



MELBOURNE HEALTH

CLINICAL EPIDEMIOLOGY & HEALTH SERVICE EVALUATION UNIT

Potentially preventable hospitalisations: a review of the literature and Australian policies

Final report

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Abbreviations

| | |
|--------|---|
| ACSC | Ambulatory Care Sensitive Conditions |
| ACSQHC | Australian Commission on Safety and Quality in Healthcare |
| ACT | Australian Capital Territory |
| ADE | Adverse Drug Events |
| AE | Adverse Events |
| AIHW | Australian Institute of Health and Welfare |
| AHRQ | Agency for Healthcare Research and Quality |
| BEACH | Bettering the Evaluation and Care of Health |
| CCM | Chronic Care Model |
| CDC | Centre for Disease Control and Prevention |
| CDM | Chronic Disease Management |
| CEHSEU | Clinical Epidemiology and Health Service Evaluation Unit |
| CHF | Congestive Heart Failure |
| COPD | Chronic Obstructive Pulmonary Disease |
| DHS | Department of Human Services |
| ED | Emergency Department |
| EPC | Enhanced Primary Care |
| GP | General Practitioner |
| HARP | Hospital Admission Risk Program |
| ICD | International Classification Disease |
| LOS | Length of Stay |
| MA | Meta-analysis |
| MBS | Medicare Benefits Scheme |
| MeSH | Medical Subject Heading |
| NHMRC | National Health and Medical Research Council |
| NHPF | National Health Performance Framework |
| NHS | National Health Service |
| NSW | New South Wales |
| NT | Northern Territory |
| OR | Odds Ratio |
| PHIDU | Public Health Information Development Unit |
| PPH | Potentially Preventable Hospitalisation |
| QALYs | Quality Adjusted Life Years |
| QoL | Quality of Life |
| RACGP | Royal Australian College of General Practice |
| RCT | Randomised Controlled Trials |
| RR | Rate/Risk Ratio, Relative Risk |
| SA | South Australia |
| SD | Standard Deviation |
| SEIFA | Socioeconomic index for area |
| SIGN | Scottish Intercollegiate Guidelines Network |
| SMD | Standard Mean Difference |

| | |
|--------|---------------------------|
| SR | Systematic Review |
| UK | United Kingdom |
| USA | United States of America |
| WA | Western Australia |
| WHO | World Health Organisation |
| WMD | Weighted Mean Difference |
| 95% CI | 95% Confidence Interval |

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1. Executive summary

Potentially preventable hospitalisations (PPH) have been defined as those hospitalisations which could have been avoided with access to quality primary care and preventative care. Rates of PPH for selected conditions, such as chronic conditions and vaccine preventable conditions are being used nationally and internationally as an indirect measure of problems with access to care and effective primary care.

For the purposes of this report PPH have been discussed using the following 4 groups of PPH conditions:

- i. Vaccine-preventable conditions
- ii. Chronic and complex conditions
- iii. Acute medical conditions
- iv. Adverse events

Research on PPH commenced in the late 1980s in the USA, and was first studied in Australia among Aboriginal and Torres Strait Islander (Indigenous) peoples. Australian work in this area has evolved into national measures that have been collected since 2002 as part of the National Health Performance Framework (NHPF) Performance Indicators, and more recently as part of the National Indigenous Health Performance Reporting. The Australian Safety and Quality Indicators are currently under development by the Australian Commission on Safety and Quality in Health Care, and include primary care indicators as one of the priority areas.

This report summarises the evidence base regarding the epidemiology of PPH conditions, and interventions aimed at reducing the risk of PPH; and describes Australian policies, strategies and initiatives that aim to reduce PPH.

A comprehensive literature review was conducted to identify literature on the epidemiology of PPH conditions and interventions to reduce the risk of PPH. Websites of Australian national, state and territory health departments were searched and a structured survey disseminated to departments to identify policies, strategies and initiatives aimed at reducing the risk of PPH.

Summary of key findings

Prevalence of PPH in Australia

Australian research on the prevalence and burden of PPH conditions varies depending on the selected conditions and the study population being assessed. The bulk of the research measures PPH conditions based on two American PPH sets, and include measures of: (i) vaccine-preventable conditions; (ii) selected chronic conditions; and (iii) selected acute medical conditions.

PPH conditions for the NHPF Performance Indicators and the National Indigenous Health Performance Reporting are based on the Victorian Ambulatory Care Sensitive Conditions study, and include measures from the 3 groups of PPH conditions mentioned above. Some of the main findings from the latest reports are summarised below:

- There has been a small increase over time in Australian PPH rates; however this should be interpreted with caution as it does not account for the increasing prevalence of chronic conditions in the general population.
- For the year 2007-2008, the national total rate of PPH conditions was 33.1 separations per 1000 people. This ranged from 22.3 separations per 1000 people in the Australian Capital Territory (ACT) to 50.1 separations per 1000 people in Western Australia (WA).
- The Australian Indigenous population are at approximately 5 times greater risk of being hospitalised for a PPH condition than the non-Indigenous Australian population.

- Diabetes complications are the most prevalent PPH condition among the Indigenous population; occurring at 9 times the rate of the non-Indigenous population.

The epidemiology of adverse events which are PPH, has been studied separately and tends to focus on the prevalence and burden of medication related adverse events. The prevalence reported in the literature varies due to the population being studied and the methods used to identify adverse drug events (ADE).

- Incidence rates of preventable ADE ranged from 2.4-3.6% of hospital admissions; with higher rates of up to 22% among older patients.

Risk and contributing factors of PPH

A wide variety of PPH risk and contributing factors have been identified in the literature. Early research on PPH examined the association of social determinants such as health insurance status and income levels on PPH rates. Since then, studies have looked at a range of factors, and across a variety of study populations from general populations to specific populations such as older people or women and children.

Individual level factors such as age, ethnicity and socioeconomic status are the most studied factors. Health system factors such as primary care physician supply, continuity of care, and physician characteristics, as well as environmental or geographic factors such as rurality and air pollution have also been studied.

- Many studies have shown that minority groups, and those of lower socioeconomic status are at greater risk of PPH.
- There are conflicting results in regards to the association of level of physician supply, rurality, and continuity of care and PPH rates.
- Environmental factors such as air pollution are associated with higher risk of PPH admissions for respiratory conditions.
- Findings from several studies suggest that age, gender, marital status, socioeconomic status and ethnicity are associated with increase risk of PPH related to chronic conditions.
- Increasing age and increasing number of medications are strong predictors of PPH as a result of ADE.

Interventions to reduce PPH

Vaccine-preventable conditions are infectious diseases, such as tetanus, measles, influenza, bacterial pneumonia etc that can be prevented through vaccine programs. There are a limited number of studies examining interventions directed at immunisation programs in primary care for the reduction and/or prevention of hospitalisation; and most studies largely focus on the immunisation coverage rate as a primary outcome. Interventions for the improvement of immunisation rates, such as patient reminder and recall systems, multi component promotional strategies, and computerised models which include identification of high-risk patients, were effective in improving overall immunisation rates.

- There is some evidence that mail reminders for patients that promote influenza and pneumococcal vaccination can increase the rate of vaccination uptake. However the effect of reminder mail systems on rates of influenza or pneumonia related emergency department (ED) visits and inpatient bed days is inconclusive.
- There is some evidence to suggest a mail out to patients promoting a telephone nurse advice service on influenza vaccine can reduce influenza, pneumonia, CHF and other respiratory related inpatient bed days, but has no effect on rates of ED visits.

The prevention and management of chronic conditions requires a multidisciplinary and coordinated approach, in which primary care plays a key role in care delivery. Chronic conditions such as asthma, diabetes, chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), hypertension and angina, have been selected as PPH

conditions as receipt of high quality care in primary care and ambulatory care settings has the potential to avoid the need for condition related hospitalisations.

The chronic care model (CCM) as described by Wagner and colleagues includes 6 components: self management support, delivery system design, decision support, clinical information system, health care organisation, and community resources. The research in this area examines interventions, including chronic disease management (CDM) programs, that include single or multiple CCM components.

- There is good evidence to show that interventions for managing COPD patients involving multiple CCM components can reduce the rate of hospitalisations and ED visits.
- Similarly, there is some evidence that CDM programs involving multiple and multidisciplinary interventions can reduce the risk of hospitalisation for COPD patients and patients with coronary heart disease.
- There is good evidence that multidisciplinary interventions for heart failure patients can have an effect on reducing all cause hospital admissions and heart failure related hospital admissions, however it is unclear whether the delivery of these interventions is from a community or primary care setting, or a secondary care setting.
- There is good evidence to show that self management support for COPD and asthma patients can reduce rates of hospital admissions.
- Among patients with diabetes, there is weak evidence to show that diabetic foot programs based in community care can reduce foot related hospitalisations and lower extremity amputation rates. There was also weak evidence to show care management programs; and telehealth programs can reduce the number of hospitalisations.
- There is some evidence that specialist psychiatric outreach clinics (in UK urban and rural areas) can reduce psychiatry related hospital admission rates.
- The effect of care coordination interventions on PPH rates is inconclusive, and requires more research.

A number of acute medical conditions have been selected as PPH conditions, including paediatric gastroenteritis, dehydration, urinary tract infections (UTI), perforated appendix etc. Overall, the evidence base assessing acute medical conditions is limited and of low methodological quality.

- There is weak evidence to suggest the following:
 - A nurse led education and direct access service in the care of children with UTI can reduce hospitalisation rates and ED visits.
 - A multimodal program targeting multiple care processes for gastroenteritis can significantly reduce hospital admission rates.
 - Emergency care practitioners (a generic practitioner with extended nursing and paramedic skills) within ambulance services can reduce hospitalisations and ED presentations among patients with breathing difficulty and older patients who have had a fall.
 - Extending the role of paramedic practitioners can reduce the number of ED presentations and the likelihood of hospitalisation.
- Further research is required to assess the effects of rapid response services, where multidisciplinary acute care is delivered within a short time frame in the patient's home, on reducing PPH.

An adverse event is defined as injury or harm resulting from medical management rather than the medical condition itself. Adverse events that occur in primary or community based care and lead to hospitalisation are considered PPH conditions. There is limited

research in this area, and those few studies identified examine interventions to prevent ADE related hospitalisations.

- There is good evidence to suggest that community based pharmacist-led interventions which include medication review, do not reduce hospital admissions due to ADE.
- There is good evidence that primary care nurses using protocols for management of patients with chronic conditions, and education programs for primary care physicians do not have an effect on ADE related hospitalisations.

Australian national and state/territory level PPH policies

- A total of 15 national initiatives; and at a state/territory level 7 ACT; 8 New South Wales; 3 Northern Territory; 4 Queensland; 3 South Australia; 4 Tasmanian ; 7 Victorian and 4 WA initiatives were identified.
- Overall, 8 policies, strategies or initiatives have been evaluated, most involving a comprehensive review – 3 national, 2 from NSW and 3 Victorian.
- Seventeen of the initiatives identified aim to reduce PPH rates as a key objective.
- The Immunise Australia Program implements the National Immunisation Program (NIP) Schedule; and 5 jurisdictional level strategies and programs were identified. None of these initiatives have reducing vaccine-preventable PPH as a key objective, but have a more indirect focus by preventing incidence and prevalence of the diseases themselves through immunisation coverage.
- Six initiatives aim to specifically reduce rates of PPH related to chronic conditions alone: 1 national, 1 Queensland, 3 Victorian and 1 WA. Victoria is the only state to have an initiative that specifically aims to reduce mental health related PPH.
- The National Model of Chronic Disease Prevention and Control: A Public Health Framework and the National Chronic Disease Strategy provide the overarching framework for jurisdictions to base practical implementation strategies. Chronic disease implementation strategies have been developed at the state/territory level in all jurisdictions, and are tailored to meet local needs.
- A number of initiatives aim to reduce PPH covering more than one of the subgroups of PPH conditions. These were generally PPH related to acute medical and chronic or complex conditions: 1 ACT, 4 NSW, 2 Queensland, 1 Victorian and 1 WA.
- NSW is the only state to have initiatives identified that target reducing PPH related acute medical conditions as an objective.
- There were no policies identified that aim specifically at reducing PPH related to adverse events.
- Older people (aged 65 years and over in the general population and 45 or 50 years and over in the Indigenous population) are the target group for 5 initiatives (2 national, 1 ACT, 1 NSW, 1 Queensland).
- The National Primary Health Care Strategy is under development, and a review of Medicare Benefits Scheme primary care items will also be conducted.

2. Introduction

2.1 Background information

The Australian healthcare system is experiencing increasing demand due to various factors such as the changing profile of the population (ageing, longevity) and the shifting burden of disease from acute to chronic and complex conditions [1]. There is also international recognition of the need to manage the demand for high cost acute health care services more effectively, and to achieve a better balance between acute health care services and primary care services.

The Australian hospital sector has long had a focus on preventing hospital admissions as a way of reducing demand. However preventing hospital admissions is also a priority for the primary care sector, as there is evidence that health outcomes can be improved when care is provided in a coordinated, systematic approach with a strong and effective primary care component [2, 3].

As part of the national response to these challenges, the Australian Commission on Safety and Quality in Health Care (ACSQHC) has funded a number of projects, including this review, that focus on safety and quality improvement in primary health care. National safety and quality indicators are currently being developed by the ACSQHC in collaboration with the Australian Institute of Health and Welfare (AIHW), with primary care indicators being one of the priority areas; and the National Healthcare Agreement includes performance indicators for primary and community care. This review will support both these national activities.

The research in this area has largely focussed on conditions for which hospitalisation is thought to be potentially prevented if timely and effective care is delivered in the ambulatory care setting, in particular access to primary care services. Early USA based research in this area, assessed the impact of socioeconomic status on potentially preventable hospitalisation (PPH) rates, as an indirect measure of appropriate access to ambulatory health care [4]. From this body of research the concept of using rates of PPH as quality indicators has developed, and is included in the Agency for Healthcare Research and Quality's (AHRQ) Prevention Quality Indicators: Hospital Admission for Ambulatory Care Sensitive Conditions [5]. These indicators are used to identify areas where potential improvements can be made in the quality of the (USA) health care system.

Potentially preventable hospitalisations have been defined by AHRQ as "hospitalisations that may be preventable with high quality primary and preventive care. These hospitalisations may be avoided if clinicians effectively diagnose, treat, and educate patients, and if patients actively participate in their care and adopt healthy lifestyle behaviors." [5]

Similar studies have since been conducted outside the USA, including Australian based research which commenced in a national study looking at the prevalence of PPH conditions among Aboriginal and Torres Strait Islander (Indigenous) peoples [6]. In Australia, this work has evolved into measures of PPH taken at both a jurisdictional level and a national level; and have been included in the Council of Australian Governments' National Healthcare Agreement [7], the primary and community care performance benchmark outlined below:

By 2014-15, improve the provision of primary care and reduce the proportion of potentially preventable hospital admissions by 7.6 per cent over the 2006-07 baseline to 8.5 per cent of total hospital admissions.

Based on the literature, PPH can be classified into the following 4 groups of conditions:

1. *Vaccine-preventable conditions*. These include hospitalisation for conditions such as influenza, bacterial pneumonia, tetanus and others.
2. *Chronic and complex conditions*. These include conditions such as asthma, chronic obstructive pulmonary disease (COPD), diabetes, congestive heart failure (CHF) etc.
3. *Acute medical conditions*. Some of which include dehydration, gastroenteritis, cellulitis, urinary tract infection etc.
4. *Adverse events* where harm is caused by the medical management rather than the disease process, and leads to hospitalisation. For example medication errors.

Vaccine-preventable conditions

This group of PPH includes those conditions that through vaccination programs can be potentially avoided. Conditions reported in the literature include influenza, bacterial pneumonia, tetanus, measles, mumps, rubella, pertussis, and polio-conditions for which vaccination is available. As stated in the Victorian Ambulatory Care Sensitive Conditions (ACSC) study "For these conditions it is the actual condition that is deemed preventable rather than the hospitalisation."

Bacterial pneumonia is currently the only vaccine-preventable condition that is part of the AHRQ Preventable Quality Indicators. It is part of the acute conditions list as not only is it vaccine-preventable, but can be effectively treated in primary care with use of appropriate antibiotics. Older people are particularly susceptible and research indicates that the influenza vaccine can be effective by up to 45% in preventing the need for hospitalisation among this population during peak seasons [8]. Other sets including the Australian national set include 'other vaccine preventable conditions'.

Chronic conditions

Chronic conditions make up a large proportion of hospital admissions, and not surprisingly a large component of selected PPH conditions. Interventions to manage chronic conditions are often complex, and require an integrated and systematic approach, of which primary care plays a key role. A number of high-prevalence chronic diseases including asthma, diabetes, CHF, COPD and hypertension have been included in PPH research.

Chronic conditions make up the bulk of the AHRQ preventable quality indicators and a large proportion of the Australian set, and include conditions such as diabetes (uncontrolled diabetes without complication, short and long term diabetes with complications, diabetes related lower extremity amputation), CHF, hypertension, angina without procedure, COPD, and asthma.

Acute medical conditions

PPH for selected acute medical conditions are those that should not result in hospitalisation if high quality primary health care is received in a timely manner. Some of the acute medical conditions reported in the literature as PPH include: paediatric gastroenteritis, dehydration, urinary tract infection, perforated appendix, pyelonephritis, kidney infection, perforated ulcer, cellulitis, pelvic inflammatory disease, ear nose and throat infections, and dental conditions.

Adverse events

This group of PPH includes those preventable adverse events that have lead to a hospital admission. An adverse event (AE) is defined as injury or harm resulting from medical management rather than the medical condition itself. There is limited research on AE in the primary care setting. The research on PPH in this area tend to focus on medication errors or adverse drug events (ADE), that lead to harm and consequently hospitalisation,

as this is the most prevalent type adverse event. “Medication errors include errors of commission (taking the wrong action) and errors of omission (failing to take action).” [9]

Scope of report

This report will use the term PPH, and will limit the scope to the four groups of conditions mentioned above. Other terms have been used in this area of research including ‘avoidable hospitalisation’ and ‘ambulatory care sensitive conditions’.

This review will examine the epidemiology of PPH conditions among community dwelling people, as well as interventions that target community dwelling patients with a focus on those with complex care needs. Community dwelling people with complex care needs such as chronic conditions are the focus of the review due to the high burden of disease and injury associated with these conditions which also translates to high health care utilisation [10].

This report does not include effectiveness of interventions for specific disease or condition diagnoses but focuses more broadly on interventions that reduce the risk of PPH in those groups of conditions listed above.

This report excludes other aspects of PPH, namely hospitalisations through injury prevention strategies (e.g. road traffic accidents) or hospitalisations of conditions that are potentially preventable through population-based health promotion strategies (e.g. alcohol-related conditions, smoking related conditions).

This report includes a literature review of the epidemiology of PPH conditions, and interventions to reduce the risk of PPH, and a review of Australian national and jurisdictional policies, strategies and initiatives to reduce PPH. The findings will inform future safety and quality work, and improved delivery of care occurring in the primary care sector.

3. Objectives

The review objectives are to:

- ❖ identify current evidence about the burden of PPH conditions and their contributing factors;
- ❖ identify current evidence about interventions to reduce the risk of PPH;
- ❖ identify current policies, strategies and initiatives being used in Australia to reduce the risk of PPH

4. Methods

The project will involve two activities:

- ❖ A literature review of the evidence base (epidemiology and interventions)
- ❖ A structured Australian policy review, involving web search and survey of Australian jurisdictional health departments

4.1 Literature review of the evidence base

The following steps were undertaken to comprehensively search the literature for evidence pertaining to (i) the epidemiology of PPH; and (ii) interventions to reduce the risk of PPH.

4.1.1 Development of research questions

The search strategy was developed to answer the following research questions:

- 1 What is the epidemiology and risk for PPH in people residing in the community?**
 - 1.1 What is the epidemiology and risk of PPH for vaccine-preventable conditions in people residing in the community?
 - 1.2 What is the epidemiology and risk of PPH for chronic conditions in people residing in the community?
 - 1.3 What is the epidemiology and risk of PPH for acute medical conditions in people residing in the community?
 - 1.4 What is the epidemiology and risk of PPH from adverse events in people residing in the community?

