.org/Health-Topics/Quality-Indicators/>.
147. Burns H. Targets and Indicators in Health and Social Care in Scotland: A Review. Edinburgh: The Scottish Government; November 2017.
148. ISD Scotland. Heart Disease Indicators. September 2015.
149. ISD Scotland. Hospital Scorecard [cited 2018 5 April]. Available from: <http://www.isdscotland.org/Health-Topics/Quality-Indicators/Hospital-Scorecard/>.
150. The Scottish Government. Core Suite of Integration Indicators. March 2015.
151. NHS Scotland. Ensuring Patients are cared for in their own homes [cited 2018 5 April]. Available from: <http://www.qihub.scot.nhs.uk/quality-and-efficiency/unscheduled-care/6-essential-actions/ensuring-patients-are-cared-for-in-their-own-homes.aspx>.
152. NHS Scotland. NSS Discovery [cited 2018 5 April]. Available from: <http://www.nssdiscovery.scot.nhs.uk/explore/>.

153. ISD Scotland. SPARRA Risk Calculator [cited 2018 5 April]. Available from: <http://www.isdscotland.org/Health-Topics/Health-and-Social-Community-Care/SPARRA/Calculator/>.
154. Canadian Institute for Health Information. A Performance Measurement Framework for the Canadian Health System. Ottawa, ON: CIHI; 2013.
155. Canadian Institute for Health Information. Health System Performance Frameworks: Aligning Frameworks for Sectors and Organizations to Health Systems. Ottawa, ON: CIHI; 2015.
156. Canadian Institute for Health Information. Indicator Library: General Methodology Notes. Ottawa, ON: CIHI; 2017.
157. Canadian Institute for Health Information. Indicator library: Areas of need. Ottawa, ON: CIHI; 2016.
158. Canadian Institute for Health Information. All-Cause Readmission to Acute Care and Return to the Emergency Department. Ottawa, ON: CIHI; 2012.
159. Canadian Institute for Health Information. Measuring the Level and Determinants of Health System Efficiency in Canada. Ottawa, ON: CIHI; 2014.
160. Canadian Institute for Health Information. Your Health System [cited 2018 5 April]. Available from: <https://yourhealthsystem.cihi.ca/hsp/indepth;jsessionid=G7V3a8yHBZ-tcvJpt3oGgt+M.yhs?lang=en#/theme/86c93748b505697d65d54633b45b3cf0b154a511/4/N4IqKgFqpqtIDCAXATqGxALIAYwPatQEMAHAZygBNNQAGGqZkxQFcoAaEOgFieVYF9BQA>
161. Canadian Institute for Health Information. OECD Interactive Tool: International Comparisons — Quality Of Care [cited 2018 5 April]. Available from: <https://www.cihi.ca/en/oecd-interactive-tool-international-comparisons-quality-of-care>.
162. Canadian Institute for Health Information. 30-Day All-Cause Readmission Rate After Percutaneous Coronary Intervention (PCI) [cited 2018 5 April]. Available from: <http://indicatorlibrary.cihi.ca/pages/viewpage.action?pageId=10682389>.
163. Statistics Denmark. Elderly - Indicators [cited 2018 5 April]. Available from: <https://www.dst.dk/en/Statistik/dokumentation/documentationofstatistics/elderly---indicators>.
164. Statistics Denmark. AED20: Clinical pathways and readmission for persons aged 67, by region, unit and diagnosis [cited 2018 5 April]. Available from: <https://www.statbank.dk/AED20>.
165. Statistics Denmark. Clinical pathways and readmission for persons aged 67 [cited 2018 5 April]. Available from: <https://www.statbank.dk/statbank5a/Graphics/mapanalyser.asp?maintable=AED20&lang=1>.
166. Doran T, Maurer K, Ryan A. Impact of Provider Incentives on Quality and Value of Health Care. *Annu Rev Public Health*. 2017;38:449-65.
167. Srinivasan D, Desai N. The Impact of the Transition From Volume to Value on Heart Failure Care: Implications of Novel Payment Models and Quality Improvement Initiatives. *Journal of Cardiac Failure*. 2017;23(8):615-20.
168. Lake Superior Quality Innovation Network. Understanding the Hospital Readmissions Reduction Program. November 2014.
169. Office of the Legislative Counsel. Compilation of Patient Protection and Affordable Care Act. May 2010.
170. Centers for Medicare & Medicaid Services. Readmissions Reduction Program (HRRP) [cited 2018 5 April]. Available from: <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html>.
171. Maryland Health Services Cost Review Commission (HSCRC). Final Recommendation for the Readmissions Reduction Incentive Program for Rate Year 2020. Baltimore, Maryland; 2018.
172. Maryland Health Services Cost Review Commission (HSCRC). Maryland Medicare Total Cost of Care Model Terms (DRAFT) July 2018 [
173. Centers for Medicare & Medicaid Services. Medicare Hospital Readmissions Among Minority Populations: 2007 – 2013 Trends and Disparities. Office of Minority Health; 2015.

174. Marks C, Loehrer S, McCarthy D. Hospital Readmissions: Measuring for Improvement, Accountability, and Patients. Issue Brief (Commonw Fund). 2013;24:1-8.
175. Library of Congress. H.R.34 - 21st Century Cures Act 2016 [cited 2018 10 April]. Available from: <https://www.congress.gov/bill/114th-congress/house-bill/34/>.
176. Centers for Medicare & Medicaid Services. Hospital Readmissions Reduction Program (HRRP) [Available from: <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html>].
177. Boccuti C, Casillas G. Aiming for Fewer Hospital U-turns: The Medicare Hospital Readmission Reduction Program. Menlo Park, CA: The Henry J. Kaiser Family Foundation; 2017.
178. Atkinson J, Phil D. Flaws in the Medicare Readmission Penalty. *N Engl J Med*. 2012;367(21):2056-7.
179. NHS Improvement. 2017/18 and 2018/19 National Tariff Payment System. 2017.
180. NHS England Pricing Team. Guidance for commissioners on the marginal rate emergency rule and 30-day readmission rule. 2016.
181. Shippee N, Shah N, May C, Mair F, Montori V. Cumulative complexity: a functional, patient-centered model of patient complexity can improve research and practice. 2012;65(10):1041-51.
182. Rodrigues C, Harrington A, Murdock N, Holmes J, Borzadek E, Calabro K, et al. Effect of Pharmacy-Supported Transition-of-Care Interventions on 30-Day Readmissions: A Systematic Review and Meta-analysis. *Ann Pharmacother*. 2017;51(10):866-89.
183. Ha Dinh T, Bonner A, Clark R, Ramsbotham J, Hines S. The effectiveness of the teach-back method on adherence and self-management in health education for people with chronic disease: a systematic review. *JBHI Database of Systematic Reviews & Implementation Reports*. 2016;14(1):210-47.
184. Jayakody A, Bryant J, Carey M, Hobden B, Dodd N, Sanson-Fisher R. Effectiveness of interventions utilising telephone follow up in reducing hospital readmission within 30 days for individuals with chronic disease: a systematic review. *BMC Health Services Research*. 2016;16(1):403.
185. Mekonnen A, McLachlan A, Brien J. Effectiveness of pharmacist-led medication reconciliation programmes on clinical outcomes at hospital transitions: a systematic review and meta-analysis. *BMJ Open*. 2016;6(2):e010003.
186. Benbassat J, Taragin M. The effect of clinical interventions on hospital readmissions: a meta-review of published meta-analyses. *Isr J Health Policy Res*. 2013;2(1):1.
187. Stratton R, Hébuterne X, Elia M. A systematic review and meta-analysis of the impact of oral nutritional supplements on hospital readmissions. *Ageing Res Rev*. 2013;12(4):884-97.
188. Santomassino M, Costantini G, McDermott M, Primiano D, Slyer J, Singleton J. A systematic review on the effectiveness of continuity of care and its role in patient satisfaction and decreased hospital readmissions in the adult patient receiving home care services. *JBHI Libr Syst Rev*. 2012;10(21):1214-59.
189. Linertová R, García-Pérez L, Vázquez-Díaz J, Lorenzo-Riera A, Sarría-Santamera A. Interventions to reduce hospital readmissions in the elderly: in-hospital or home care. A systematic review. *J Eval Clin Pract*. 2011;17(6):1167-75.
190. Driscoll A, Meagher S, Kennedy R, Hay M, Banerji J, Campbell D, et al. What is the impact of systems of care for heart failure on patients diagnosed with heart failure: a systematic review. *BMC Cardiovascular Disorders*. 2016;16:195.
191. Feltner C, Jones C, Cene C, Zheng Z, Sueta C, Coker-Schwimmer E, et al. Transitional Care Interventions to Prevent Readmissions for Persons With Heart Failure: A Systematic Review and Meta-analysis. *Ann Intern Med*. 2014;160:774-84.
192. Slyer J, Concert C, Eusebio A, Rogers M, J. S. A systematic review of the effectiveness of nurse coordinated transitioning of care on readmission rates for patients with heart failure. *JBHI Library of Systematic Reviews*. 2011;9(15):464-90.