- 2 What is the evidence for effective interventions to reduce the risk of PPH in people residing in the community?**
 - 2.1 What is the evidence for effective interventions to reduce the risk of PPH for vaccine-preventable in people residing in the community?
 - 2.2 What is the evidence for effective interventions to reduce the risk of PPH for chronic conditions in people residing in the community?
 - 2.3 What is the evidence for effective interventions to reduce the risk of PPH for acute medical conditions in people residing in the community?
 - 2.4 What is the evidence for effective interventions to reduce the risk of PPH from adverse events in people residing in the community?

Separate searches were conducted to identify the evidence base for the above mentioned research questions.

4.1.2 Epidemiological studies

A comprehensive literature search of both the grey and peer reviewed literature was conducted to identify studies that assessed the epidemiology of PPH conditions. A search to identify English language studies published between 1990 to May 2009 using the Medline database was conducted. The search strategy used combinations of terms that

related to PPH conditions, risk factors / contributing factors, prevalence and hospitalisation. See Table 1 for details.

Epidemiological studies were included if they included the following criteria:

- **Conditions of interest:** at least one of the four categories of PPH conditions.
- **Study population:** community dwelling population.
- **Study types:** systematic reviews (SR), prospective or retrospective cohort studies or case-control studies, other observational studies. Where high quality SR were identified, articles published prior to the date of that review's search strategy were excluded.

Initially, a targeted search of the literature was conducted with a focus on Australian data. Other key international papers identified from the Australian based research were also retrieved.

Table 1: Outline of search terms* used for literature search

| | MeSH terms | Other terms |
|-----------------------------|--|--|
| Outcomes | Hospitalization* Delivery of Health Care Health services accessibility Patient admission Ambulatory care utilization* Patient acceptance of health care Health services misuse which includes: abuse of health services, health services over utilisation* | Potentially preventable hospitalisation* Avoidable hospitalisation* Preventable hospitalisation Unexpected/unnecessary hospitalisation* Ambulatory care sensitive conditions |
| Contributing factors | Risk factor Health services accessibility | Determinant Predictor Severe adverse events Adverse events Adverse outcomes Patient risk Admission risk |
| Settings | Ambulatory care Primary health care Family practice Community health services which includes Community healthcare Physician, family which includes general practitioner Emergency service, Hospital | |

*Terms were searched using English and USA-English spelling

A comprehensive website search of the grey literature was conducted to identify relevant reports, health technology assessments or other materials related to the epidemiology and risk of the PPH conditions. Again the search focussed on Australian data and additional information (where relevant) from international reports was added.

The following websites were searched but were not limited to:

Australian

- Australian Institute of Health and Welfare
- Australian Department of Health and Ageing
- State and territory based health departments
- Royal Australian College of General Practice (RACGP)
- Divisions of General Practice
- Australian Commission on Safety and Quality in Healthcare
- Websites of state/territory Ambulance Services

International

- Agency for Health Care Research and Quality (AHRQ)
- Centre for Disease Control and Prevention (CDC)
- National Institute for Health and Clinical Excellence (NICE)
- National Health Service (NHS)
- Health Departments and Ministries of New Zealand, USA, UK, and Canada
- World Health Organisation (WHO)

4.1.3 Interventions

A comprehensive search of the peer reviewed literature published from January 1990 to April 2009 was undertaken using Medline and Cochrane Library databases. A search for SR (filter) using the PubMed database was also conducted, and PubMed Clinical alerts was set up to identify literature published from April 2009 to the first week in June 2009. The search was limited to English language publications.

Medical subject heading (MeSH) search terms were used for all databases and a keyword search was used if the MeSH term was not available. Table 1 summarises the search terms used; and the detailed search strategy can be found in Appendix 1.

Article identification and selection for critical appraisal

A series of steps were taken to establish whether an article would be included or excluded from the literature review. Titles of articles were reviewed to exclude those that were obviously not about PPH or one of the four groups of PPH conditions. Abstracts of articles were then reviewed.

Inclusion criteria for intervention studies

Abstracts were assessed where available to see if they met the inclusion criteria. Studies that examined interventions to reduce the risk of PPH conditions were included if they fulfilled the following criteria:

- **Study outcomes:** At least one of the following health utilisation outcomes were reported:
 - potentially preventable hospitalisations
 - avoidable hospitalisations
 - preventable hospitalisations
 - unnecessary hospitalisations
 - unexpected hospitalisations
 - hospital admissions
 - emergency department presentations/admissions

Studies that included preventable **readmissions** to hospital as the only health care utilisation outcome was beyond the scope of this review.

- **Study setting:** Studies needed to be set in the primary care setting, or with outreach from a secondary setting with the care delivery occurring in primary care.
- **Study population:** community dwelling population
- **Study type:** SR, meta-analyses (MA), and randomised controlled trials (RCT) were given high priority. Where high level evidence was not available or where there was a paucity of publications, lower levels of evidence were reviewed eg clinical controlled trials, controlled before-and-after studies, before-and-after studies without a concurrent control, cohort, case-control studies, and case series.

Where high quality SR or MA were identified, articles published prior to the date of that review's search strategy were excluded.

Exclusion criteria

Studies were excluded according to the following criteria:

- Studies that measured hospital readmissions only
- Primarily about interventions targeting residential care facilities, public health or health promotion
- Studies not related to care delivered in primary care settings
- Non-human studies
- Other non-systematic/narrative reviews, expert opinions and reports from various governmental and non-governmental organisations will be excluded but will be reviewed for additional references, information and data; and
- Studies that could not be retrieved within the time frame of the project.

Manual search

The bibliographies of identified articles were scrutinised for additional references and a manual search of relevant journals was undertaken, which included but was not limited to:

- Australian Family Physician
- Australian and New Zealand Journal of Public Health
- Australian Health Review
- American Journal of Public Health
- British Medical Journal
- Health Affairs
- Health Services Research
- Internal Medicine Journal
- Medical Journal of Australia
- Medical Care
- Lancet
- Journal of American Medical Association
- Journal of Quality in Clinical Practice
- Public Health
- Quality and Safety in Health Care

The title and abstract of all identified articles were reviewed by two reviewers to determine if the article met the selection criteria. Those intervention studies that fulfilled the inclusion criteria then went on to be critically appraised.

Article critical appraisal

All included articles (SR, MA, RCT and cohort studies) were critically appraised for assessment of quality using structured critical appraisal methodology - checklists 1, 2 and 3 developed by Scottish Intercollegiate Guidelines Network (SIGN) [11](Appendix 2). Each checklist includes an assessment of the methodological quality; summary of the key points of the study; the strengths and weaknesses; and the study's applicability to the patient groups targeted by the review. Study quality was rated as ++ (well conducted, high quality); + (moderate quality); or - (low quality).

Evidence was categorised according to study design using a hierarchy of evidence in descending order. Formal levels of evidence were assigned using a standard format defined by National Health and Medical Research Council (NHMRC) pilot program 2005-2006 for intervention studies (Table 2).

Table 2: Designations of levels of evidence according to type of study

| Level | Intervention |
|-------|--|
| I | A systematic review of level II studies |
| II | A randomised controlled trial |
| III-1 | A pseudo-randomised controlled trial (i.e. alternate allocation or some other method) |
| III-2 | A comparative study with concurrent controls <ul style="list-style-type: none"> • Non-randomised experimental trial (including controlled before-and-after study) • Cohort study • Case-control study • Interrupted time-series with a control group |
| III-3 | A comparative study without concurrent controls <ul style="list-style-type: none"> • Historical control study • Two or more single arm study • Interrupted time-series without a parallel control group |
| IV | Case series with either post test or pre test/post test (also known as before-and-after study) outcomes |

The evidence base was summarised using the following terminology and definitions:

- Strong evidence: several level I or II studies of high quality (++)
- Good evidence: one or two level I or level II studies of high quality (++)
- Some evidence: one or two level I or II studies of moderate quality (+); or level III studies of high quality (++)
- Weak evidence: level I and II studies of low quality (-) or level III studies of moderate or low quality (+/-)

4.2 A structured policy review of Australian health department websites

A structured review of Australian health department websites was conducted to identify current policies, strategies and initiatives being used in Australia to reduce the risk of PPH.

Each state/territory based health department website was searched using the departmental website search engine for the following terms:

- Avoidable hospitalisation
- Preventable hospitalisation
- Unexpected hospitalisation
- Unnecessary hospitalisation
- Patient risk
- Admission risk
- Chronic disease management
- Vaccine preventable
- Vaccination
- Immunisation

The term “policy” was used in advanced searches when outputs for terms were large. Contact with key Australian PPH researcher Zahid Ansari, and other organisation or research staff was also made to gather further information regarding PPH initiatives.

4.3 A survey of jurisdictional health departments

A structured survey was developed based on information gained from the peer and grey literature review to map policies, initiatives and strategies being considered, developed or implemented to reduce the burden and risk of PPH across Australia. The ACSQHC provided the Clinical Epidemiology and Health Service Evaluation Unit (CEHSEU) project team with names and contact details of jurisdictional health department staff to participate in the survey.

The survey collected information about the title and description of the policy including information about the organisation of care, funding model, workforce redesign, service delivery settings, implementation status (main stream; pilot stage; for future), and whether the implementation had undergone an evaluation. See Appendix 3 for a copy of the survey.

The survey was disseminated electronically to participants in May 2009. Up to three reminders were also sent out to participants via email.

5. Epidemiology and risk

The search identified several key international and Australian studies and reports. The key epidemiological studies were retrospective studies assessing rates of selected PPH conditions using hospital administrative data bases. For these studies the selected PPH conditions varied but all used International Classification of Disease (ICD) codes to define their selected conditions [12].

Two recent comprehensive literature reviews related to contributing factors of PPH conditions were identified. The authors of both reviews assessed the studies identified in a narrative way rather than systematically appraising the studies. These literature reviews have been summarised in Section 5.3.

5.1 Identifying and selecting PPH conditions

Key international research

The concept of preventable or avoidable hospital admissions or ACSC, was first introduced over 20 years ago. Initial research assessed the impact of socioeconomic status on hospitalisation rates for selected ACSC, which were considered an indirect measure of the receipt of timely access to effective care delivered in ambulatory care [4, 13, 14].

This body of research has grown from USA-state and county based data to now being analysed in the USA by the AHRQ (for most states) at a national level. The concept has also been adopted and modified by countries outside the USA, including Australia [15-18].

There are a broad range of conditions identified in the literature as PPH conditions, many of which involve a process of selection by a panel of experts; however most of the research in this area is based on the following two sets of PPH conditions:

- The set developed by John Billings in conjunction with the United Hospital Fund of New York includes 28 ACSC, identified by a panel of six physicians [4, 13, 19].
- The set developed by Weissman et al includes 12 avoidable admissions identified through review of the literature and evaluation by a panel of 5 physicians [14].

The development of the Prevention Quality Indicators followed on from this work. In the early 1990s, the AHRQ began developing quality indicators which could be sourced from routinely collected hospital administrative data. The original work included measures of PPH conditions. This work has evolved into what are now 4 separate modules of quality indicators including: (i) Prevention Quality Indicators; (ii) Inpatient Quality Indicators; (iii) Patient Safety Indicators; and (iv) Pediatric Quality Indicators.

The Prevention Quality Indicators module includes indicators of PPH. Selection of indicators to be included in the set is based on a rigorous evaluation framework, including a systematic literature review and evaluation of the indicators using empirical analyses [5].

The AHRQ describe the Prevention Quality Indicators as

...a set of measures that can be used with hospital inpatient discharge data to identify "ambulatory care sensitive conditions". ACSC are conditions for which good outpatient care can potentially prevent the need for hospitalization, or for which early intervention can prevent complications or more severe disease [5].

The most recent version of the Prevention Quality Indicators (2007) consists of 14 measures which have been categorised into: (i) chronic conditions – diabetes, circulatory, respiratory; (ii) acute conditions; and (iii) birth outcomes. See Table 3.

Table 3: AHRQ Prevention Quality Indicators, Version 3.1 (March 2007)

| Indicator name | Description |
|--|---|
| Chronic conditions | |
| 1. Diabetes short-term complication admission rate | Number of admissions for diabetes short-term complications per 100,000 population |
| 2. Diabetes long-term complication admission rate | Number of admissions for diabetes long-term complications per 100,000 population |
| 3. COPD admission rate | Number of admissions for COPD per 100,000 population |
| 4. Hypertension admission rate | Number of admissions for hypertension per 100,000 population |
| 5. CHF admission rate | Number of admissions for CHF per 100,000 population |
| 6. Angina admission without procedure | Number of admissions for angina per 100,000 population |
| 7. Uncontrolled diabetes admission rate | Number of admissions for uncontrolled diabetes per 100,000 population |
| 8. Adult asthma admission rate | Number of admissions for asthma per 100,000 population |
| 9. Rate of lower-extremity amputation among patients with diabetes | Number of admissions for lower-extremity amputation among patients with diabetes per 100,000 population |
| Acute conditions | |
| 10. Perforated appendix admission rate | Number of admissions for perforated appendix as a share of all admissions for appendicitis within an area |
| 11. Dehydration admission rate | Number of admissions for dehydration per 100,000 population |
| 12. Bacterial pneumonia admission rate | Number of admissions for bacterial pneumonia per 100,000 population |
| 13. urinary tract infection admission rate | Number of admissions for urinary infection per 100,000 population |
| Birth outcomes | |
| 14. Low Birth Weight | Number of low birth weight births as a share of all births in an area. |

Australian research

In Australia, research looking at PPH conditions has been based on those defined by USA studies. In 1998, Stamp et al used PPH conditions and procedures identified by Hadley and Steinberg [20] to assess the prevalence among Indigenous women and children [6].

This was followed by the Victorian ACSC study in 2001 in which selected conditions based on work by Weissman et al 1992, and those endorsed by the Institute of Medicine 1993 (from Billings work) were used to develop the indicator set [21 2001]. The list of PPH conditions included in the latest version of the Victorian ACSC study can be found in Appendix 4.

Australian research in this field has evolved into what is now collected by the AIHW as part of the National Health Performance Framework (NHPF) - Performance Indicators. Separation rates for selected PPH conditions are presented by state and territory, and according to remoteness area and quintile of socioeconomic advantage/disadvantage. These have been collected at a national level since 2002-2003. Table 4 outlines the selected PPH conditions currently being collected in Australia. Details of the ICD-10-AM (version 10, Australian modification) codes used to define these conditions have been listed in Appendix 5.

Table 4: PPH conditions included in the National Health Performance Framework – Performance Indicators (AIHW, 2009)

| Category and indicator name | |
|--------------------------------------|---|
| Vaccine-preventable | Acute |
| Influenza and pneumonia | Dehydration and gastroenteritis |
| Other vaccine-preventable conditions | Pyelonephritis |
| Chronic | Perforated/bleeding ulcer |
| Asthma | Cellulitis |
| Congestive cardiac failure | Pelvic inflammatory disease |
| Diabetes complications | Ear, nose and throat infections |
| COPD | Dental conditions |
| Angina | Appendicitis with generalised peritonitis |
| Iron deficiency anaemia | Convulsions and epilepsy |
| Hypertension | Gangrene |
| Nutritional deficiencies | |
| Rheumatic heart disease | |

Development of Australian safety and quality indicators, including indicators targeting primary care, is currently underway by the ACSQHC [22]; and the latest National Healthcare Agreement includes selected PPH conditions as a measure of primary and community care.

In April 2007 the Public Health Information Development Unit (PHIDU), University of Adelaide, a collaborating unit of the AIHW, published a comprehensive report of the level and extent of regional variation in Australia of selected PPH conditions [23]. The sub-set of PPH conditions is listed in Appendix 4, and has been compared to the national set and Victorian ACSC study.

In addition to work being done at a national level by AIHW, most jurisdictions are collecting similar information on PPH conditions using the NHPF Performance Indicators, or the Victorian ACSC set of PPH conditions. The definition of PPH conditions and the list of PPH conditions used nationally and by the jurisdictions can be found in Appendix 6.

Adverse events

Adverse events have not been included in the international or national PPH sets. However a number of studies were identified that measure the prevalence and burden of AE that result in hospitalisation and could potentially have been prevented. The research on PPH in this area focuses on medication errors or ADE that lead to harm and consequently hospitalisation.

5.2 Prevalence and burden of PPH

The prevalence and associated burden of PPH have been described below. This report will focus on the prevalence and burden of PPH in Australia; and where this information is not available will draw on key international research.

Australian research

Aboriginal and Torres Strait Islander population

As mentioned earlier, one of the first Australian PPH studies assessed the prevalence of selected PPH conditions among the Indigenous population. The study used data from New South Wales (NSW), Queensland, Western Australia (WA), South Australia (SA) and the Northern Territory (NT) during 1992-1993, and compared rates of selected PPH conditions and procedures among Indigenous women and children to non-Indigenous women and children [6].

The selected PPH conditions included 4 vaccine preventable conditions (mumps, measles, pertussis and bacterial pneumonia); 24 acute conditions (including infectious gastroenteritis, respiratory distress syndrome, dehydration-volume depletion, severe ear nose throat infections, kidney and urinary tract infections, cellulitis, pelvic inflammatory disease, dental abscess, intra cerebral haemorrhage and acute myocardial infarction); 5 chronic conditions (asthma or bronchitis, diabetes, hypertension, anaemia, CHF); maternal and birth outcomes (small for gestational age, severe pre-eclampsia, eclampsia, spontaneous abortion complicated by shock, complicated pregnancy with sexually transmitted diseases); and other conditions or procedures such as radical hysterectomy, cervical cancer and nutritional deficiencies.

The results of this study showed that Indigenous women and children were more likely to be admitted for the selected PPH conditions or to undertake a potentially avoidable procedure than non-Indigenous women and children in all jurisdictions, and for all age cohorts except neonates.

In a recent publication, differences in the rates of PPH conditions among Aboriginal and non-Aboriginal people in the NT during 1998/99 and 2005/06 were examined [24]. Comparisons were also made to national rates of the selected PPH conditions. The PPH conditions included in the analysis were those identified by the PHIDU (see Appendix 4).

The overall rate of PPH conditions between 1998/99 and 2005/06 was 52 144 (15.6% of total) hospitalisations in the NT. Among the Aboriginal population, the PPH rate was 11,090 per 100,000 population, compared to the non-Aboriginal population rate of 2779 per 100,000 population. Rates of PPH conditions increased significantly over time among the Aboriginal population, whereas a much smaller increase was seen among the non-Aboriginal group (average annual increase in rates, $p < 0.001$). The increase in PPH condition rates among the Aboriginal population was predominantly due to chronic conditions, and occurred among the older age group (>44 years).

Rates of PPH conditions, termed ambulatory care sensitive hospital admissions, have recently been included in the National Indigenous Health Performance Framework [25]. The framework includes analyses of the number of hospitalisations for PPH conditions for Indigenous people from NSW, Victoria, Queensland, WA, SA and NT.

Some of the findings from the framework's 2004/06 analyses include:

- Overall, Indigenous people were hospitalised for PPH conditions at approximately 5 times the rate of other Australians (RR=5.1, $p < 0.05$). This rate is thought to be higher, once adjusted for the under-identification of indigenous status.

- In Queensland, SA and the NT Indigenous Australians were hospitalised for PPH conditions at 4 to 5 times the rate of other Australians; in WA it is as high as 13 times the rate; and in Victoria and NSW it is 3 times the rate of non-Indigenous Australians.
- Diabetes complications were the most prevalent PPH condition, followed by convulsions and epilepsy and COPD.
- Hospitalisation for diabetes complications among the Indigenous population was 9 times the rate of the non-Indigenous population (RR=8.7, $p < 0.05$).

Table 5 outlines the top 10 PPH conditions by indigenous status from the latest National Indigenous Health Performance Framework report [25].