193. Bettger J, Alexander K, Dolor R, Olson D, Kendrick A, Wing L, et al. Transitional Care After Hospitalization for Acute Stroke or Myocardial Infarction: A Systematic Review. *Ann Intern Med.* 2012;157:407-16.
194. Gavvani V, Majd F, Nosratnejad S, Golmohammadi A, Sadeghi-Bazargani H. The Efficacy of Written Information Intervention in Reduction of Hospital Re-admission Cost in Patients With Heart Failure; A Systematic Review and Meta-Analysis. *J Cardiovasc Thorac Res.* 2015;7(1):1-5.
195. Oyanguren J, Garcia P, Languna J, Goya I, Martin S, Lafuente E, et al. Effectiveness and Factors Determining the Success of Management Programs for Patients With Heart Failure: A Systematic Review and Meta-analysis. *Rev Esp Cardiol.* 2016;69(10):900-14.
196. Gorthi J, Hunter C, Mooss A, Alla V, Hilleman D. Reducing Heart Failure Hospital Readmissions: A Systematic Review of Disease Management Programs. *Cardiol Res.* 2014;5(5):126-38.
197. Goyal P, Delgado D, Hummel S, Dharmarajan K. Impact of Exercise Programs on Hospital Readmission Following Hospitalization for Heart Failure: A Systematic Review. *Curr Cardiovasc Risk Rep.* 2016;10(10).
198. Sperry B, Ruiz G, Najjar S. Hospital readmission in heart failure, a novel analysis of a longstanding problem. *Heart Fail Rev.* 2015;20:251-8.
199. Ziaean B, Fonarow G. The Prevention of Hospital Readmissions in Heart Failure. *Prog Cardiovasc Dis.* 2016;58(4):379-85.
200. Sherwood A, Blumenthal J, Trivedi R, Johnson K, O'Connor C, Adams KJ, et al. Relationship of depression to death or hospitalization in patients with heart failure. *2007;167(4):367-73.*
201. Press VG, Konetzka T, White SR. Insights about the economic impact of chronic obstructive pulmonary disease readmissions post implementation of the hospital readmission reduction program. 2018;24(2).
202. Pedersen P, Ersgard K, Soerensen T, Larsen P. Effectiveness of structured planned post discharge support to patients with chronic obstructive pulmonary disease for reducing readmission rates: a systematic review. *JBIC Database of Systematic Reviews & Implementation Reports.* 2017;15(8):2060-86.
203. Yang F, Xiong Z, Yang C, Li L, Qiao G, Wang Y, et al. Continuity of Care to Prevent Readmissions for Patients with Chronic Obstructive Pulmonary Disease: A Systematic Review and Meta-Analysis. *Journal of Chronic Obstructive Pulmonary Disease.* 2017;14(2):251-61.
204. Liu M, Zhang Y, Li D, Sun J. Transitional care interventions to reduce readmission in patients with chronic obstructive pulmonary disease: A meta-analysis of randomized controlled trials. *Chinese Nursing Research.* 2017;4(84-91).
205. Prieto-Centurion V, Markos M, Ramey N, Gussin H, Nyenhuis S, Joo M, et al. Interventions to reduce rehospitalizations after chronic obstructive pulmonary disease exacerbations. A systematic review. *Ann Am Thorac Soc.* 2014;11(3):417-24.
206. Zwerink M, Brusse-Keizer M, Valk PDvd, Zielhuis GA, Monninkhof EM, Palen Jvd, et al. Self management for patients with chronic obstructive pulmonary disease. 2014(3).
207. Alshabanat A, Otterstatter M, Sin D, Road J, Rempel C, Burns J, et al. Impact of a COPD comprehensive case management program on hospital length of stay and readmission rates. *International Journal of COPD.* 2017;12:961-71.
208. Sharma G, Kuo Y-F, Freeman JL, Zhang DD, Goodwin JS. Outpatient Follow-up Visit and 30-Day Emergency Department Visit and Readmission in Patients Hospitalized for Chronic Obstructive Pulmonary Disease. 2010;170(18).
209. Merkow R, Ju M, Chung J, Hall B, Cohen M, Williams M, et al. Underlying Reasons Associated With Hospital Readmission Following Surgery in the United States. *JAMA.* 2015;313(5):483-95.
210. Jones C, Hollis R, Wahl T, Oriel B, Itani K, Morris M, et al. Transitional care interventions and hospital readmissions in surgical populations: a systematic review. *Am J Surg.* 2016;212(2):327-35.