Table 5: Top 10 PPH conditions by indigenous status for combined NSW, Vic, Qld, WA, SA and NT data, July 2004-June 2006 ^{(a)(b)(c)(d)}

| | Separations | | | | | Total bed days | | |
|---------------------------------|-------------------|---|------------------------|------------------------|---------------------------------------|----------------------|----------------|----------------------|
| | Number Indigenous | Indigenous no. per 1,000 ^(e) | LCL 95% ^(f) | UCL 95% ^(g) | Other no. per 1,000 ^{(e)(h)} | Ratio ⁽ⁱ⁾ | Indigenous | Other ^(h) |
| Diabetes complications | 65,120 | 147.0 | 145.7 | 148.3 | 16.9 | 8.7* | 230,102 | 4,171,241 |
| Convulsions and epilepsy | 5,929 | 7.5 | 7.3 | 7.8 | 1.5 | 5.2* | 13,855 | 161,507 |
| COPD | 4,526 | 13.2 | 12.7 | 13.6 | 2.6 | 5.1* | 25,655 | 764,282 |
| Ear, nose and throat infections | 4,129 | 3.5 | 3.3 | 3.6 | 1.6 | 2.1* | 7,665 | 107,715 |
| Asthma | 4,077 | 4.4 | 4.3 | 4.6 | 1.9 | 2.4* | 9,018 | 161,219 |
| Dental problems | 3,657 | 2.9 | 2.8 | 3.0 | 2.6 | 1.1* | 5,539 | 115,255 |
| Cellulitis | 3,542 | 4.7 | 4.5 | 4.9 | 1.4 | 3.2* | 12,088 | 291,781 |
| Pyelonephritis | 3,343 | 6.2 | 5.9 | 6.5 | 2.1 | 3.0* | 11,960 | 386,872 |
| Congestive cardiac failure | 2,426 | 6.6 | 6.3 | 6.9 | 1.9 | 3.4* | 13,877 | 613,472 |
| Angina | 2,397 | 5.4 | 5.2 | 5.7 | 1.9 | 2.8* | 5,746 | 202,471 |
| Total^(j) | 101,253 | 199.2 | 197.7 | 200.7 | 38.7 | 5.1* | 339,870 | 7,322,059 |

* Represents results with statistically significant differences in the Indigenous/other comparisons at the $p < 0.05$ level.

(a) Data are from public and most private hospitals. Data exclude private hospitals in the Northern Territory.

(b) Categories are based on the ICD-10-AM fifth edition (National Centre for Classification in Health 2006).

(c) Financial year reporting.

(d) Data are reported by state/territory of usual residence of the patient hospitalised and are for New South Wales, Victoria, Queensland, Western Australia, South Australia, and the Northern Territory only. These six jurisdictions are considered to have adequate levels of Indigenous identification, although the level of accuracy varies by jurisdiction and hospital. Hospitalisation data for these six jurisdictions should not be assumed to represent the hospitalisation experience in the other jurisdictions.

(e) Directly age-standardised using the Australian 2001 standard population.

(f) LCL = lower confidence limit.

(g) UCL = upper confidence limit.

(h) 'Other' includes hospitalisations of non-Indigenous people and those for whom Indigenous status was 'not stated'.

(i) Rate ratio—Indigenous: other.

(j) All ambulatory care sensitive hospital admissions. Note that the sum of the number of hospitalisations for each condition exceeds the total as more than one ambulatory care sensitive condition can be diagnosed for each hospital separation.

General Australian population

Some of the findings from the most recent report on the AIHW NHPF – Performance Indicators [26] include:

- There were 33.13 separations per 1,000 people in Australia for PPH in 2007/08; this rate has been slowly increasing since 2002/03.
- The rate of PPH separations ranged from approximately 22 per 1,000 people in the Australian Capital Territory (ACT) to 50 per 1,000 people in WA.
- See Tables 6 and 7 for differences between the jurisdictions.

Table 6: Time series of separations per 1,000 population (age-standardised) for potentially preventable hospitalisations by state or territory of usual residence, 2002–03 to 2007–08

| | 2003–04 | 2004–05 | 2005–06 | 2006–07 | 2007–08 |
|--|--------------|--------------|--------------|--------------|--------------|
| State or territory of usual residence | | | | | |
| NSW | 27.59 | 27.43 | 28.13 | 28.40 | 28.00 |
| Vic | 31.73 | 32.94 | 31.73 | 32.17 | 33.16 |
| Qld | 31.76 | 32.10 | 31.87 | 32.47 | 33.90 |
| WA | 35.99 | 44.90 | 46.78 | 47.62 | 50.12 |
| SA | 31.42 | 30.93 | 32.58 | 32.29 | 32.75 |
| Tas | 29.57 | 27.40 | 31.22 | 31.87 | 32.18 |
| ACT | 20.17 | 19.40 | 21.86 | 22.13 | 22.28 |
| NT | 48.60 | 46.29 | 48.19 | 48.00 | 44.98 |
| Australia^(b) | 30.63 | 31.70 | 32.06 | 32.47 | 33.13 |

(a) Separations for which the care type was reported as *Newborn* with no qualified days, and records for *Hospital boarders* and *Posthumous organ procurement* have been excluded. Excludes multiple diagnoses for the same separation within the same group of potentially preventable hospitalisations.

(b) Includes unknown state of residence and excludes overseas residents.

(c) Rate per 1,000 population was directly age-standardised as detailed in *Appendix 1*.

Table 7: Separation rates^{(a)(b)} for potentially preventable hospitalisations^(c) by state or territory of usual residence, 2007–08

| | Vaccine preventable conditions | Acute conditions | Chronic conditions | Potentially preventable hospitalisations ^(c) |
|--|--------------------------------|------------------|--------------------|---|
| Australia | 0.71 | 13.34 | 19.24 | 33.13 |
| 95% CI ^(d) | 0.0 – 1.8 | 8.5 – 18.3 | 13.5 – 25.0 | 25.5 – 40.8 |
| State or territory of usual residence^(e) | | | | |
| NSW | 0.67 | 12.30 | 15.16 | 28.00 |
| Vic | 0.68 | 14.26 | 18.35 | 33.16 |
| Qld | 0.76 | 13.61 | 19.69 | 33.90 |
| WA | 0.64 | 13.06 | 36.61 | 50.12 |
| SA | 0.76 | 15.24 | 16.93 | 32.75 |
| Tas | 0.42 | 11.00 | 20.93 | 32.18 |
| ACT | 0.77 | 10.51 | 11.09 | 22.28 |
| NT | 2.31 | 17.92 | 25.53 | 44.98 |

(a) Rate per 1,000 population was directly age-standardised as detailed in *Appendix 1*.

(b) Separations for which the care type was reported as *Newborn* with no qualified days, and records for *Hospital boarders* and *Posthumous organ procurement* have been excluded. Excludes multiple diagnoses for the same separation within the same group.

(c) The conditions included in the groups *Vaccine preventable conditions*, *Acute conditions* and *Chronic conditions* are listed in *Appendix 5*.

(d) 95% confidence intervals calculated based on weighted sums of poisson parameters (Dobson et al. 1991).

(e) Includes records with unknown remoteness area but with known state of residence, and excludes overseas residents and unknown state of residence.

The literature review identified a number of additional Australian based studies measuring the prevalence and burden of selected PPH conditions. Table 8 briefly outlines the main findings from a number of these studies. There is wide variation in the rate of reported PPH in the literature. This is mainly due to differences in operational definitions and variations in study populations [27].

In terms of hospital expenditure, the Victorian ACSC study 2000-2001 reported diabetes complications to be the most expensive condition in terms of the direct cost of the hospital stay with an estimated cost (based on diagnostic-related group weights) of \$145.1 million, followed by COPD estimated at \$39.7 million [28].

Table 8: Rate of PPH admissions reported in the Australian literature

| Study (Year) | Jurisdiction if applicable | Study population & PPH conditions* | Data source | % of PPH |
|---------------------------------|----------------------------|---|--|--|
| Li et al (2009) [24] | Northern Territory | All NT hospital admissions Compared Aboriginal population to non-Aboriginal population PHIDU set – VP, CC, AM | NT public hospital discharge data 1998/99 – 2005/06 | 15.6% of total NT admissions; RR 3.9 times higher among NT- Aboriginal population |
| Glover et al (2008) [29] | South Australia | All SA hospital admissions AIHW set - VP, CC, AM | SA Health hospital admissions database 2005/06 and 2006/07 | 10.2% of total SA admissions |
| Page et al (2007) [23] | Australia | All hospital admissions PHIDU set– VP, CC, AM | National Hospital Morbidity Database 2001/02 | 8.7% of total admission |
| Ansari <i>et al</i> (2003) [30] | Victoria | All VIC hospital admissions Compared rural to urban populations VACSC set– VP, CC, AM | Victorian Admitted Episodes Dataset 1997/98 to 1999/2000 | 7.7% of total Vic admissions |
| Chan et al (2001) [31] | Tasmania | Older patients admitted to acute medical units (≥ 75 years) ADE (used WHO classification for adverse drug reactions and definitions by Strand et al) | Cross sectional survey involving medical record review and patient interview | 15% of all admissions were PPH related ADE |

*VP: vaccine preventable; CC: chronic conditions; AM: acute medical; AE: adverse events

International research

Many international studies have assessed the prevalence and burden of PPH. The findings of several of these studies have been summarised in Table 9. There is wide variation in the rate of reported PPH in the literature. Again these differences are mainly due to the use of differing operational definitions of PPH conditions and differences in study populations.

In England the estimated costs of PPH (based on 19 PPH conditions the NHS use) for 2005/06 is over £1.18 billion, or 4.38 million bed-days [18].

During the year 2000, nearly 5 million admissions to hospitals in the USA involved treatment for one or more PPH, accounting for a cost of more than US\$26.5 billion [32]. With a 5 percent decrease in this rate of PPH, this figure would translate to a cost saving of more than US\$1.3 billion (assuming an average cost of US\$5300 per admission).

Two studies from the USA have looked at the cost of specific PPH conditions or regions including:

- Ahern et al (2007) estimated the nationwide (USA) costs for 2004 short-term complications and uncontrolled diabetes hospitalisations as over US\$1.3 billion [33].
- For the year 2002, an estimated US\$9.5 billion (of \$52 billion total inpatient charges) was attributed to PPH conditions in rural hospitals nationwide [34].

Table 9: Rate of PPH admissions reported in the international literature

| Study (Year) | Country | Study population & PPH conditions* | Data source | % of PPH |
|---|-------------------------------|--|--|--|
| <i>International studies (most recent at top)</i> | | | | |
| Purdy et al (2009) [18] | England | General emergency admission (unplanned) NHS subset of 19 ACSC and compared to wider set with additional 17 conditions identified from literature; VP, CC, AM | Hospital Episode Statistics dataset 2005-2006 | 14% (19 NHS ACSC) 41% (36 conditions) |
| Rizza et al (2007) [35] | Catanzaro, Italy | Random sample of medical ward adult patients 9 AHRQ PQIs: CC, 1VP, AM (excl paediatrics) | Medical record review, patient interview April-July 1995 | 31.5% of sample hospitalisations |
| Bindman et al (2005) [36] | California, USA | Medicaid beneficiaries [#] <65 years, non pregnancy hospitalisations ACSC (AHRQ): CC, AM (1 VP) | California hospital discharge data & California DHS Medi-Cal eligibility file 1994-1999 | 26% of total admissions; significantly higher rates among those receiving Fee-for-service care |
| Niti et al (2003) [17] | Singapore | General hospital admissions 5 chronic conditions: diabetes, asthma, COPD, CHF, hypertension | Annual hospital admissions data from the Central Claims Processing System 1991-1998 | 6.8% of total hospitalisations; 5.25% of total hospitalisations among <65 years; 11.6% of total hospitalisations ≥ 65 years |
| Jackson et al (2001) [37] | New Zealand | General hospital admissions aged 0-74 years 3 types of PPH: preventable admissions through population based strategies; ambulatory sensitive hospitalisations (VP, CC, AC); injury prevention | New Zealand Health Information Service discharge data set 1989-1998 | 30% total potentially avoidable admissions; 19.3% ambulatory sensitive hospitalisations; 5.4% injuries; 4.8% population based preventable; |
| Blustein et al (1996) [38] | USA | Medicare beneficiaries ≥65 years community dwelling United hospital fund defined ACSC: VP, CC, AM | Medicare Current Beneficiary Survey 1991-1992 | 4% of all older Medicare beneficiaries had a PPH |
| Pappas et al (1997) [39] | USA | General hospital admissions, excluded psychiatric, obstetric and newborn admissions Weissman's 12 avoidable hospital conditions (1 VP), CC, AM | National Hospital Discharge Survey 1990 | 12% of total admissions |
| Weissman et al (1992) [14] | Maryland & Massachusetts, USA | General hospital admissions <65 years, excluded psychiatric and obstetric admissions Defined 12 avoidable hospital conditions: (1 VP), CC, AM | Computerised hospital discharge data 1987 | 7.4 – 7.8% of total admissions |

* VP: vaccine preventable; CC: chronic conditions; AM: acute medical; AE: adverse events

[#] Temporary Assistance to Needy Families – Eligible Medi-Cal Beneficiaries

Adverse events

Adverse events have been discussed separately in this report as the PPH sets discussed above do not include them in their list of selected conditions. The literature search identified a number of studies assessing the prevalence and burden associated with ADE requiring hospitalisation.

These have been summarised below and include:

- Recent Australian publications;
- A SR of Australian studies published during 1988-1996 looking at drug-related hospital admission;
- A SR looking at the incidence and characteristics of preventable ADE in ambulatory care.

Australian data

In a Tasmanian study, Chan et al (2001) conducted a prospective cross-sectional survey of 219 older patients, and estimated 30.4% of admissions may have been a result of an ADE; over half were considered definitely preventable (n=39, 53.4%) translating to 15% of all acute medical admissions in this age group [31]. They found 23.3% of ADE cases were possibly preventable and the remaining 23.3% of cases were not preventable. There were 6 deaths related directly to an ADE, 4 of which were considered preventable.

Falls and falls associated with hypotension (n=20) were the commonest clinical presentation of ADE, followed by pulmonary oedema or heart failure (n=14), and delirium (n=12). Cardiovascular medications accounted for 48.4% of ADE, followed by: central nervous system medications (20.5%), anti-inflammatory medications (10.6%), anti-thrombotic medications (5.7%), and others (15.6%). The authors calculated the cost of the definitely preventable ADE admissions to be A\$157,700 for the 475 bed days of the admissions; and A\$946,200 per year.

The 'Bettering the Evaluation and Care of Health (BEACH)' program, a continuous national cross-sectional study of general practice activity in Australia, reported that one in ten patients presenting to a general practitioner (GP) had had an ADE in the preceding 6 months; almost 50% being in the moderate to severe range as assessed by the GP, and almost 8% of patients were hospitalised as a result of the ADE [40].

Prior to this work, a SR of Australian studies assessing drug-related hospital admissions was undertaken [41]. Incidence rates varied depending on the study population, with 2.4-3.6% of all hospital admissions being drug related, 15-22.1% of geriatric admissions via emergency departments (ED), and 33% of cardiac patients. The highest rates of drug related admissions were found among older patients (65 years and over), and among those with increasing number of medications. Four included studies examined the preventability of the admissions, and results varied with between 31-69% definitely, probably or possibly avoidable, and 29-68% probably not or definitely unavoidable.

Other recent research

In a SR by Aagard Thomsen et al (2007) the proportion of ADE in ambulatory care that required hospital admission was calculated from eight studies to have an incidence of 0.45 per 1000 person-months (range 0.10-13.1); and one study reported the proportion of preventable ADE requiring hospital admission as 4.5 per 1000 person-months [9].

Howard et al (2006) conducted a SR to estimate the percentage of preventable drug-related hospital admissions, and assess the drug and underlying causes of the admissions. From 13 papers the median percentage of preventable ADE hospitalisations was 3.7% (range 1.4-15.4). Contributing factors of ADE are discussed in Section 5.3 below.

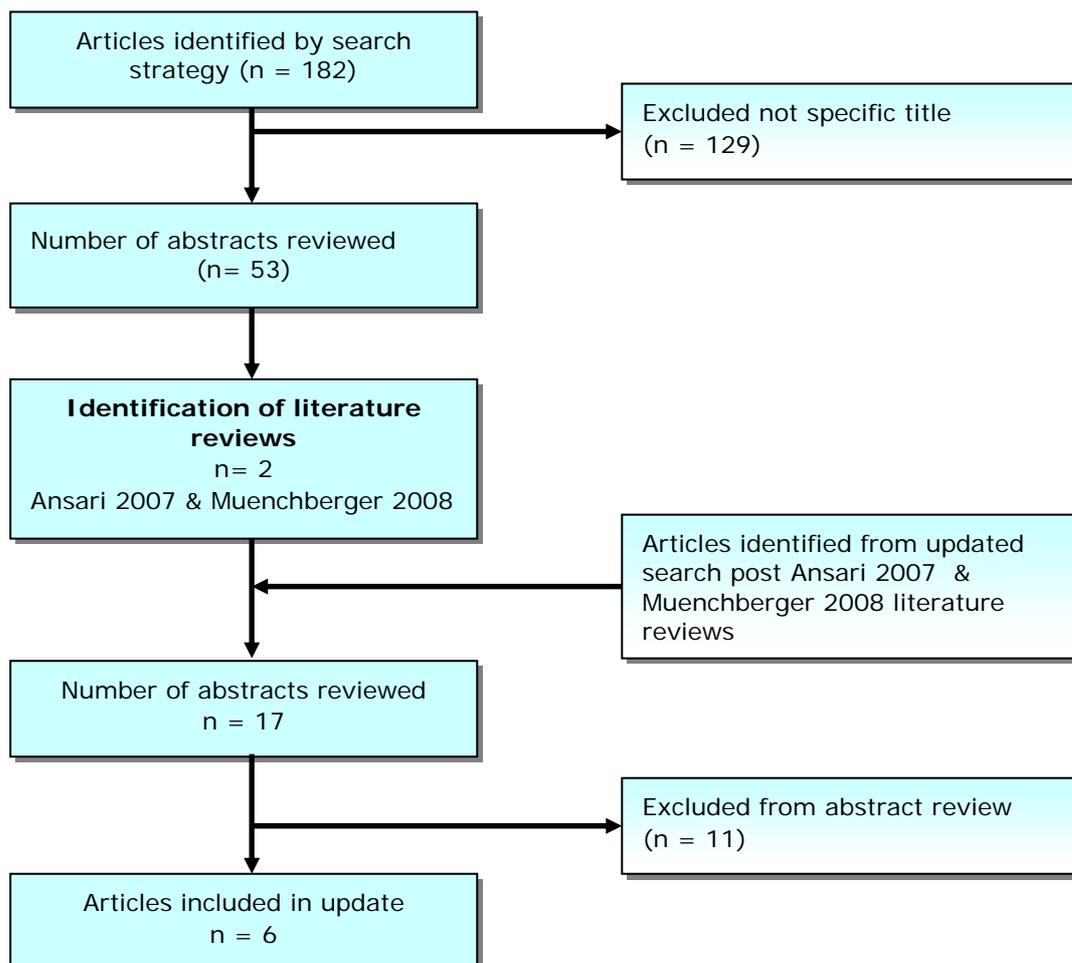
In the USA, it is estimated that 75,000 hospitalisations per year are due to preventable AE that occur in the ambulatory care setting (includes in ED); resulting in 4839 serious permanent injuries and 2587 deaths [42].

5.3 Risk and contributing factors of PPH

Early studies, including Australian research, focused on socioeconomic determinants and the associated risk of PPH utilisation. The literature review provides strong evidence for the relationship between a number of factors which have a direct or indirect impact on PPH rates [1, 4, 43, 44].

Summarised below are two of the ‘pioneer studies’ that were published in the early nineties, and the two recently published narrative literature reviews; one of which reviews studies related to chronic conditions and the other that focuses on the vaccine preventable, chronic conditions and acute medical conditions that are PPH. A search was conducted to update these narrative reviews. See Figure 1 for the article selection process. Research assessing risk and contributing factors associated with PPH due to AE has been discussed separately.

Figure 1: Study eligibility flowchart of studies assessing risk and contributing factors



Key research

Weissman et al (1992) assessed differences in PPH rates according to private health insurance status (uninsured and Medicaid patients compared to insured patients) in two US-states. The overall PPH adjusted relative rates were significantly higher (1.71 in Massachusetts and 1.49 in Maryland; $p < 0.05$) among uninsured compared with insured patients; similarly rates were significantly higher among Medicaid patients compared with the insured patients (1.84 and 1.65; $p < 0.05$). [14]

Billings et al (1993) looked at the effect of area income levels (low compared with high) and race in New York City. They also looked at the effect of other covariates which may influence the differences seen among the low and high income areas such as: age; lifestyle factors (alcohol or drug dependence/abuse); comorbid chronic conditions (asthma and diabetes); and admission criteria among physicians. They found a strong association between rates of PPH and area income. The authors suggested that "access to ambulatory care and the performance of the outpatient care delivery system may have a substantial effect on admission rates for a broad range of medical and surgical conditions." [4]

Recent reviews of studies assessing risk and contributing factors

Chronic conditions [1]

A recently conducted literature review from Australia investigated the modifiable determinants of PPH in adults with chronic disease, and explored the impact of these factors on hospitalisation rates. Although the search strategy was comprehensive and systematically conducted, quality appraisal of the studies was not performed.

The review identified 82 articles that met the selection criteria. Studies varied in their study design and study population making the results difficult to generalise, and studies measuring hospital readmission rates (outside the scope of our review) were included.

The authors identified 31 factors that were considered to be key determinants of PPH, which they grouped into three categories:

- Individual-level factors
 - age and age at onset of disease
 - gender
 - socioeconomic status – income, education, employment status
 - health insurance status
 - race and ethnicity
 - social support
 - living arrangements
 - biomedical markers & treatment
 - medication
 - health status and health related quality of life
 - co-morbidity
 - severity of condition
 - lifestyle factors – alcohol/drug use, smoking
- Health service system factors
 - prior hospitalisation
 - availability of health services
 - integrated services & coordinated care
 - physician characteristics
 - self management supports
- Environmental factors
 - atmospheric conditions
 - geographical factors

The authors concluded the following:

- Health status, age and socioeconomic status were the most studied risk factors.
- Several individual factors (age, gender, marital status, socioeconomic status and race) were significantly associated with an increased risk of PPH due to chronic conditions. However, their significance was often dependent on a combination of other factors such as disease type, disease duration and the number and nature of co-morbid illnesses.
- Geographical and environmental factors, particularly in relation to the distance to health services and practical challenges associated with accessing the services, were associated with higher rates of PPH.
- Several health service system factors including self management supports, physician characteristics (i.e., experience, use of guidelines) and continuity of care (i.e., care plans, management plans, emergency action plans, and integrated services) were found to be associated with reducing rates of avoidable hospitalisation.

Vaccine preventable, chronic conditions and acute medical conditions [43]

An Australian literature review by Ansari (2007) explored the concept of ACSC, and provided a comprehensive description of the factors affecting variations in rates of ACSC related hospitalisations.

Contributing factors are discussed using the following categories:

- Demographics - age, gender, race etc
- Socioeconomic status
- Rurality
- Health system factors – primary care physician supply, continuity of care etc
- Prevalence - control for disease prevalence
- Lifestyle factors
- Environment
- Adherence to medication
- Propensity to seek care
- Severity of illness

Demographics

- Age has been assessed in many studies (n=22), with higher rates of PPH found among younger (under 19 years) and older (65 years and above) groups of patients.
- Differences in PPH rates among different racial groups have been assessed in 9 studies; all showing that minority groups are at greater risk of PPH. In the USA greater rates of PPH conditions have been found among African American and Hispanic populations compared to other Americans. In Australia and New Zealand, the indigenous population has also been found to be at greater risk of PPH compared to non-indigenous populations.

Socioeconomic status

- In addition to the work by Weissman [14] and Billings [4] discussed above, socioeconomic factors have been studied in much of the research. In 23 studies identified in this review, most reported at least one socioeconomic factor such as education, income, employment and insurance status to be a significant predictor of PPH. Higher rates of PPH were found among populations with area-level poverty or low area level socioeconomic status; among people with access to Medicaid only or the uninsured (USA based studies), lower education levels and low income levels.

Rurality

- Among 9 studies assessing rurality, there was conflicting evidence in regards to the relationship between rurality and PPH. Some studies (n=4) demonstrated that highest rates of PPH were found in the most rural areas, and other studies (n=2) demonstrated a non-linear relationship between rurality and rate of PPH with most occurring among those living in large urban cities and those in rural areas compared with those living in other urban areas.

Health system factors

- Primary care supply has been investigated in 12 studies. There was a significant association between low physician supply and increased rate of PPH for 6 of these studies; whereas 2 studies found the opposite effect occurred, and the remaining 4 were either unable to detect any significant differences or had inconsistent results.
- Six included studies showed having greater continuity of care and a regular source of care such as a subsidised community health service significantly reduce the likelihood of PPH. However 2 studies were unable to detect any difference.
- There are mixed results in studies assessing the effect of free or subsidised primary care on PPH.
- In 1 study, higher inpatient bed supply was linked with higher rates of PPH; and in another study financially distressed hospitals had a significantly higher proportion of PPH discharges than other hospitals.
- Based on 2 studies lower clinical thresholds for hospital admissions was found to occur among patients living in low income areas and also for patients with higher disease severity, whereas another study found that the effect of severity on PPH admissions thresholds was small and varied substantially.

Disease prevalence

- The prevalence of chronic conditions as a contributing factor among vulnerable groups (eg lower socioeconomic status groups, minority groups where there are higher rates of chronic conditions) and the association with condition related PPH rates has been investigated in 5 studies. However prevalence does not seem to play a significant role in determining PPH rates among these populations.

Lifestyle factors

- One study looking at the impact of socioeconomic status on PPH, examined the relationship of serious alcohol and drug dependence/abuse in explaining variations in PPH rates. The number of patients with alcohol/drug related secondary diagnoses varied according to the PPH condition and age group. Higher levels of alcohol/drug abuse patients were found for conditions such as pneumonia and cellulitis, and among the 24-48 year age group, but lower levels were found among asthma and gastroenteritis hospitalisations.

Environment

- In 21 studies environmental factors such as air pollution and exposure to fungal spores, NO₂ and SO₂ have been associated with increased hospitalisation for respiratory conditions such as asthma and COPD. The impact of the environment on other PPH conditions has not been examined or adjusted for in analyses due to lack of readily available data.

Adherence to medications

- The relationship between individual chronic condition related PPH rates with medication adherence has been explored in 10 studies; and found to be an important predictor on hospital admission rates (and readmissions) for that chronic condition.

Severity of illness

- Severity of illness was found to be an important factor (usually for risk adjustment) in explaining variations in PPH rates between geographical areas and populations (socioeconomic status, insurance status, age, race and gender) in 4 studies.

Propensity to seek care

- Propensity to seek care (the tendency of an individual to seek care) was found to be an important predictor of health care utilisation in 7 studies. One study found that in areas with high PPH rates, people tended to delay seeking primary care for new illnesses. Another study found little difference in propensity to seek care for serious conditions, and no significant association between an area-level rating of importance to seek care and rate of PPH.

A range of factors that influence the rate of PPH have been identified in the literature. Therefore, when using PPH rates (for selected conditions) as a measure of access to primary health care, the range of factors discussed above must be recognised and considered in the analyses.

Update of literature reviews: 2005- June 2009

Five additional studies from the USA [45-49] and 1 Australian study [44] were identified in the search to update the 2 identified literature reviews. The studies are predominantly about socioeconomic factors, or focus on uninsured populations or rurality.

Demographics and socioeconomic status

A cross sectional study evaluating low literacy as a predictor of PPH, when considered in the context of social support, sociodemographics, health status, and risk behaviours, found that neither low literacy (< seventh grade) nor very low literacy (< fourth grade) was significantly associated with preventability of hospitalisation [45]. The authors found that significant predictors of PPH included binge alcohol drinking, lower social support for medical care, annual clinic visits, and less social networks.

Health system factors, access to care and rurality

Rust et al [47] assessed whether the presence of community health centres in rural communities (in Georgia, USA) had an impact on PPH rates among uninsured people. Community health centres provide an important source of primary health care to the uninsured, in particular in rural communities. The authors found that counties without a community health centres had a 37% greater risk of PPH-related ED visits compared to counties with community health centres (RR 1.37, 95% CI 1.11-1.70). This rate remained significant after adjusting for percentage of population below poverty level, percentage of black population, and number of hospitals (RR 1.22, 95% CI 1.01-1.47). There were no significant differences in PPH rates among insured patients (RR 1.07, 95% CI 0.90-1.27).

Also in the USA rural setting, Zhang et al examined the relationship between the presence of rural health clinics in rural health professional shortage areas, and the likelihood of having PPH related to acute or chronic conditions [46]. The results showed that the presence of rural health clinics was a significant factor associated with fewer PPH for chronic conditions among the elderly in rural health professional shortage areas. The total rate ratio (counties without any rural health clinic compared to counties with at least 1 rural health clinic) for all PPH was 1.21 (95% CI 1.17-1.24), for PPH related to chronic conditions was 1.29 (95% CI 1.24-1.35); and for PPH related to acute conditions was 1.14 (95% CI 1.09-1.18). Further analysis showed a significant relationship between the presence of at least 1 rural health clinic in health professional shortage areas and the likelihood of a PPH related to a chronic condition as the reason for

hospitalisation for elderly patients (adjusted OR 0.95, 95% CI 0.89 - 0.99). The authors found no statistical difference among non elderly age groups.

In a Victorian study, the association of access to primary care and PPH rates was assessed among the adult population during 1999-2000 [44]. There was a significant difference in the mean PPH rate across rural areas compared to urban areas (30.56 per 1000 vs 23.23 per 1000, $p < 0.001$), but there were no significant differences in the mean supply of primary care physicians between rural or urban areas ($p = 0.6$). Following multivariate analysis lower self-rated access was significantly associated with increased PPH rates ($p = 0.02$); whereas other factors such as propensity to seek care and disease burden were not significantly associated with PPH rates.

Health insurance coverage

Two recently published studies conducted in the USA evaluated the impact of managed care (health insurance coverage) on PPH rates in different sub groups of population.

One study examined the impact of interruptions in Medicaid (government funded health insurance) coverage on the rate of PPH among Medicaid beneficiaries in California [48]. During the study period of 4 years, 62% of Medicaid beneficiaries experienced at least 1 interruption in coverage. The authors found that interruptions in Medicaid coverage were associated with a higher rate of PPH (adjusted hazard ratio=3.66 95% CI, 3.59 to 3.72, $p < 0.001$). The 3 most common conditions resulting in a hospitalisation were CHF, diabetes, and COPD.

Another comparative study examined the impact of Children's Health Initiatives, a health insurance program for children in low and middle income families, on PPH rates among children aged 0-18 years in 9 operational Children's Health Initiatives counties in California [49]. There was a total of 81,000 paediatric PPH between 2000 and 2005. The rate of PPH was 19% lower post-implementation of Children's Health Initiatives versus pre-implementation for children of low income families ($RR = 0.81$, $p = 0.0001$); but not for children of higher-income families ($R = 0.99$, $p = 0.93$). The authors estimated that 6324 hospitalisations may have already been prevented in counties with existing Children's Health Initiatives after implementation, with an estimated saving of \$6.7 million over the 6 year period (assuming \$7000 per child hospitalisation).

Australian data

The national data collected by the AIHW analyses differences in PPH rates according to a number of risk or contributing factors including: remoteness area of usual residence (described as rurality in the literature) and socioeconomic advantage/disadvantage based on the socioeconomic index for area (SEIFA) [26]. Tables 10 and 11 outline some of this data. A linear increase in rates of total PPH conditions can be seen among the more remote areas and increasing socioeconomic disadvantage. Although results need to be interpreted with caution, the data supports similar findings from the literature regarding these contributing factors.

On analyses of risk factors using Australian data for 2001-2002, Page et al (2007) reported the following [23]:

- Significantly higher proportions of PPH among males compared with females ($RR = 1.06$, $p < 0.01$).
- Higher rates of PPH were seen among older aged people, in particular people aged 75 years and over who accounted for 149,661 PPH or 27.1% of the total number. However the relationship appears to be a non linear one.
- Admission rates for PPH were significantly higher in areas of greater socioeconomic disadvantage compared with those of least socioeconomic disadvantage ($RR = 1.61$, $p < 0.01$).

- There was a distinct socioeconomic gradient associated with PPH for most chronic conditions and most acute medical conditions, and influenza and pneumonia but not for other vaccine-preventable conditions.

Table 10: Separation statistics^(a) for selected potentially preventable hospitalisations^(b), by remoteness area of usual residence, all hospitals, 2007–08

| | Major cities | Inner regional | Outer regional | Remote | Very remote | Total ^(c) |
|---|--------------|----------------|----------------|-----------|-------------|----------------------|
| Total potentially preventable hospitalisations | | | | | | |
| Separations ^(d) | 447,168 | 162,145 | 87,298 | 22,677 | 10,910 | 730,840 |
| Proportion of total separations(%) | 8.5 | 10.3 | 11.6 | 17.4 | 13.5 | 9.3 |
| Separation rate ^(e) | 30.46 | 35.31 | 41.45 | 73.98 | 76.15 | 33.48 |
| Standardised separation rate ratio (SRR) | 0.91 | 1.05 | 1.24 | 2.21 | 2.27 | |
| 95% confidence interval of SRR | 0.91–0.91 | 1.05–1.06 | 1.23–1.25 | 2.18–2.24 | 2.23–2.32 | |

(a) Separations for which the care type was reported as *Newborn* with no qualified days, and records for *Hospital boarders* and *Posthumous organ procurement* have been excluded.

(b) These conditions are defined using ICD-10-AM codes in *Appendix 1*.

(c) Includes unknown remoteness area and excludes overseas residents and unknown state of residence.

(d) Excludes multiple diagnoses for the same separation within the same group.

(e) Rate per 1,000 population was directly age-standardised as detailed in *Appendix 1*.

(f) *Rheumatic heart disease* includes acute rheumatic fever as well as the chronic disease.

Table 11: Separation statistics^(a) for selected potentially preventable hospitalisations^(b), by quintile of socioeconomic advantage/disadvantage^(c), 2007–08

| | Most disadvantaged | Second most disadvantaged | Middle quintile | Second most advantaged | Most advantaged | Total ^(d) |
|---|--------------------|---------------------------|-----------------|------------------------|-----------------|----------------------|
| Total potentially preventable hospitalisations | | | | | | |
| Separations ^(e) | 184,690 | 160,473 | 149,148 | 130,248 | 105,826 | 730,842 |
| Proportion of total separations (%) | 11.0 | 10.1 | 9.5 | 8.9 | 6.9 | 9.3 |
| Separation rate ^(f) | 42.07 | 36.34 | 35.10 | 32.25 | 25.06 | 34.26 |
| Standardised separation rate ratio (SRR) | 1.23 | 1.06 | 1.02 | 0.94 | 0.73 | |
| 95% confidence interval of SRR | 1.22–1.23 | 1.06–1.07 | 1.02–1.03 | 0.94–0.95 | 0.73–0.74 | |

(a) Separations for which the care type was reported as *Newborn* with no qualified days, and records for *Hospital boarders* and *Posthumous organ procurement* have been excluded.

(b) These conditions are defined using ICD-10-AM codes in *Appendix 1*.

(c) Based on the Australian Bureau of Statistics' SEIFA 2006 Index of Relative Advantage/Disadvantage score for the Statistical Local Area of the patient's usual residence.

(d) Includes unknown residence area and excludes overseas residents and unknown state of residence.

(e) Excludes multiple diagnoses for the same separation within the same group.

(f) Rate per 1,000 population was directly age-standardised as detailed in *Appendix 1*.

(g) *Rheumatic heart disease* includes acute rheumatic fever as well as the chronic disease.

Adverse events

The focus of the epidemiological research in this area is on PPH that are ADE related admissions.

In the SR of 14 Australian studies by Roughead et al (1998) increasing age and increasing number of medications was reported to be a risk factor for ADE related PPH [41]. Other risk factors such as gender and prior history of ADE had inconsistent results in the literature. The review also found cytotoxic medication, non-steroidal anti-inflammatory drugs or aspirin, cardiovascular agents, anti-coagulants, central nervous system medications and corticosteroids were the most common medications implicated in the ADE admissions.

Similarly, in a more recent Australian study Chan et al (2001) found cardiovascular medications accounted for 48.4% of ADE related PPH, followed by central nervous system medications (20.5%), anti-inflammatory medications (10.6%); anti-thrombotic medications (5.7%); and others (15.6%) [31].

Among the 29 hospital-based studies reviewed by Aagard Thomsen et al (2007), inadequate monitoring was the most frequently reported error of omission (45.4%), and patient non adherence was the most frequently reported error of commission (36.6%) associated with preventable ADE related hospital admissions [9]. The authors also noted that more than 86% of preventable ADE were due to 3 drug groups – cardiovascular agents, non steroidal anti-inflammatory drugs, and insulin.

Howard et al (2006) reported over half of the ADE related PPH involved 4 groups of drugs: antiplatelet medication (16%), diuretics (16%), non steroidal anti-inflammatory drugs (11%) or anticoagulants (8%) [50]. Most errors were due to problems associated with patient adherence to medications (33.3%), prescribing problems (30.6%), and monitoring (22.2%).

Classification of adverse events in primary care

We also identified studies that looked at how AE in primary care can be classified. A comprehensive review conducted by Elder et al evaluated process errors and preventable AE that occur from medical care in primary care settings [51]. Based on the findings from the published literature, the authors categorised preventable AE (what went wrong) into the following three main categories:

- i. Diagnosis*
 - related to symptoms
 - misdiagnosis
 - delayed diagnosis
 - related to prevention
 - misdiagnosis
 - delayed diagnosis
- ii. Treatment*
 - drugs
 - incorrect drug
 - incorrect dose
 - delayed administration
 - omitted administrations
 - non-drug
 - inappropriate,
 - delayed
 - omitted
 - procedural complication

iii. Preventive services

- inappropriate
- delayed
- omitted
- procedural complication

The authors further categorised process errors (why it went wrong) into four broad categories:

- i. Clinician factors* (clinical judgment, procedural skills error);
- ii. Communication factors* (clinician–patient, clinician–clinician or health care system personnel);
- iii. Administration factors* (clinician, pharmacy, ancillary providers (physical therapy, occupational therapy, etc) and office setting); and
- iv. Blunt end factors* (personal and family issues of clinicians and staff, insurance company regulations, government regulations, funding and employers, physical size and location of practice and general health care system).

The Primary Care International Study of Medical Errors (PCISME), an international study of medical errors in general practice (from 6 countries including Australia, New Zealand, Canada, the USA, the UK and the Netherlands) has developed an international taxonomy of medical errors from the reports provided by GPs [52]. The final taxonomy consisted of a five level system encompassing 171 error types. Makeham et al conducted a comparative analysis of the PCISME taxonomy into the Australian context, and reported similarity in the types of errors encountered by the GPs in other participating countries [52].

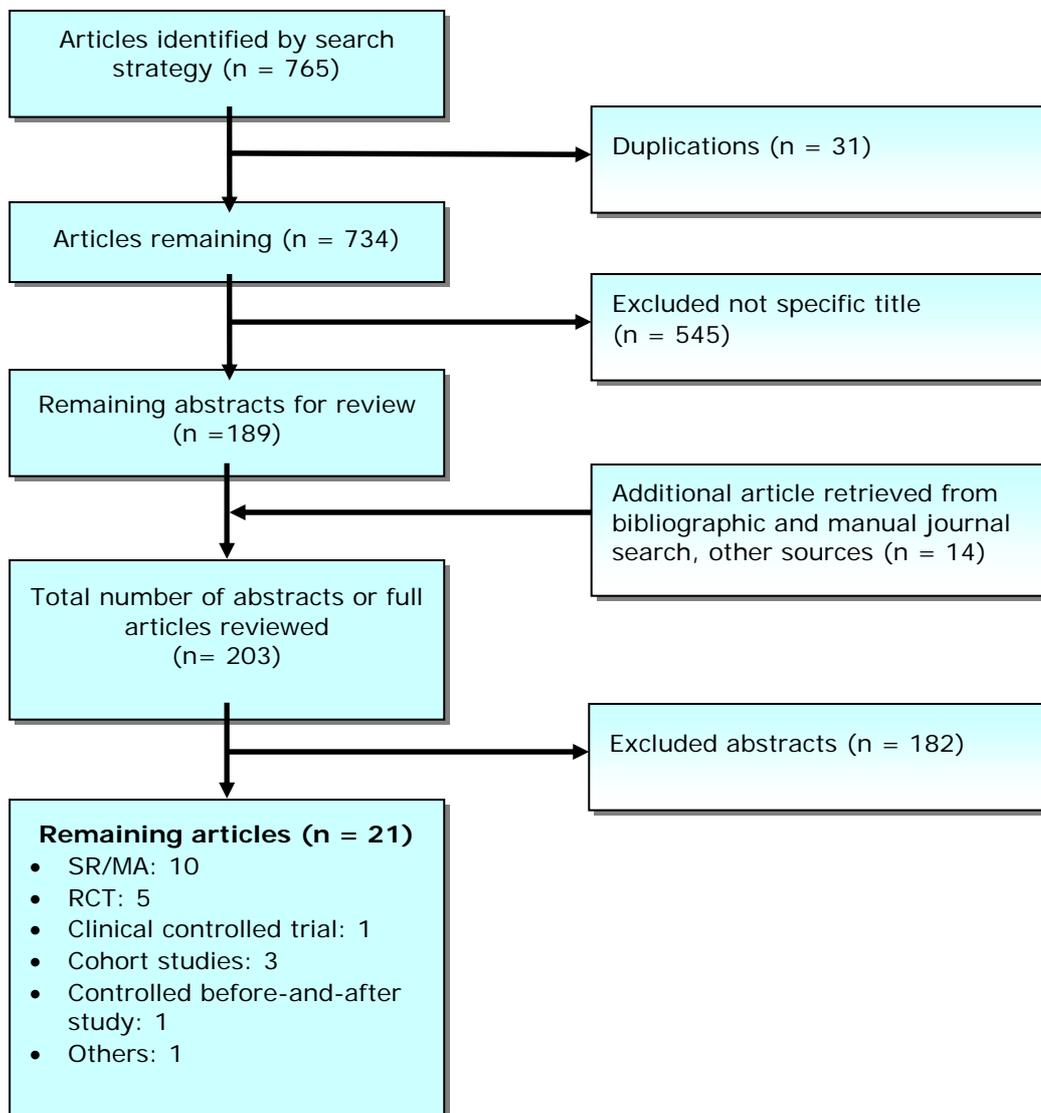
6. Interventions to reduce the risk of PPH

6.1 Article retrieval

The search retrieved 765 articles, 31 of which were duplicates resulting in 734 articles being assessed for title inclusion. 203 articles met the title inclusion and went on to have the abstract or full text reviewed.