211. Prescott H, Sjoding M, Iwashyna T. Diagnoses of early and late readmissions after hospitalization for pneumonia. A systematic review. *Ann Am Thorac Soc*. 2014;11(7):1091-100.
212. Shorr A, Zilberberg M, Reichley R, Kan J, Hoban A, Hoffman J, et al. Readmission Following Hospitalization for Pneumonia: The Impact of Pneumonia Type and Its Implication for Hospitals. 2013;57(3).
213. Ruiz D, McNealy K, Corey K, Simmerman J. Final evaluation report: Evaluation of the Community-based Care Transitions Program 2017.
214. Coleman EA. The Care Transitions Intervention (CTI) [Available from: <https://caretransitions.org>].
215. National Quality Forum. Patient Safety Collaboration: materials [Available from: <http://www.qualityforum.org/ProjectMaterials.aspx?projectID=74070>].
216. National Quality Forum. Readmissions Action Team Action Pathway: Reducing Avoidable Admissions and Readmissions 2014 [
217. Boutwell AE, Johnson MB, Rutherford P, Watson SR, Vecchioni N, Auerbach BS, et al. An Early Look At A Four-State Initiative To Reduce Avoidable Hospital Readmissions. 2011;30(7).
218. Mittler JN, O’Hora JL, Harvey JB, Press MJ, Volpp KG, Scanlon DP. Turning Readmission Reduction Policies into Results: Some Lessons from a Multistate Initiative to Reduce Readmissions. 2013;16(4).
219. White N. Hospital To Home Initiative - Reviewing The Goals And Challenges. 2011;8(2):84-7.
220. Colleges. AoAM. Best Practice for Better Care 2011 [Available from: <https://www.aamc.org/about/leadership/kirch-word-from-president/184182/president.html>].
221. Agency for Healthcare Research and Quality (AHRQ). Better Outcomes for Older Adults through Safe Transitions (BOOST).
222. Pathway Health. Interact - Lead with Quality
223. Ouslander J, Bonner A, Herndon L, Shutes J. The Interventions to Reduce Acute Care Transfers (INTERACT) quality improvement program: an overview for medical directors and primary care clinicians in long term care. 2014;15(3):162-70.
224. Boston University of Medicine. Re-engineered Discharge (Project Red).

Abbreviations

ACA	Affordable Care Act
ACSQHC	Australian Commission on Safety and Quality in Health Care
AHRQ	Agency for Healthcare Research and Quality
AIHW	Australian Institute of Health and Welfare
AMI	Acute myocardial infarction
BHI	Bureau of Health Information
BOOST	Better Outcomes for Older adults through Safe Transition
CABG	Coronary artery bypass grafting
CCG OIS	Clinical Commissioning Group Outcomes Indicator Set
CCTP	Community Based Care Transitions Program
CHBOI	Core Hospital-Based Outcome Indicators
CIHI	Canadian Institute for Health Information
CMS	Centres for Medicare and Medicare Services
COPD	Chronic obstructive pulmonary disease
DRG	Diagnostic Related Group
ERR	Excess readmission ratio
FY	Financial year
H2H	Hospital to Home
HAC	Hospital-Acquired Condition
HCUP	Healthcare Cost and Utilization Project
HF	Heart failure
HIIN	Hospital Improvement Innovation Network
HRR	Hospital readmission rates
HRRP	Hospital Readmission Reduction Program
ICU	Intensive Care Unit
INTERACT	Interventions to Reduce Acute Care Transfers
IPPS	Inpatient Prospective Payment System
IQR	Hospital Inpatient Quality Reporting Program
ISD	Information Services Division
KPI	Key performance indicator
MBS	Medicare Benefit Schedule
NHS	National Health Service
NICE	National Institute for Health and Clinical Excellence
NQF	National Quality Forum

Avoidable Hospital Readmissions: Report on Australian and International indicators, their use and the efficacy of interventions to reduce readmissions

PSI	Patient Safety Indicator
RRIP	Maryland Readmissions Reduction Program
RSRR	Risk standardised readmission rate
STAAR	State Action on Avoidable Rehospitalisation
VBP	Hospital Value-Based Purchasing Program
VLAD	Variable Life Adjusted Display
ACA	Affordable Care Act
ACSQHC	Australian Commission on Safety and Quality in Health Care
AHRQ	Agency for Healthcare Research and Quality
AMI	Acute myocardial infarction
BHI	Bureau of Health Information
CABG	Coronary artery bypass grafting
CHBOI	Core Hospital-Based Outcome Indicators
CHF	Congestive heart failure
CIHI	Canadian Institute for Health Information
CMS	Centres for Medicare and Medicare Services
COPD	Chronic obstructive pulmonary disease
DRG	Diagnostic Related Group
ERR	Excess readmission ratio
HF	Heart failure
HRR	Hospital readmission rates
HRRP	Hospital Readmission Reduction Program
ICU	Intensive Care Unit
KPI	Key performance indicator
MBS	Medicare Benefit Schedule
MDC	Major diagnostic categories
NHS	National Health Service
NICE	National Institute for Health and Clinical Excellence
RSRR	Risk standardised readmission rate
UK	United Kingdom
US	United States
VLAD	Variable Life Adjusted Display