Twenty one studies met the abstract or full article inclusion, and 16 of these underwent critical appraisal using SIGN methodology checklists. The remaining 5 studies (1 clinical controlled trial, 2 before-and-after studies, 1 historical control studies and 1 data analyses study) have been summarised narratively. Summaries of all included studies are tabulated in Appendix 7, and critical appraisals are summarised in Appendix 8. Figure 2 outlines the article retrieval and exclusion process.

Figure 2: Study eligibility flowchart studies assessing interventions to reduce risk of PPH



The review identified a limited number of studies of varying methodological quality. Overlap or repetition of the included studies was noted in a number of reviews and reports.

The findings of the literature review are presented in following 4 sections:

1. Interventions to reduce the risk of PPH for vaccine-preventable conditions
2. Interventions to reduce the risk of PPH for chronic conditions
3. Interventions to reduce the risk of PPH for acute medical conditions
4. Interventions to reduce the risk of PPH from adverse events

6.2 Interventions to reduce the risk of PPH for vaccine-preventable conditions

The search identified 2 RCT that met the inclusion criteria for critical appraisal. Seven studies evaluating the effectiveness of the vaccine itself; and a further 4 studies evaluating an intervention to increase vaccination rates were identified. These intervention studies did not assess hospital utilisation as an outcome, but as the intervention potentially could be assessed for this, have been summarised in narrative format below.

Reminder and recall systems to reduce PPH

A moderate quality RCT evaluated the impact of a reminder system to receive influenza and pneumococcal vaccinations among members of a USA health plan, on inpatient admissions and ED visits [53]. The authors included 339,220 individuals: 82,364 individuals with an average age of 50.2 years in the intervention group, and 256,856 with an average age of 50.0 years in the control group. Each participant in the intervention group received two reminders by mail encouraging them to receive the vaccinations.

Compared to the control group, the intervention group received a significantly higher rate of influenza vaccinations (2.62%, $p = 0.01$); experienced a non significantly lower rate of influenza or pneumonia related inpatient admissions (9.67%, $p=0.136$); and a significantly lower rate of influenza or pneumonia related ED visits (22.64%, $p=0.002$). The rate for receiving pneumococcal vaccination was higher among the intervention group but did not reach statistical significance (4.61%, $p = 0.08$). The benefit-cost ratio (return on investment) from this intervention was estimated to be US\$2.21 per dollar spent. The authors concluded that health plans can have a cost-effective impact on hospital utilisation and vaccination rates by mailing information to their members.

Another RCT of moderate quality examined the effect of directly contacting participants by mail to promote influenza vaccination, on health service utilisation (including hospitalisation rates) [54]. This trial included 134,791 individuals, over 65 years of age, randomised into one of three groups: (i) influenza vaccine reminder mailing to promote the vaccination; (ii) mailing to promote the use of a telephone nurse advice service regarding the influenza vaccine; and (iii) control group.

The authors found that the reminder mailing group experienced significantly fewer condition related inpatient bed days (2.87%, $p= 0.033$); and 7.25% ($p=0.101$) fewer condition-related ED visits compared to the control group. The telephone nurse advice service group experienced significantly fewer condition-related inpatient bed days (7.65%, $p<0.001$); but non significantly fewer condition-related ED visits (6.75%, $p=0.125$) compared to the control group. Furthermore, the authors estimated that per dollar spent, the return on investment was estimated to be \$2.51 for the influenza mailing intervention and \$24.24 for the nurse advice mailing intervention.

Effectiveness of the influenza vaccine

There is also indirect evidence from the 5 observational studies and 1 SR described below that the influenza vaccine is associated with related health care utilisation. These studies assess the vaccine effectiveness on outcomes, rather than assessing specific interventions to improve vaccine uptake.

A Cochrane review of 48 studies (37 RCT involving 66,248 people; 8 comparative non-randomised trials and 2 descriptive reports) examined the clinical effectiveness of the influenza vaccine in healthy adults (18-65 years old) [55]. The reviewers found that inactivated parenteral vaccines were 30% effective (95% CI: 17% to 41%) against influenza-like illness, and 80% (95% CI: 56% to 91%) efficacious against influenza when the vaccine matched the circulating strain and circulation was high, but decreased to 50% (95% CI: 27% to 65%) when it did not. Pooled analysis of 4 RCT showed no benefit of the influenza vaccination on hospitalisation rates (RR 0.89, 95% CI 0.65, 1.20). Furthermore, the authors found that the influenza vaccination had a modest effect on time off work but insufficient evidence to draw conclusions on complication rates.

A retrospective study examining the administrative data of influenza vaccination and subsequent hospitalisation, found individuals aged 65 to 79 years who had received influenza vaccination experienced fewer hospitalisations and lower health care costs compared to unvaccinated subjects [56]. Hospitalisations for respiratory conditions or CHF were significantly fewer in vaccinated subjects than in unvaccinated subjects (OR=0.8, 95% CI 0.7 to 0.9). Furthermore, the authors found that estimated cost savings averaged about US\$80 per vaccinated subject. However, among subjects aged 80 years and older these associations were found to be weaker.

A cohort study of older people (aged 65 years and older) found similar results in favour of the influenza vaccination [57]. The authors found that during the influenza season the overall vaccine effectiveness against hospitalisations for acute respiratory disease was 21% (95% CI 17% to 26%); and attributable rate reductions of 5.44 hospitalisations per 100,000 person-weeks (95% CI 4.81-6.07). Furthermore, the authors found that the pooled effectiveness of vaccine against deaths due to respiratory disease was 12% (95% CI 8% to 16%).

To evaluate the effectiveness of the influenza vaccine among community-dwelling older people over a 10 year period, a retrospective analysis was conducted using US administrative and clinical databases of 18 cohorts of members of a USA health maintenance organisation [8]. The authors found the influenza vaccination was associated with statistically significant reductions in the risk of hospitalisation for pneumonia or influenza (adjusted OR=0.73; 95% CI 0.68 to 0.77), and in the risk of death (adjusted OR=0.52; 95% CI 0.50 to 0.55).

In a before-and-after study the benefits of influenza vaccination among 87 people with COPD on prevention of acute respiratory illness and acute exacerbations from COPD was evaluated [58]. The authors found that the incidence of acute respiratory illness and acute exacerbation from COPD significantly decreased after vaccination (reduced from 28.6 per 100 person-years prior to vaccination to 9.7 per 100 person-years post-vaccination: RR=0.33, p=0.005). The total number of outpatient visits and hospitalisations also decreased from 16.09% prior to vaccination to 4.6% post-vaccination (RR=0.28, p=0.02).

Effectiveness of the pneumococcal vaccine

Two observational studies evaluating the effectiveness of the pneumococcal vaccine have been summarised below.

Nichol et al conducted a retrospective cohort study to assess the health and economic benefits associated with pneumococcal vaccination among elderly individuals who had a baseline diagnosis of chronic lung disease (n =1898 subjects) [59]. The authors found that in the 2 year period, pneumococcal vaccination was associated with significantly lower risk for pneumonia related hospitalisations (adjusted RR=0.57; 95% CI 0.38 to 0.84, p=0.005) and death (adjusted RR=0.71; 95% CI 0.56 to 0.91, p=0.008). During influenza seasons, the benefits of pneumococcal and influenza vaccinations were additive, with significantly lower risk of pneumonia and influenza related hospitalisations (adjusted RR=0.28, 95% CI 0.14 to 0.58, p<0.001), and related deaths (RR=0.18, 95% CI 0.11-0.31, p<0.001) among those who had received both vaccinations compared with those who had received neither.

A large retrospective cohort study conducted by Jackson et al assessed the effectiveness of the pneumococcal vaccine among elderly individuals (65 years and older, n=47,365) [60], and reported conflicting results to the above study. The authors found that receipt of the pneumococcal vaccine was associated with a significant reduction in the risk of pneumococcal bacteraemia (hazard ratio=0.56; 95% CI, 0.33 to 0.93) but a slightly increased risk of hospitalisation for pneumonia (hazard ratio=1.14; 95% CI 1.02 to 1.28).

Other initiatives and strategies to promote vaccination uptake

A number of studies have assessed the impact of initiatives and strategies on improving rates of vaccinations. However the studies described below did not include hospitalisation rates (due to related conditions) as an outcome, and therefore did not undergo critical appraisal.

The main findings from these studies include:

- Patient reminder and recall systems in primary care settings were effective at improving immunisation rates significantly for: childhood vaccinations (OR=1.47, 95% CI =1.28 to 1.68), childhood influenza vaccinations (OR=2.18, 95% CI = 1.29 to 3.70), adult pneumococcus, tetanus, and Hepatitis B (OR=2.19, 95%CI = 1.21 to 3.99), and adult influenza vaccinations (OR=1.66, 95% CI 1.31 to 2.09) [61].
- All types of reminders were found to be effective (postcards, letters, telephone or auto-dialer calls) at improving immunisation rates, with telephone reminders being the most effective but also the most costly [61].
- There is evidence that targeted payments (payments which remunerate professionals only if they provide a minimum level of care) result in an increase in immunisation rates by primary care physicians [62].
- An intervention combining strategies targeting patients, physicians and care delivery can significantly increase influenza vaccine uptake of elderly patients in primary care, particularly those at high risk [63].
- A computerised prevention model for influenza vaccination, which includes search functions for potential high risk individuals, and automatic reminder and vaccination registration functions, demonstrated a significantly positive impact on the overall vaccine uptake among high risk patients [64].

Summary

- There is some evidence that mail reminders for patients that promote influenza and pneumococcal vaccination can increase the rate of vaccination uptake. However the effect of reminder mail systems on rates of influenza or pneumonia related ED visits and inpatient bed days is inconclusive.
- There is some evidence to suggest a mail out to patients promoting a telephone nurse advice service on influenza vaccine can reduce influenza, pneumonia, CHF and other respiratory related inpatient bed days, but has no effect on rates of ED visits.

6.3 Interventions to reduce the risk of PPH for chronic conditions

Disease management has been defined as a multidisciplinary approach to care for chronic diseases that coordinates comprehensive care along the disease continuum across health care delivery systems [65]. Disease management programs are programs that focus on one or more chronic illness and attempts to improve the quality and reduce costs of care [66]. These programs form part of the chronic care model (CCM) which according to Wagner et al consists of 6 core elements: self management support, delivery system design, decision support, clinical information system, health care organisation and community resources [67].

There is a burgeoning of interventions on chronic disease management (CDM). However few studies specifically investigate hospitalisations as an outcome. The search identified 12 studies evaluating various interventions targeting chronic conditions in primary care to prevent or reduce hospitalisation, which included 8 SR/MA, 1 RCT, 1 clinical controlled trial, 1 cohort study, and 1 before-and-after study with a non concurrent historical control. An evaluation report of the Australian coordinated care trials was also identified and has been summarised at the end of this section, however a critical appraisal was not conducted.

Components of the chronic care model

This section will discuss the evidence base regarding single or multiple components of the CCM.

A high quality SR and MA evaluated the effectiveness of interventions which contained at least one component of the CCM in managing and preventing complications in patients with COPD [68]. Health care use including emergency or unscheduled visits and hospitalisations were one of the outcomes of interest in this review.

Pooled analysis of 3 RCT demonstrated that patients with COPD who received multicomponent interventions had significantly lower rates of emergency/unscheduled visits ($n=3$, $RR=0.58$, $95\% CI 0.42-0.79$) compared to control group patients. One RCT assessing a single CCM component intervention (self management) found no significant difference in number of emergency/unscheduled visits between groups.

Pooled analysis of 3 RCT with 1 CCM component did not demonstrate significant differences in hospitalisation rates between intervention and control groups. However, pooled analysis of 4 RCT involving multiple CCM components demonstrated significantly reduced hospitalisations among the intervention group ($RR=0.78$, $95\% CI 0.66$ to 0.94).

The reviewers found that trials which included the following multicomponent interventions resulted in reduced hospitalisations or emergency/unscheduled visits:

- Sessions with a nurse who taught self management skills;

- Advanced access to care, which consisted of a knowledgeable health care provider;
- Use of guideline based therapy;
- Included communications between the nurse and the subject's physician; and
- One study also provided an individualised action plan.

The reviewers suggested a need for strategies based on sound education, behavioural change and motivational theories when planning self management component, which should further depend on sound communication theory [68].

An Australian SR of 141 studies (80% of which were RCT) and 23 SR examined the effectiveness of CDM interventions in the primary care setting [69, 70]. The authors reviewed the literature using the CCM framework to assess organisational redesign, service delivery, funding and program applicability to the Australian context and health care system. Due to heterogeneity among the included studies, MA was not performed.

The outcomes of interest were (i) health professional performance, such as adherence to disease specific guidelines; and (ii) patient level measures, such as physiological measures of disease, adherence to treatment, quality of life, satisfaction, health service use (including hospital admissions), health status and functional status. Key findings from this review are summarised in Table 12.

Included studies assessed interventions of self management support and found a reduction in hospital admissions among patients with COPD (n=2; WMD 0.16, 95% CI -0.09 to -0.42) and asthma (n=4; RR=1.17, 95% CI 0.44 to 3.12). Three included studies examining delivery system design interventions resulted in reduced risk of hospital admissions among patients with asthma (n=1; RR=0.36, 95% CI 0.16 to 0.81) and diabetes patients receiving GP shared care (n=2; OR=0.83, 95% CI 0.53 to 1.30). In contrast one included study found no differences in ED visits or hospital admissions among those diabetic patients receiving the delivery system design intervention compared to the control.

Table 12: Summary of the key findings from systematic review by Zwar et al*

| Elements of CCM | Effective interventions | Effective on (outcome measures) |
|---------------------------------------|---|--|
| Patient self management support (SMS) | <ul style="list-style-type: none"> • Patient educational sessions • Patient motivational counselling • Distribution of educational materials | <ul style="list-style-type: none"> • Physiological measures of disease • Patient quality of life • Patient health status • Patient functional status • Patient satisfaction with service • Patient risk behaviour • Patient knowledge • Patient service use • Patient adherence to treatment |
| Delivery system design (DSD) | <ul style="list-style-type: none"> • Multidisciplinary teams | <ul style="list-style-type: none"> • Physiological measures of disease • Professionals adherence to guidelines • Patient service use |
| SMS + DSD | <ul style="list-style-type: none"> • Multidisciplinary teams + patient educational session • Multidisciplinary teams + patient motivational counselling | <ul style="list-style-type: none"> • Physiological measures of disease • Patient quality of life • Patient health status • Patient satisfaction with service • Patient risk behaviour • Patient service use • Professionals adherence to guidelines |
| Decision support (DS) | <ul style="list-style-type: none"> • Implementation of evidence based guidelines • Educational meetings with professionals • Distribution of educational materials among professionals | <ul style="list-style-type: none"> • Professionals adherence to guidelines • Physiological measures of disease |
| Clinical information systems (CIS) | <ul style="list-style-type: none"> • Audit and feedback | <ul style="list-style-type: none"> • Professionals adherence to guidelines |
| Health care organisation (HCC) | <ul style="list-style-type: none"> • Little published experimental evidence | |
| Community resources (CR) | <ul style="list-style-type: none"> • Little published experimental evidence | |

*Reprinted with permission. Source: Zwar et al (2006). [70]

Disease management programs (multiple and multidisciplinary interventions)

A moderate quality SR of 36 studies (30 RCT and 6 controlled before-and-after studies) examined the effectiveness of multiple disease management interventions in asthma and COPD [71]. Included studies used combinations of patient-related, professional-directed and/or organisational level interventions; and measured the impact on quality of life, health care utilisation, processes of care and clinical outcomes.

Six included studies assessed patient education in combination with case management on health care utilisation, but only one study showed statistically significant reductions in ED visits and hospitalisations over the 2 year period.

Three of ten included studies assessing interventions of patient education in combination with case management and professional education showed significant reductions in readmissions and ED visits. Pooled analysis of nine of these studies reporting hospitalisations in COPD-care was performed and showed a statistically significant reduction in the probability of at least one hospital admission among those receiving multiple interventions versus usual care (OR=0.58; 95% CI 0.40-0.83, p=0.003). Meta-analysis of 4 studies did not show significant differences in rates of ED visits among those receiving multiple interventions compared to usual care.

Six studies focussed on patient education in combination with revision of professional roles, of which only one measured hospitalisations but no differences were detected between groups.

A moderate quality SR of 12 RCT evaluated multidisciplinary disease management programs for patients with coronary heart disease [72]. Multidisciplinary programs were defined as those with a combination of patient education, provider use of practice guidelines, appropriate consultation, and supplies of medications and ancillary services. The outcomes of interest were reinfarction rate, all cause mortality, rate of admission to hospital, processes of care, and other end points such as quality of life and functional status.

Six included trials reported hospital admission rates, and although only 2 reported a significant difference in rates, the meta-analysis of all trials showed an overall beneficial impact of the interventions (summary RR 0.84, 95% CI 0.76 to 0.94). The programs were shown to improve processes of care related to risk factor management and appropriate medication management. Pooled analysis of RCT however showed no overall effect on reinfarction rates or all cause mortality.

Since the publication of the above review a cost analysis of one of the UK interventions has been published [73]. Although the program resulted in increased costs to primary care of £136 per patient over 4 years (1998-9 prices), the gain in mean life years per patient of 0.110 and of 0.124 QALYs translates into an incremental cost per life year saved of £1236 and £1097 respectively.

A good quality SR evaluated the impact of multidisciplinary interventions on hospital admissions and mortality in patients with heart failure [74]. The reviewers defined multidisciplinary interventions as those in which management of heart failure was the responsibility of a multidisciplinary team that included medical input plus one or more of the following: a specialist nurse, a pharmacist, a health educator, a dietician, or a social worker. This SR included a broad range of interventions conducted in various settings (hospital, clinics, home, primary care etc.) which were categorised into four intervention subgroups: (i) provision of home visits; (ii) home physiological monitoring or televideo contact; (iii) telephone or self management mailing to patient's home but no home visits; and (iv) hospital, clinic or general practice interventions without home visits. Pharmaceutical and exercise based interventions were excluded. This review included 30 RCT of which: 21 RCT had data on all cause hospital admissions; 16 with data on heart failure related hospital admission; and 27 trials provided data on all cause mortality were pooled for meta-analyses.

The reviewers found that overall multidisciplinary interventions showed a significant reduction in all cause admissions (RR=0.87, 95% CI 0.79 to 0.95, p=0.002); and heart failure related admissions (RR=0.70, 95% CI 0.61 to 0.81, p<0.0001) compared to usual care. In the subgroup analyses, home visit interventions showed a significant reduction in all cause admissions (RR=0.80, 95% CI 0.71 to 0.89, p=0.0001), and heart failure related admissions (RR=0.62, 95% CI 0.51 to 0.74, p < 0.001) compared to usual care. There was no admission data for subgroup "(ii) home physiological monitoring or televideo contact". Compared to usual care, telephone or self management mailing

interventions did not have an effect on all cause admission rates (RR=0.86, 95% CI 0.73 to 1.02, $p=0.09$), but significantly reduced heart failure related admissions (RR=0.70, 95% CI 0.57 to 0.85, $p < 0.001$). Hospital, clinic or general practice interventions without home visits ($n=2$) were found to have no significant effect on rates of all cause hospital admissions (RR 0.99, 95% CI 0.90 to 1.10, $p=0.56$) or heart failure related admissions (RR=0.94, 95% CI 0.78 to 1.13, $p = 0.51$) [74]. This review did not differentiate findings according to study setting so we are unable to get a picture of where these interventions are delivered, ie whether the interventions are carried out in primary care and community based settings or from a secondary care setting.

A before-and-after study evaluated the impact of the diabetic foot disease management program in 2738 diabetic patients from community based services [75]. Historical controls were used as the comparison group. The authors found that after implementation of the program, the number of foot-related hospital admissions decreased by 37.8% from 22.86 per 1000 diabetics per year to 14.23; the incidence of amputations decreased by 47.4% from 12.89 per 1000 diabetics per year to 6.18 ($p<0.05$). Similarly, the average inpatient length-of-stay was reduced by 21.7% from 4.75 to 3.72 days ($p<0.05$).

A clinical controlled trial explored the impact of a Care Management Plus program (a technology-supported, multi-disease care management program) on mortality and hospital usage for chronically ill older people [76]. This program focused on reorganising primary care through a team-based approach in order to address the complex needs of chronically ill patients, in which nurse care managers were trained and given specific information technology tools to record, track, and react to pertinent patient-related data. The authors included 3432 patients (65 years and greater) from seven intervention and six control clinics. Hospitalisations were lower for the majority of intervention patients, but unadjusted rates were not statistically significant (at 1 year: Care Management Plus 22.2% vs control 23.3%, OR=0.94, $p=0.55$; at 2 years: Care Management Plus 31.8% vs control 34.7%, OR=0.88, $p=0.23$).

Following multivariate analysis of patients with diabetes mellitus, those receiving Care Management Plus showed significantly lower hospitalisation rates at 1 year (Adjusted OR=0.65, 95% CI 0.44-0.97, $p=<0.001$) and 2 years (Adjusted OR=0.56, 95% CI 0.36-0.89, $p<0.001$). The intervention also resulted in significantly lower mortality in patients with diabetes at 1 year (6.2% Care Management Plus vs 10.6% controls; OR=0.56, $p=0.01$) and at 2 years (12.9% vs 18.2%; OR=0.66, $p=0.03$).

Self management programs (single component)

A good quality Cochrane SR of 36 RCT, reported that training in asthma self management for adults, which incorporated self monitoring, regular medical review and a written action plan, improved specific patient outcomes, including hospitalisations, ED visits, unscheduled visits to the doctors, days off work, and nocturnal asthma [77].

Self management education significantly reduced hospitalisations ($n=12$ trials) compared to usual care (RR 0.64, 95% CI 0.50 to 0.82, $p=0.00003$). In a sub group analysis the authors found that optimal self management involving provision of a written action plan appeared to be more effective than other forms of asthma self management, and led to a significant reduction in hospitalisations for asthma (RR 0.58; 95% CI 0.43 to 0.77, $p=0.00002$). There was also a significant reduction in the proportion of asthmatics needing ED visits in the intervention group compared to the control group (RR 0.82, 95% CI 0.73 to 0.94, $p=0.003$).

Furthermore, asthma education programs led to significant reductions in unscheduled visits to the doctor (RR 0.68, 95% CI 0.56 to 0.81); days off work or school (RR 0.79, 95% CI 0.67 to 0.93); nocturnal asthma (RR 0.67, 95% CI 0.56 to 0.79); and quality of life (SMD 0.29, CI 0.11 to 0.47) [77].

Another high quality Cochrane SR, included 15 group comparisons drawn from 14 RCT, to assess the efficacy of self management programs on health outcomes and healthcare utilisation in the patients with COPD [78]. In a MA of 8 RCT reporting hospitalisation as an outcome, the authors reported a clinical and significant reduction in the probability of at least one hospital admission among patients receiving self management education compared to those receiving usual care (OR 0.64; 95% CI 0.47 to 0.89, $p=0.007$). This translated into numbers needed to treat (NNT) over a 1 year period, ranging from 10 (6 to 35) for patients with a high risk (51%) of exacerbation, to an NNT of 24 (16 to 80) for patients with a low risk (13%) of exacerbation.

The reviewers found no significant effects of self management education compared to those receiving regular care in the average number of respiratory related ED visits (WMD 0.07; 95% CI -0.17 to 0.31). However, there was heterogeneity in interventions, study populations, follow-up time, and outcome measures regarding the form and content of self management education programs.

Care coordination

A well designed RCT evaluated 15 care coordination programs, in the Medicare fee-for-service setting in the USA, to examine whether these programs reduced hospitalisation rates and Medicare expenditure, and improved quality of care for chronically ill Medicare beneficiaries [79]. The care coordination programs primarily targeted individuals with CHF, coronary artery disease, COPD and diabetes ($n=18309$ patients; 178 to 2657 per program).

The care coordination interventions of the 15 programs differed widely, but all assigned patients to a care coordinator who assessed their patients' needs and developed patient care plans. Programs involved patient education to improve adherence to medications, diet, exercise and self care; regular communication with physicians by written reports; referral to support services; and communication with other health professionals.

The authors found that the effect of these programs on hospitalisation rates was inconsistent amongst the different services. Only 2 programs had favourable treatment-control differences on hospitalisation rates, with one of these programs showing a statistically significant difference of 17% ($p=0.02$). Contrary to these results one program showed significantly higher hospitalisations (19% more than the control group mean, $p=0.04$). None of the programs significantly reduced regular (without program fees) or total (with program fees) Medicare expenditure for beneficiaries with chronic illnesses.

The authors compared components of the 2 successful programs with the 10 unsuccessful programs and revealed 5 noteworthy differences between these programs. The successful programs had relatively more frequent in-person contact between the patients and care coordinator, targeted the appropriate population, provided adequate patient education in regards to their medication management, worked closely with the local hospitals which provide the programs with timely information, and had close links between the patient's care coordinator and physician. They concluded that there is a potential for care coordination interventions, as demonstrated by some programs to be cost neutral and to improve patients' well being.

Specialist clinics

A good quality Cochrane SR of 9 studies (5 RCT, 2 controlled before-and-after studies; 2 interrupted time series analyses) assessed the effectiveness of specialist outreach clinics either providing simple consultation or as part of complex multifaceted interventions on access, quality of care, health outcomes, patient and provider satisfaction, use of hospital and primary care services, and costs [80].

The 9 studies examined 73 outreach interventions covering many specialties, countries and settings. However, only 2 studies (1 controlled before-and-after study and 1 interrupted time series analysis) of fair quality measured hospital admission rates as an outcome. Both studies examined the effect of psychiatric outreach services, and found an associated reduction in the rate of hospital admissions.

The review also reported the pooled effect size of three similar RCT showed specialist outreach clinics had a significant effect on improving clinical outcomes and adherence to treatment (n=560; RR 0.63 and 0.62 respectively). Four RCT provided good evidence that multifaceted interventions involving specialist services as a component, can improve the processes of care, reduce inappropriate referrals and unnecessary tests, and ultimately improve health outcomes. There were no included studies in the review from urban disadvantage populations; one included study from general rural populations; and one study from rural disadvantaged areas making it difficult to generalise findings to these populations.

Telehealth program

A retrospective cohort study of moderate quality, assessed healthcare utilisation among veterans with diabetes enrolled in a Department of Veterans Affairs Care Coordination Home Telehealth program (n = 400 subjects), compared to a control group of veterans not enrolled in the program [81]. From baseline to 24-month follow up, the treatment group had a significant reduction in diabetes-related hospitalisations (p=0.02) and all cause hospitalisations (p=0.01). All cause hospitalisations were reduced among those receiving the program compared to the control group (mean interaction effect -9.1 percentage points, p=0.02); but there was no significant difference in diabetes-related hospitalisations (-6.1 percentage points, p=0.08) between the two group. Furthermore, the treatment group experienced a significant reduction in care coordinator-initiated primary care clinic visits, decreasing from 59.0% to 22.6% (p <0.001).

The Australian Coordinated Care Trials

In response to the Council of Australian Governments' proposed health service reform agenda in 1995, 9 coordinated care trials were activated across Australia (first round) [82]. The main aim of these trials was to test whether multidisciplinary care planning and service coordination improved health outcomes and reduced healthcare utilisation in people with chronic conditions [83, 84].

The 9 trials differed in terms of the study design, sample size, eligibility criteria, role and function of personnel involved in care coordination, the care planning process, and the development and distribution of their funding [82]. The trials adopted 1 or used a combination of 3 identified care coordination models, namely: (i) GP approach, in which GP undertakes all tasks associated with the care coordination role; (ii) GP care coordinator with a service coordinator approach, in which GP is supported by a service coordinator; and (iii) non-GP care coordination approach, where the tasks are undertaken by specifically designated coordinators.

The interim results from the trials did not demonstrate any overall improvement in health and wellbeing of the participants or reductions in hospitalisation. In regards to the analysis of hospitalisation rates, in which data was obtained for the 14,600 participants, only 2 trials showed statistically significant differences in the pattern of admissions per client between intervention and control groups; however, after adjustment for baseline characteristics, only 1 trial showed a significant difference with more clients in the intervention group hospitalised compared with the control group [82]. Furthermore, care coordination was not associated with any difference in length of stay (LOS), either for the first admission or the first two admissions combined.

The second round of the coordinated care trials operated from 2002 to 2005 and included 6 trials (3 main stream trials and 3 Aboriginal community trials) that covered a range of

locations, health needs and existing services, built on the learning from the first round of trials [85].

The evaluation of the second round trials reported the following results:

- For the Aboriginal community trials, when compared against Australian normative funding, the effectiveness and efficiency delivered by the intervention was difficult to judge mainly due to the short evaluation period.
- For the mainstream trials, hospitalisations decreased for intervention participants compared to control participants; and the 'coordinated care intervention' led to increased access to primary care services during the trial in intervention participants compared with the control group participants.

Summary

- There is good evidence to show that interventions for managing COPD patients involving multiple CCM components can reduce the rate of hospitalisations and ED visits.
- Similarly, there is some evidence that CDM programs involving multiple and multidisciplinary interventions can reduce the risk of hospitalisation for COPD patients and patients with coronary heart disease.
- There is good evidence that multidisciplinary interventions for heart failure patients can have an effect on reducing all cause hospital admissions and heart failure related hospital admissions, however it is unclear whether the delivery of these interventions took place in a community or primary care setting, or a secondary care setting.
- There is good evidence to show that self management support for COPD and asthma patients can reduce rates of hospital admissions.
- Among patients with diabetes, there is weak evidence to show that diabetic foot programs based in community care can reduce foot related hospitalisations and lower extremity amputation rates. There was also weak evidence to show care management programs; and telehealth programs can reduce the number of hospitalisations.
- There is some evidence that specialist psychiatric outreach clinics (in urban and rural areas) can reduce psychiatry related hospital admission rates.
- The effect of care coordination interventions on PPH rates is inconclusive, and requires more research.

6.4 Interventions to reduce the risk of PPH for acute medical conditions

There was a paucity of high level evidence for the acute medical conditions section of the review. Five studies (and 1 cost analysis) evaluating interventions to reduce the risk of PPH for acute medical conditions were identified. The cost analysis study was included due to the small number of retrieved articles, even though it didn't meet the inclusion criteria of the article selection process.

Nurse led education and direct access service

A cluster RCT of low quality evaluated the impact of a nurse led education and direct access service in the care of children with urinary tract infections [86]. The study included 88 general practices (346 GPs, 107,000 children) which were randomly stratified into either the intervention group or the control group. The intervention included GP education, implementation of new management guidelines, and additional help with referrals and investigations. The authors found that the intervention improved the management of urinary tract infections in children, and was valued by both doctors and parents.

Families in the intervention group visited hospital half as much as the control families (mean 1.3 times vs 2.6 times); although it is unclear whether these differences reached statistical significance. The intervention practices diagnosed twice as many urinary tract infections as the control practices (6.42 vs 3.45/1000 children/year; RR=1.86, 95% CI 1.42 to 2.44, $p < 0.001$). Diagnoses were made more robustly by intervention practices: 99% vs 89% of referred patients had their urine cultured and 79% versus 60% had bacteriologically proved urinary tract infections ($p < 0.001$ for both). Overall, 294 of 312 (94%) children aged under 4 years were prescribed antibiotic prophylaxis by study doctors compared with 61 of 147 (41%) by control doctors ($p < 0.001$).

Multimodal quality improvement program

A controlled before-and-after study of moderate quality examined the effect of a practice-based, multimodal intervention on hospital admission rates for gastroenteritis, in a 20-practice Medicaid network [87]. The multimodal program targeted multiple care processes to make them consistent with evidence-based guidelines, and included education sessions for the GPs, free oral rehydration solution, patient education materials, and performance feedback and follow-up. Three practices (high-intensity practices) formed interdisciplinary teams to develop and test changes and collaborated with the project team, while the other 17 practices (low-intensity practices) shared the information with these high-intensity practices. The authors found the intervention significantly reduced the gastroenteritis admission rates, which declined 45% in high-intensity practices (from 6.6 to 3.6 per 1000 person) and 44% in low-intensity practices (from 3.2 to 1.8 per 1000 person), compared with 11% in the control practices (from 12.2 to 10.9 per 1000). The authors did not perform any statistical analysis to determine the significance.

Emergency services

Paramedic practitioners

In the UK, a new strategy, to encourage use of non-medical staff trained with extended skills to carry out assessments and treat patients, traditionally carried out by doctors, has been developed to manage the increasing demands of healthcare. This strategy includes extended roles of paramedic practitioners, who are trained to assess and treat, or refer patients with a range of conditions which were not life-threatening such as wounds, falls, hypoglycaemia, falls and epistaxis [88, 89].

A good quality clustered RCT based in England evaluated the impact of paramedic practitioners with extended skills managing older patients in the community after acute minor injury or illness on processes and outcomes of care [88]. The authors included 56 clusters with 3018 patients aged over 60 years who called the emergency services, and compared those treated by the paramedic practitioners to those who received the standard ambulance response. The authors found that the paramedic practitioner service showed significant benefit in terms of reduced overall attendance at ED and hospital, shorter episode times and higher levels of patient satisfaction.

The results demonstrated that patients in the intervention group were less likely to have attended an ED either during the initial episode (day 0) or in the 28 days following (62.6% v 87.5%, $p < 0.001$); and were also less likely to have required a hospital admission during the same time period (40.4% v 46.5%, $p < 0.001$). Patients in the intervention group were more likely to report being "very satisfied" with the service than those in the control group (85.5% v 73.8%, $p < 0.001$); and patients in the intervention group experienced a significantly shorter total episode time by around 42 minutes compared to control group (235 v 278 minutes, $p < 0.001$).

A recently published cost analysis by the same authors reported that the paramedic practitioner service was cost effective. The authors found that the total cost of the intervention group was £140 lower when routine data was considered, though this was not statistically significant ($p = 0.63$). However, when the costs and QALY were considered simultaneously, the authors estimated that the paramedic practitioner service had a greater than 95% chance of being cost effective at £20 000 per QALY [89].

Emergency care practitioner service

An historically controlled study of poor quality examined the impact of emergency care practitioners within ambulance services in Yorkshire, England on ED attendance [90]. The emergency care practitioner is a generic practitioner who combines extended nursing and paramedic skills to ensure that patients' health needs are assessed appropriately, and to either treat or refer to the appropriate care pathways. The authors reviewed all patients who called the emergency services with a diagnosis of either breathing difficulties, or older patients (greater than 65 years) with a fall, and compared those who received the emergency care practitioner service with an historical comparison group.

Both patient groups (those with breathing difficulties and older patients with a fall) receiving the emergency care practitioner service had decreased hospital admission rates during the initial contact and in the 28 days following compared to the control group. In the 5 month study period, the emergency care practitioner service reviewed 186 patients with breathing difficulties. At initial contact 64% ($n = 119$) from the intervention group were treated at home and referred on for primary care review and did not require an ED attendance, compared to 24% among the control group. At 28 days following initial contact 16 patients from the intervention group had attended the ED with related problems, and 13 went on to be admitted to hospital. The authors report an avoided admission rate of 46.7% among the intervention group, and they suggest that emergency care practitioners reduce admissions by 30% at 28 days relative to the initial contact figure (from 76% to 53.3%, $n = 1307$, $p < 0.001$). Similarly, amongst the older patients with falls at initial contact the emergency care practitioner service avoided ED attendance rates by 73%, compared to 48% in the control group; and reduced admissions by 17% at 28 days relative to the initial contact figure (from 52% to 44%, $n = 1005$, $p < 0.05$). This article lacks the comparative data for the control group at 28 days after initial contact making it difficult to understand how the authors came up with these results.

Rapid response system

The aim of rapid response systems are to prevent unnecessary hospital admissions by responding efficiently and coordinating delivery with a range of nursing, allied health and

help services in an individual's home instead of in an acute care service. These programs accept referrals from ED staff and community physicians and respond within hours [91, 92]. Rapid response services have been initiated in various countries including Australia, but very few studies have assessed their impact [91].

Brazil et al in a descriptive study examined the role of the rapid access home-based service as a means for the elderly to avoid admission to an acute care hospital in Canada [92]. Multiple sources of information were used to evaluate the service, including review of medical records, and surveys of patients who participated in the service (n = 96) and of physicians and nurses who had involvement with the service (n = 119). Most of the patients presented to the service with problems of a functional nature such as with a fall or with mobility problems, and elderly women with multiple health problems who lived alone were the most frequent users. The results indicated that 66% of the patients (47 out of 77 patients) admitted to the service averted a hospital admission, and the service was found to be cost effective. However, this study lacked statistical analysis.

Summary

- There is weak evidence to suggest the following:
 - A nurse led education and direct access service in the care of children with urinary tract infection can reduce hospitalisation rates and ED visits.
 - A multimodal program targeting multiple care processes for gastroenteritis can significantly reduce hospital admission rates.
 - Extending the role of paramedic practitioners can reduce the number of ED presentations and the likelihood of hospitalisation.
 - Emergency care practitioners (a generic practitioner with extended nursing and paramedic skills) within ambulance services can reduce hospitalisations and ED presentations among patients with breathing difficulty and older patients who have had a fall.
- Further research is required to assess the effects of rapid response services, where multidisciplinary acute care is delivered within a short time frame in the patient's home, on reducing PPH.

6.5 Interventions to reduce risk of PPH from adverse events

The review identified two SR with meta-analyses which comprehensively summarised the evidence with regards to interventions in primary care aimed at reducing ADE and related hospital admissions. Due to the paucity of evidence a narrative review providing an overview of preventive strategies that can be adopted in primary care; and one data analysis study has also been summarised below.

In a good quality MA, Royal and colleagues evaluated characteristics and effectiveness of interventions in primary care aimed at reducing medication related AE that result in morbidity, hospital admission, and/or mortality [93]. The reviewers included 38 studies of various methodology which were categorised as followings: 17 pharmacist-led interventions (of which 15 reported hospital admissions as an outcome); 8 interventions led by other primary healthcare professionals (that reported preventable drug related morbidity and hospital admission as outcomes); and 13 complex interventions that included a component of medication review aimed at reducing falls in the elderly (the outcome being incidence of falls).

Meta-analysis of 13 studies investigating pharmacist-led interventions which included medication review as a component, demonstrated a positive effect on reduction of hospital admissions (OR=0.64, 95% CI 0.43 to 0.96). However, these interventions failed to demonstrate significant benefit when the analysis was restricted to the 9 RCT (OR=0.92, 95% CI 0.81 to 1.05).

Interventions led by other primary healthcare professionals included nurse managed interventions for chronic diseases, and education programmes for primary care physicians. Meta-analysis of these studies (n = 8) did not find any significant effect on hospitalisation rates (OR=1.05, 95% CI 0.57 to 1.94). Similar non-significant results were demonstrated from the studies (n = 9) which described medication review undertaken by a primary healthcare professional as an intervention component. The reviewers concluded that there is a paucity of high quality evaluations of interventions aimed specifically at preventing medication related AEs in primary care [93].

Another recently published good quality SR evaluated and quantified the effects of medication review by pharmacists on substantive clinical outcomes (hospital admissions and mortality) for older people across all care settings. The reviewers included 32 RCT, which included 13 studies (41%) investigating interventions delivered in a clinic/primary care setting [94]. The authors found that pharmacist-led medication review interventions did not have any effect on reducing mortality or hospital admission rates in older people. Meta-analysis of 17 trial failed to show a significant effect of the interventions on all-cause hospital admission rates (RR=0.99, 95% CI 0.87 to 1.14, p=0.920) [94].

Summary

- There is good evidence to suggest that community based pharmacist-led interventions which include medication review, do not reduce hospital admissions due to ADE.
- There is good evidence that primary care nurses using protocols for management of patients with chronic conditions, and education programs for primary care physicians do not have an effect on ADE related hospitalisations.

7. Review of Australian policies to reduce PPH

Tables 13 to 15 summarise the findings of the combined website searches and survey results. Survey responses were received from 6 jurisdictions; with multiple responses received from Victoria and Tasmania. Not all jurisdictions completed surveys and there was variation in the amount of information available from the departmental websites, limiting the amount of information summarised in the tables. There is a caveat to this summary as we were reliant on published policies (on websites) and self reported policies (from surveys). We may have missed important policies and initiatives where they were not published or where survey participants were unaware of other jurisdictional activities.

A total of 15 national initiatives; 7 initiatives from ACT; 8 initiatives from NSW; 3 NT initiatives (and a further 2 linked initiatives); 4 Queensland initiatives; 3 SA initiatives; 4 Tasmanian initiatives; 7 Victorian initiatives and 4 WA initiatives were identified. These have been summarised in Table 14.

Eighteen of the initiatives identified, aim to reduce PPH rates as a key objective. Seven initiatives aim to specifically reduce rates of PPH related to chronic conditions alone; 1 national, 1 NSW, 1 Queensland, 3 Victorian and 1 WA. Victoria is the only state to have an initiative aimed at reducing mental health related PPH. None of the vaccine related initiatives have reducing vaccine-preventable PPH as a key objective, but have a more indirect focus by preventing incidence of the diseases themselves. A number of initiatives aim to reduce PPH covering more than one of the subgroups of PPH conditions. These were generally PPH related to a combination of acute medical and chronic or complex conditions: 1 ACT, 4 NSW, 2 Queensland, 1 Victorian and 1 WA. NSW is the only state to have initiatives that target reducing PPH related acute medical conditions (alone) as an objective. There were no policies identified aimed specifically at reducing PPH related to adverse events.

Overall, 8 strategies or initiatives have been evaluated – 3 national, 2 from NSW and 3 Victorian; most of which are comprehensive evaluations of the programs. The evaluation findings have been summarised in Table 15.

Vaccine-preventable conditions

The Immunise Australia Program implements the National Immunisation Program (NIP) Schedule which currently includes vaccines against a total of 16 diseases. The Australian Government provides funding for state and territory governments to obtain vaccines listed on the NIP in accordance with the list of designated vaccines. The Pneumococcal Vaccination for Older Australians Program targets this vulnerable patient population at a national level.

Jurisdiction level immunisation strategies and programs identified include:

- ACT Immunisation Strategy 2007-2010
- NT CDC Immunisation Program
- NSW Immunisation Strategy
- Victorian Immunisation Strategy 2009-2012
- WA Immunisation Program

The identified immunisation programs however do not aim to directly reduce vaccine-preventable PPH, but have a primary aim of preventing incidence of the targeted diseases, which would indirectly lead to a reduction in related hospital admissions.

Chronic conditions

In the area of chronic disease, a number of policies and strategies have been implemented at the federal and jurisdictional level. The National Model of Chronic Disease Prevention and Control: A Public Health Framework, and the National Chronic Disease Strategy provide the overarching framework for jurisdictions to base practical implementation strategies [95-97]. Chronic disease implementation strategies have been developed at the state/territory level, and have been tailored to meet local needs, including:

- ACT Health Chronic Disease Strategy
- NSW Chronic Care Program and Chronic Care Collaborative
- NT Preventable Chronic Disease Strategy and Framework
- Queensland Strategy for Chronic Disease
- Chronic Disease Action Plan for SA
- Tasmanian Strengthening the Prevention and Management of Chronic Conditions Policy Framework
- Victorian Hospital Admission Risk Program – Chronic Disease Management
- WA Chronic Disease Self Management Strategy & Healthy at Home Chronic Disease Service

Acute medical conditions

Acute medical conditions that are PPH are specifically targeted by NSW strategies; and are included in a number of strategies that combine chronic and acute PPH conditions in all jurisdictions.

Adverse events

There were no policies identified that specifically targeted PPH related to adverse events.

Under development: National Primary Health Care Strategy

Several national and jurisdiction level primary care strategies have been implemented. The National Primary Health Care Strategy is under development, and there are plans “to review Medicare Benefits Scheme (MBS) primary care items – with a focus on simplifying the primary care item structure, reducing red tape and giving more support to preventative health care” [97].

Table 13: Overview of policies and initiatives related to PPH conditions by jurisdiction

| | PPH condition subgroups | | | | |
|-------------------|-------------------------|---------|-------|----|----------------------|
| | Vaccine | Chronic | Acute | AE | General [#] |
| National | ✓ | ✓ | | | ✓ |
| ACT | ✓ | ✓ | | | ✓ |
| NSW | ✓ | ✓ | ✓ | | ✓ |
| NT | ✓ | ✓ | | | |
| Queensland | | ✓ | | | ✓ |
| SA | | ✓ | | | ✓ |
| Tasmania | | ✓ | | | ✓ |
| Victoria | ✓ | ✓ | | | ✓ |
| WA | ✓ | ✓ | | | ✓ |

[#]Policies/initiatives not targeting a specific PPH category but which include a broad range of PPH conditions.

Table 14: Summary of Australian PPH polices, strategies and initiatives identified

| Policy, Strategy, Initiative title [†] | Target population & PPH conditions if specified | Objectives |
|--|---|--|
| NATIONAL | | |
| Australian Better Health Initiative (ABHI) | General population Chronic conditions | To reduce the prevalence of risk factors for chronic disease, limit the incidence and the impact of these diseases and reduce morbidity and mortality rates. ABHI is a four year joint Australian, state and territory government program, priority areas of which include: promoting healthy lifestyles supporting early detection of risk factors and chronic disease, supporting lifestyle and risk modification, encouraging active patient self management of chronic conditions, and improving the communication and coordination between care services. |
| Audit and Best Practice for Chronic Diseases (ABCD) Project | Indigenous population Chronic conditions | To improve chronic disease prevention and management in Aboriginal primary care services. The ABCD project is a continuous quality improvement and participatory action research project that aims to implement evidence based approaches to assessing and improving health centre systems, service delivery and health outcomes in Indigenous population. |
| Australian Primary Care Collaboratives (APCC) Program [†] | People with diabetes or coronary heart disease | To improve clinical health outcomes, reduce lifestyle risk factors, maintain health for chronic and complex conditions and improve access to Australian general practice. |
| Bettering the Evaluation and Care of Health (BEACH) Program | General population | To collect reliable and valid data about general practice and establish an ongoing database of GP/patient encounter information; to assess patient based risk factors and the relationship that these factors have with health service activity; and to provide accurate and timely data to a wide variety of users including government bodies, GP organisations, consumers, researchers, and the pharmaceutical industry. |
| Divisions of General Practice (DGP) Program [†] | General population Non specific, but has a focus on chronic conditions and population health | To provide services and support to general practices at the local level to achieve health outcomes for the community and better service delivery, that would not otherwise be achieved on an individual GP basis. The Divisions network comprises of the Australian General Practice Network (AGPN), state based organisations and regional DGPs, which provide core programs to address: access; prevention and early intervention; supporting integration and multidisciplinary care; and an increased focus on population health and the better management of chronic disease. |

[†] Has undergone evaluation – see Table 15 for details

| Policy, Strategy, Initiative title | Target population & PPH conditions if specified | Objectives |
|---|---|--|
| NATIONAL cont | | |
| Enhanced Primary Care (EPC) Plan • Allied health Partnership | Older population Chronic conditions | To provide preventive care for older Australians and improve coordination of care for people with chronic conditions and complex care needs. |
| General Practitioner Immunisation Incentives Scheme [†] (GPPI) | Children under the age of 7 years Vaccine preventable conditions | The GPPI provides financial incentives to GPs that monitor, promote and provide immunisation services to children under the age of seven years. The overall aim of the GPPI scheme is to encourage at least 90 per cent of practices to achieve 90 per cent proportions of full immunisation. |
| General Practice Super Clinics (GPSP) | General population | To establish a greater range of affordable, high quality, comprehensive and integrated primary care services which are convenient and accessible and tailored to the needs and priorities of the local community, particularly in rural and regional areas and where Medicare has not been utilised to its fullest because of workforce shortages. |
| Immunise Australia Program | General population Vaccine preventable conditions | To increase national immunisation rates for vaccine preventable diseases. The program implements the National Immunisation Program (NIP) Schedule which currently includes vaccines against a total of 16 diseases. |
| Mental Health Nurse Incentives Program | General population Mental health conditions | To provide non-Medical Benefit Schedule (MBS) incentive payments to community based general practices, private psychiatrist services and other appropriate organisations (such as DGP) who engage mental health nurses to assist in the provision of coordinated clinical care for people with severe mental disorders. This program is a part of the Commonwealth component of the Council for Australian Governments (COAG) National Action Plan on Mental Health 2006-2011. |
| National Primary Health Care Strategy | General population | To better tackle the current health challenges and to deliver better frontline care to families across Australia. The main priorities of this proposed strategy include: better rewarding prevention, promoting evidence-based management of chronic disease, supporting patients with chronic disease to manage their condition, supporting the role GPs play in the health care team, addressing the growing need for access to other health professionals, including practice nurses and allied health professionals like physiotherapists and dieticians and encouraging a greater focus on multidisciplinary team-based care |

| Policy, Strategy, Initiative title | Target population & PPH conditions if specified | Objectives |
|---|---|--|
| NATIONAL cont | | |
| National Chronic Disease Strategy | General population Chronic conditions | To encourage coordinated action in response to the growing impact of chronic disease on the health of Australians and the health care system. This strategy provides an overarching framework of national direction for improving chronic disease prevention and care across Australia and includes three major elements: (i) a national chronic disease strategy; (ii) a set of five national service improvement frameworks for asthma, cancer, diabetes, heart, stroke and vascular diseases; and osteoarthritis, rheumatoid arthritis and osteoporosis; and (iii) a blueprint for nationwide surveillance of chronic diseases and associated determinants. One of the key objectives of this strategy is to reduce PPH related to chronic conditions. |
| National Model of Chronic Disease Prevention and Control: A Public Health Framework | General population Chronic conditions | To provide the basis for a comprehensive, evidence based, public health response to the National Health Priority Area initiative by providing a strategic framework for the prevention and control of chronic non-communicable diseases in Australia. The framework recommends building the organisation of the national prevention effort in Australia around three key areas of activity: (i) <i>ensuring an effective information base to guide action</i> (systematic surveillance of risk factors and their determinants, systematic development of an evidence base to inform policy and program design, and evaluation and performance measurement); (ii) <i>strengthening prevention and health promotion</i> (reduction of risk factors and their determinants, enhancing protective factors, promotion of health across the life course, building partnerships for inter-sectoral action and supportive public policies, and giving priority to populations most at risk); and (iii) <i>improving systems of care for those with chronic conditions</i> (strengthening the role of prevention in the health system, improving early detection and intervention, integrating primary care systems, and developing care partnerships and consumer participation). |
| Pneumococcal Vaccination for Older Australians Program | Older population Pneumococcal disease | To provides free pneumococcal polysaccharide vaccine to adults aged 65 years or older. This program is listed on the National Immunisation Program (NIP) Schedule and funded under the Immunise Australia Program. |
| Practice Incentives Program (PIP) | General population | To deliver financial incentives with the aim of recognising general practices that provide comprehensive, quality care, who are either accredited or working towards accreditation for the Royal Australian College of General Practitioners' (RACGP) Standards for General Practices. |

| Policy, Strategy, Initiative title | Target population & PPH conditions if specified | Objectives |
|---|---|--|
| AUSTRALIAN CAPITAL TERRITORY | | |
| ACT Health Chronic Disease Strategy 2008-2011 | General population Chronic conditions | To improve the health of the ACT community through improved prevention, detection and management of chronic disease across the population. The Strategy includes the 5 areas of action: prevention and risk reduction across the continuum; early detection and early treatment; integration and continuity of prevention and care; self management; and research and surveillance. |
| ACT Immunisation Strategy 2007-2010 | General population Vaccine preventable conditions | To maintain and enhance the immunisation coverage rates of children and amongst adolescents, adults and vulnerable people within the community, with special emphasis on Indigenous people; to provide support for effective delivery of immunisation programs, in accordance with 'best practice'; to enhance the quality of information about immunisation in the ACT available to consumers and service providers to ensure that it is timely, consistent and comprehensive; and to increase the provision of early childhood immunisations through general practice. |
| ACT Diabetes Services Strategic Plan 2008-2012 | People with diabetes mellitus | To prevent and delay the onset of diabetes; prevent and slow progression of diabetes complications; and enhance the quality of life of people with diabetes. |
| ACT Primary Health Care Strategy 2006-2009 | General population | To provide population based and person centred health care through health promotion and early intervention, and CDM; to provide continuity of health care through integration of services, improving co-ordination between ACT Health and other ACT government funded services, to improve coordination with Australian government supported services; and to achieve high quality health care through improved information management, and evaluation and research. |
| Chronic Care Program | People with CHF and COPD who are frequent users of the acute health care system | To facilitate enhanced communication amongst all relevant healthcare and community service providers, encourage client self management and provide education and support to clients and their support networks. |
| Mental Health Services Plan 2008 – 2013 (Draft) | General population Mental health | To articulate the vision and the strategic directions for the development of the mental health sector in ACT to the year 2020, and to establish a coordinated approach to achieving and sustaining mental health. |

| Policy, Strategy, Initiative title | Target population & PPH conditions if specified | Objectives |
|--|--|---|
| AUSTRALIAN CAPITAL TERRITORY cont | | |
| Rapid Assessment of the Deteriorating Aged at Risk (RADAR) | Older population, younger patients may be seen if already known to the aged care team or in residential care facility, or over 50 years for Indigenous Australians | <p>To provide an older person with a rapid medical intervention to prevent a subsequent hospital admission.</p> <p>The RADAR team (comprising medical staff, aged care nurse practitioner, other nursing staff) remains closely in contact with the GP and liaises with available services (pathology, imaging, hospital in the home, domiciliary allied health, community rehabilitation, etc.) to ensure that timely investigation and multidisciplinary management is available for the older person in the appropriate environment.</p> |
| <p><i>Other:</i></p> <ul style="list-style-type: none"> • Building a Strong Foundation: a Framework for Promoting Mental Health and Wellbeing in the ACT 2009-2014 • Care Coordination Project • Chronic Disease Management Register • Community Acute and Post Acute Program • Home Tele-monitoring • Self Management of Chronic Conditions Programs • Staff Influenza Immunisation Policy • Staff Screening and Immunisation Policy • Telephone and web-based coaching programs | | |

| Policy, Strategy, Initiative title | Target population & PPH conditions if specified | Objectives |
|---|---|--|
| NEW SOUTH WALES | | |
| Acute Post Acute Care/ General Practitioner (APAC/GP) Shared Care | General population Acute conditions that have not responded to oral antibiotics or other interventions or therapies | To manage the patient in the community, by collaborative work of the GP and the APAC team to ensure that where possible the patient does not need to go to hospital for initiation of clinical care. The GPs role is to establish the clinical diagnosis, prescribe and administer the first dose of treatment. The APAC team under the ongoing clinical management of the GP continue the care. |
| Avoidable Admission Strategy, NSW State Plan • Sustainable Access Plan | General population 12 medical conditions: cellulitis, community acquired pneumonia, COPD, bronchitis and asthma, red blood cell disorders and transfusions, DVT, UTI, acute non-surgical pain (musculo-tendinous disorders), chest pain, seizure, headache and gastroenteritis | To identify specific low complexity medical conditions which can be treated in alternative settings to inpatient hospital care. The strategy identifies the CAPAC Model of Care (see below for details) as the NSW Health Preferred vehicle to deliver target of a range of selected conditions that are amenable to being managed in the acute community environment. |
| NSW Chronic Care Program [†] | General population Chronic conditions | The program is aimed at reducing avoidable hospital admissions and improving quality of life for people with chronic illness and their carers. To strengthen the capacity of the NSW health system to improve service delivery for people with chronic diseases, with its strategies aimed at: supporting consumers at the centre of the health system with services designed around their unique health needs; developing the capacity of consumers to participate fully in their own health care and more effectively navigate their way through the health system; ensuring easier and more timely access; facilitating continuity of relationships between health providers at various levels of the health system and between health providers and consumers; and developing organisational and governance systems and structures to support long term orientation and reorientation of care within the health system. |

| Policy, Strategy, Initiative title | Target population & PPH conditions if specified | Objectives |
|--|---|---|
| NEW SOUTH WALES cont | | |
| Community Acute Post Acute Care (CAPAC) Service [†] | General population Selected acute and chronic conditions | To provide the most appropriate care setting, avoid hospital admissions or reduce patient length of stay through the immediate provision of multidisciplinary care for clients at their home as an alternative to inpatient (hospital) care. It encompasses services variously described as “Hospital-in-the-Home” and “Post Acute Care”. |
| HealthOne NSW | General population Includes chronic conditions | To prevent illness and reduce the risk and impact of disease and disability; to improve chronic disease management in the community; to reduce avoidable admissions (and unnecessary demand for hospital care); improve service access and health outcomes for disadvantaged and vulnerable groups and to build a sustainable model of health care delivery. |
| Healthy at Home [†] | Frail older people in the community who are over 65 years (over 45 years for Indigenous people) | To provide more integrated and tailored care for frail elderly at home, before a crisis occurs, and avoid hospitalisation. The key elements of the program include: Referral Information Centre, Healthy at Home teams (rapid response teams), Community Options (case management service) and ComPacks (case-managed package of care for up to 6 weeks). |
| NSW Chronic Care Collaborative | People with COPD and heart failure | To enhance implementation of the clinical service frameworks for chronic respiratory disease and heart failure developed in Phase 1 of the Chronic Care Program which focused on the improving the diagnosis and management of COPD and heart failure across the NSW. The NSW Chronic Care Collaborative is a clinical improvement program organised and led by the Clinical Excellence Commission and NSW Department of Health, to enhance implementation of NSW Clinical Service Frameworks developed as part of the NSW Chronic Care Program. |
| NSW Immunisation Strategy 2008-2011 | General population Vaccine preventable conditions | To minimise the incidence and prevalence of vaccine preventable diseases through maximising immunisation coverage. |

| Policy, Strategy, Initiative title | Target population & PPH conditions if specified | Objectives |
|--|--|--|
| NORTHERN TERRITORY | | |
| Centre for Disease Control (CDC) Immunisation Program | General population Vaccine preventable conditions | The Immunisation Program is one of a range of services provided through the CDC, primarily to prevent, monitor and control communicable and non-communicable diseases in the Northern Territory. |
| Chronic Disease Network | General population Chronic conditions | To link stakeholders and promote: communication, collaboration, coordination, and collective memory in the area of common chronic diseases affecting the NT population, across the continuum of care. |
| Preventable Chronic Disease Strategy & Framework | General population 5 preventable chronic conditions: type 2 diabetes, renal disease, hypertension, ischaemic heart disease, and COPD. | To bring about change in the prevention, early detection, and management of chronic diseases in the Northern Territory, and at all levels of the health care system, with collaboration by a broad range of players from governments, non-government organisations and the private sector. |
| <p><i>Others:</i></p> <ul style="list-style-type: none"> • Healthy Living NT • Urgent Care After Hours • General Practice Network NT • Expanded Health Service Delivery Initiative | | |
| QUEENSLAND | | |
| Queensland Health's Directions For Aged Care 2004 – 2011 | Older people who are 65 years and over (45 years and over for Indigenous people) | To provide direction to health service providers on meeting older people's health and aged care needs while respecting their (and their carers') choices about that care. |
| Queensland Strategy For Chronic Diseases 2005-2011 | General Population Chronic conditions | To reduce avoidable hospital admissions in the short-term, to improve the quality of life for people with chronic disease in the short-to-medium-term and to reduce the incidence and prevalence of chronic disease in the medium-to-longer-term. |

| Policy, Strategy, Initiative title | Target population & PPH conditions if specified | Objectives |
|---|---|--|
| QUEENSLAND cont | | |
| Country Home link | People living in regional/rural area | To provide support and assistance to people living in the country who are at the risk of hospitalisation and/or who require support in order to be discharged early from metropolitan hospital. |
| Metro Home Link | General Population | To provide support and assistance to people in their homes to avoid deterioration of their health and eventual admission to a metropolitan hospital. |
| SOUTH AUSTRALIA | | |
| SA Health Strategic Health Plan 2008-2010 | General Population | <p>Outlines the key strategic directions of SA Health, which include: strengthen primary health care; enhance hospital care; and reform mental health care.</p> <p>The strategic directions for strengthening primary health care aims to focus on health protection and promotion, provide effective avenues for prevention and early intervention, facilitate effective coordination and continuity of care, minimise the burden of disease on the health system and provide appropriate services closer to where people live.</p> |
| GP Plus Health Care Strategy: GP Plus Health Improvement Plan: A New Model For GP Plus Health Networks | General Population | To provide fully integrated and accessible health care to the South Australian community; to increase prevention and early intervention services to promote good health. |
| Chronic Disease Action Plan for SA | General Population Chronic conditions | To use evidence based strategies to prevent chronic disease, by reducing risk associated with biomedical and lifestyle factors; detect disease and risk of disease early and intervene effectively; and manage existing disease effectively and proactively. |
| <p><i>Others:</i></p> <ul style="list-style-type: none"> • Practice Nurse Initiative • Cardiology Service Plan • Stroke Service Plan • Palliative Care Service Plan • Health Service Framework for Older People • Rehabilitation Service Plan • Primary Service Plan • Renal Service Plan | | |

| Policy, Strategy, Initiative title | Target population & PPH conditions if specified | Objectives |
|---|---|--|
| TASMANIA | | |
| Consistent Community Health (CCH) Project | General Population | The main aims of the CCH Project are: to align clinical practice and business processes with evidence and national standards based on an agreed service model; to develop a Community Care Tool Kit that delivers a consistent approach to the fundamental elements of the client flow which are referral, admission, assessment, care planning, service delivery, discharge, and post discharge follow up; to provide consistency across the core clinical and business processes of documentation, reporting and associated data definitions; and to identify the customer group and the range of services provided to enable best use of skill mix/resources. |
| Primary Health Services Plan (PHSP) 2007-2010 | General Population | To develop an integrated primary health care system with a focus more on prevention and community-based care. |
| Primary Health Chronic Disease Demonstration Service | General population Type 2 diabetes | To employ a partnership approach to the delivery of chronic disease management in the community, incorporating the principles of: integration, coordination, multidisciplinary team care, communication, care planning and broad based funding. |
| Strengthening the Prevention and Management of Chronic Conditions Policy Framework 2005 | General population Chronic conditions | To introduce service change in community based health services to prevent and manage chronic diseases. |
| <i>Other:</i> <ul style="list-style-type: none"> • COPD Patients Self management Program | | |

| Policy, Strategy, Initiative title | Target population & PPH conditions if specified | Objectives |
|--|---|---|
| VICTORIA | | |
| Care In Your Community | General Population All conditions, with a particular focus on chronic conditions | To deliver person-centred health care in community settings, reducing the need for inpatient care, and improving the health outcomes of Victorians. This initiative provides clear policy directions and an overarching planning framework for ambulatory care service delivery models and facilities in Victoria, building on established and successful elements of the current health system. |
| Community Health Services (CHS) - Creating a healthier Victoria | General population | To develop and integrate CHS within the broader national and state health system and provide a consistent set of roles, principles and directions that is to: provide leadership in improving health outcomes and reducing health inequalities of local communities throughout Victoria; be a major platform for integrated community-based health services; be a strong partner in the broader health and community service system; and provide services and programs that are high quality, affordable and delivered in a timely way. |
| Crisis Assessment and Treatment (CAT) service | General population Mental health | To provide community-based assessment and treatment for people experiencing psychiatric crisis, with the aim to prevent unnecessary hospitalisation by providing treatment in the person's own environment, such as in their home. The CAT service is responsible for screening all people who appear appropriate for psychiatric inpatient treatment in order to determine whether the psychiatric inpatient service is the most appropriate environment for them to receive treatment. |
| Early Intervention in Chronic Diseases in Community Health (EiCD) [†] | General population Chronic conditions | To implement community based early intervention services for people with chronic diseases who are at higher risk of hospitalisation in medium to long-term. This program developed a set of models, with leadership from community health services and DGPs, targeting people with chronic conditions. |

| Policy, Strategy, Initiative title | Target population & PPH conditions if specified | Objectives |
|---|--|---|
| VICTORIA cont | | |
| Hospital Admission Risk Program Chronic Disease Management (HARP CDM) [†] | People with chronic heart disease, chronic respiratory disease, diabetes, complex psychosocial needs and older people with complex needs | <p>To improve management of people with defined chronic diseases and complex needs who frequently use hospitals or who are at risk of hospitalisation. The objectives of HARP CDM are to:</p> <ul style="list-style-type: none"> • Improve patient outcomes; • Provide integrated seamless care within and across hospital and community sectors; • Reduce avoidable hospital admissions and ED presentations; and • Ensure equitable access to healthcare. <p>HARP was implemented through a series of competitively funded community and hospital based projects and comprises a range of prevention initiatives that have the potential to affect hospital emergency demand.</p> |
| Primary Care Partnerships (PCP) <ul style="list-style-type: none"> • Integrated CDM | General population Chronic conditions and other conditions | <p>To improve the health and well-being outcomes of people using primary health care services and to reduce avoidable use of hospital, medical and residential services.</p> <p>PCPs focus on building relationships between agencies and service system reform, with highly developed networks engaging different sectors and stakeholders.</p> |
| Victorian Immunisation Strategy 2009-2012 | General population Vaccine preventable conditions | <p>To provide a clear overview and direction for immunisation service providers and consumers in the State, within the context of national policy.</p> <p>The development of the Strategy started in April 2007 and has been overseen by the Victorian Immunisation Advisory Committee (VIAC), a cross-sectoral body of independent immunisation experts that meets regularly to review and inform immunisation policy and services across Victoria.</p> |
| <p><i>Others:</i></p> <ul style="list-style-type: none"> • Health Care Workers Influenza Vaccination Program • Pertussis Vaccine for New Parents • Refugee Health Nurse Program • Nurse-On-Call Service | | |

| Policy, Strategy, Initiative title | Target population & PPH conditions if specified | Objectives |
|---|--|---|
| WESTERN AUSTRALIA | | |
| Ambulatory and Community-based Care: A framework for non-inpatient care | General population All conditions | To provide the strategic direction for ambulatory and community care from which specific models of care and service delivery will be developed and implemented as part of state-wide policy and Area Health Service clinical planning. One of the priority areas of the framework is developing strategies to reduce the demand for inpatient services i.e. targeting the ACSC. |
| Chronic Disease Self Management Strategy | General population Chronic conditions | To create opportunities for collaboration between all chronic diseases self management service providers in WA and raise awareness of self management amongst other stakeholders. This strategy is part of the Australian Better Health Initiative and is currently funding two self management programs across the metropolitan area: <i>Living well</i> and <i>Living with Diabetes</i> . The self management programs approach emphasises the person's central role in managing their health, links them to personal and community resources and includes strategies of assessment, goal setting, problem solving and follow-up. |
| Healthy at Home Chronic Disease Service | People with diabetes, COPD and/or heart failure | To maximise the health and well-being of patients with chronic health conditions, by helping patients to stay in control of their health and prevent avoidable hospitalisation. This program is offered to patients who are referred and supported by their GP. |
| Immunisation Program | General population Vaccine preventable conditions | The Immunisation Program is a state-wide program, which conducts the distribution of scheduled vaccines to immunisation providers, school based vaccination programs and immunisation campaigns. The program also manages the Central Immunisation Clinic. In addition, the Immunisation Program also: <ul style="list-style-type: none"> • Conducts the distribution of vaccines to other agencies as well as providing direct vaccination through the Central Immunisation Clinic in Perth. • Initiates campaigns to promote vaccinations and to alert general practitioners to missed vaccinations in children attending the surgery. |

Table 15: Summary of policies that have undergone evaluation

| Policy, Strategy, Initiative title | Implementation status | Evaluation findings | Comments |
|---|-----------------------|--|--|
| National: Australian Primary Care Collaboratives Program (APCC) | 2003 - ongoing | <p>The APCC website reported, as of December 2007 data submission, the participating 43 divisions and over 600 Australian general practices have achieved significant improvements through their involvement in the APCC Program. The program has resulted in key changes within Australian primary care and better health outcomes for patients with chronic disease, including:</p> <ul style="list-style-type: none"> • Improved patient care through better management of diabetes and coronary heart disease • Increased best practice care through better use of information systems (both medical and business systems) • Evolving roles among practice staff to better meet patient demand • A cultural shift from individual patient care to population based care | <p>This program does not collect data in relation to hospitalisation rates. Participation is voluntary and collected at the local level mainly for quality improvement purposes. Measurement and monitoring is not system level and therefore may not be generalisable.</p> |
| National: Divisions of General Practice (DGP) Program | 1992 – ongoing | <p>Scott and Coote (2007) examined the following 5 areas of performance to assess the effect of DGP [98, 99].:</p> <ol style="list-style-type: none"> i. Practice infrastructure ii. Access iii. Multidisciplinary working iv. Chronic disease v. Prevention and early intervention <p>They performed a longitudinal regression analysis of 2002-2004 data and reported the following:</p> <ul style="list-style-type: none"> • Overall, performance has increased in the majority of areas. • The largest effects of DGP were in areas of general practice infrastructure. This included the proportion of general practices participating in the Practice Incentives Program (PIP), and the proportion of these practices 'signed on' to provide higher quality care for asthma, diabetes and cervical screening. • Divisions were less likely to have influenced performance in clinical areas. • DGP programs had only modest achievements in collaboration with other health services and less involvement of other health professional groups, consumers or community groups in governance arrangements. • Divisions which conducted diabetes and asthma programs had a higher percentage of PIP practices signed on for asthma. However, there were no statistically significant effects for asthma Service Incentives Program (SIP), or diabetes sign ons or SIPs. • For practice infrastructure, there was strong evidence that Divisions who employed more staff were associated with higher levels of performance. | <p>There was no evidence to support the impact of DGP in improving access to primary health care, improving the health and well being of patients/populations, their impact on other parts of the health system (health care utilisations) or provider satisfaction [98].</p> <p>Only participating practices are represented, with approximately one third of practices are not included in the analyses.</p> |

| Policy, Strategy, Initiative title | Implementation status | Evaluation findings | Comments |
|--|---|---|---|
| | | <ul style="list-style-type: none"> • Divisions were associated with a 4.5% increase in the proportion of PIP practices, equivalent to bringing in an additional 354 practices to the scheme. • Divisions with a higher proportion of indigenous people in the population, and those with higher workloads (more patients per GP) had higher proportions of PIP practices. | |
| National: General Practice Immunisation Incentives Scheme (GPII) | 1998 - ongoing | <p>In April 2000 the Department of Health and Ageing engaged KPMG Consulting to conduct an evaluation of the scheme to determine whether it had been effective in raising childhood immunisation rates [100]. The comprehensive evaluation published in November 2000 reported the following key findings:</p> <ul style="list-style-type: none"> • Overall, there was an increase in real levels of childhood immunisation coverage since the inception of the GPII scheme, although at levels lower than the apparent increase, due to artifacts of increased reporting to the Australian Childhood Immunisation Register (ACIR) • The service incentive program was important in encouraging GPs to participate in the scheme and has had a substantial impact on the reporting of data to the ACIR. • Areas of low socio-economic status exhibited more marked increases in reporting of immunisation data to the ACIR since the inception of the GPII. • The National, State and Divisional coordination roles have been essential to the success of the scheme—particularly the Divisional Immunisation Coordinators. • According to DGP, the most effective strategies used were: <ul style="list-style-type: none"> - Nurse and administrative staff education (94%); - Practice visits (77%); - Developing and distributing resource kits (72%); and - Other activities, principally comprising clinical and cold chain audits, GP and continuing medical education seminars, data entry, data cleaning and data interpretation. | Information about the effectiveness of this program in relation to healthcare utilisation, in particular in reducing the rate of vaccine-preventable PPH was not reported on as part of the evaluation. |
| NSW Chronic Care Program | Phase 1 2000-03 Phase 2 2003-06 Phase 3 2006-09 | <p>Schofield et al reported the following results which show the overall effect of the collaborative (and not that of individual teams) [101]. They are presented as diagnostic (diagnostic assessments and interventions) or management (treatment and management interventions) bundles:</p> <ul style="list-style-type: none"> • For heart failure there were significant improvements between April and November 2004 for: the use of the full bundle of diagnostic interventions in the community ($p < 0.001$); and the use of the full bundle of management interventions in the community ($p < 0.02$), at discharge ($p < 0.001$), but not in the ED ($p < 0.10$). • In the community, there were significant improvements in use of ACE inhibitors ($p < 0.004$), after hours contact ($p < 0.001$), influenza immunisation ($p < 0.009$), and | The findings are based on the comprehensive evaluation by the Centre for Health Services Research which took place in 2004 during the implementation of Phase 2. |

| Policy, Strategy, Initiative title | Implementation status | Evaluation findings | Comments |
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| | | <p>smoking cessation ($p < 0.01$).</p> <ul style="list-style-type: none"> For COPD there were significant improvements between April and November 2004 for the use of: the full bundle of diagnostic interventions in the community ($p < 0.009$); and the full bundle of management interventions in the community ($p < 0.001$), at discharge ($p < 0.001$), and in the ED ($p < 0.001$). <p>On analysis of NSW hospital admission data the following results were reported:</p> <ul style="list-style-type: none"> Heart failure admissions expressed as a percentage of all NSW admissions were significantly less for October, November and December in 2004 than for the same months in 2003 ($p < 0.017$ or less at each month). COPD admissions expressed as a percentage of all NSW admissions were significantly less in November ($p < 0.003$) and December 2004 ($p < 0.001$) than for the same months in 2003, but in May and October there were significant differences in the opposite direction. | |
| <p>NSW Health's out of hospital programs: Community Acute/Post Acute Care (CAPAC); ComPacks; Rehabilitation for Chronic Disease and Healthy at Home.</p> | <p>Ongoing</p> | <p>The recent auditor general's report <i>Delivering Health Care Out of Hospitals</i> (September 2008) reported the following findings [102]:</p> <ul style="list-style-type: none"> Almost 45,000 patients per annum are currently being treated out of hospital in NSW Health's CAPAC, ComPacks and Rehabilitation for Chronic Disease programs. The number of patients cared for is equivalent to 3% of inpatient admissions and 2% of inpatient beds. It is estimated that these out of hospital programs operate at around half the cost of providing the care in hospital, costing \$55 million less per annum. In a metropolitan Sydney hospital with an established CAPAC program, 30% of cellulitis presentations to the ED were seen by the CAPAC service, avoiding admissions to hospital which equated to a saving of 741 bed days, or almost \$780,000 a year (on an annual basis). A study of the St George Respiratory Coordinated Care Program concluded that it reduced the number of hospital admissions required by patients with chronic and complex conditions from over 4 per annum to less than 1 per annum. The length of stay for patients was reduced from 6.9 days to 4.2, which represented savings equivalent to 21 inpatient beds. Between 2000 and 2003, the Rehabilitation for Chronic Disease program claimed a state-wide reduction of 56,000 hospital admissions for patients with cardiovascular, respiratory disease and cancer, equating to 89 beds saved. | <p>The Healthy at Home program is still being piloted and an evaluation commissioned by NSW Health suggests that it is not yet achieving its planned objectives.</p> <p>It is not clear whether these programs have contributed to overall improvement in the access to ED and to elective surgery in NSW.</p> |
| <p>Victoria: Hospital Admission Risk Program (HARP)</p> | <p>2002 - ongoing</p> | <p>HARP has undergone a number of comprehensive evaluations, the most recent of which was published in 2006, in which the following findings were reported [103]:</p> <ul style="list-style-type: none"> A positive overall impact of HARP on the level of hospital utilisation in Victoria was found, with 35% fewer ED attendances, 52% fewer ED admissions and 41% fewer | <p>HARP CDM Respiratory was undergoing an evaluation at the time of the survey</p> |

| Policy, Strategy, Initiative title | Implementation status | Evaluation findings | Comments |
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| | | <p>days in hospital.</p> <ul style="list-style-type: none"> The reduced need for hospital services was equivalent to approximately one ED attendance, 2 ED admissions, and 6 days spent in hospital each year for every HARP patient. HARP patients with COPD experienced: 63% fewer ED attendances; 65% fewer ED admissions and 50% fewer hospital days. There was no difference in the pattern of ongoing hospital use (presentations, admissions and number of nights spent in hospital) for both HARP and non-HARP patients with CHF. HARP patients with diabetes experienced: 38% fewer ED attendances, 73% fewer ED admissions and 40% fewer days in hospital. HARP patients with complex needs (individuals with one or more diagnoses, including COPD, CHF, or diabetes experienced): 49% fewer ED attendances, 61% fewer ED fewer emergency admissions and 57% fewer days in hospital. | <p>dissemination.</p> |
| <p>Victoria: Early Intervention in Chronic Disease in Community Health (EiCD)</p> | <p>2004 - ongoing</p> | <p>The initiative was comprehensively evaluated between 2006-2008, and the following main findings were reported [104]:</p> <ul style="list-style-type: none"> The EiCD initiative successfully demonstrated the capacity of the community health sector to engage with a client population requiring a more integrated approach to chronic disease management. Overall, agency reports suggest evidence of sustainable change in relation to EiCD programs, particularly in regard to the structure and organisation of care across agencies. A wide range of services were provided as part of EiCD programs. The most commonly reported services were nursing, diabetes education, physiotherapy, podiatry, counselling and dietetics. The complexity of clients' health and psychosocial needs was nominated as being the most important issue affecting costs. Practice changes; workforce shortages; and the impact of increased demand were identified by agencies as having the potential to affect program efficacy and effectiveness. Clinical outcome data were extremely limited; improvements in HbA1c levels were noted, but in an extremely small dataset. Shifts towards lower levels of psychological distress were also seen for some clients at six months. Patient self-reported health care utilisation (in 12 month prior) was collected. Hospital admissions (any cause) were found to have decreased slightly from 199 (30.0%) at baseline to 88 (27.2%) at 6 months; but had increased slightly for chronic disease admissions from 58.7% to 63.6%. | <p>Statistical analyses of the findings were not identified. Hospital admission data relied on patients self reporting.</p> |

| Policy, Strategy, Initiative title | Implementation status | Evaluation findings | Comments |
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| Victoria: Primary Care Partnerships (PCP) | 2000 - ongoing | <p>Evaluation of the Victorian PCP (31 across the state) has included 4 key activities [105]:</p> <ul style="list-style-type: none"> • Australian Institute of Primary Care reports (2003 and 2005) on the evaluation of the PCP Strategy • KPMG project to assess the impact of Service Coordination • Maps of program logic for strategic initiatives of the PCP Strategy • Information resource about the evaluation of the PCP Strategy. <p>The 2001-2003 comprehensive evaluation was designed to investigate the extent to which the PCP Strategy had been implemented as planned and whether the proposed relationship between the various elements of the Strategy occurred over time. The 2005 evaluation aimed to examine and describe the activities (and their effect on agencies and consumers) of the PCP during 2004-2005, and compare to 2002-2003 findings. Some of the key findings from the most recent (2005) evaluation include:</p> <ul style="list-style-type: none"> • Overall, the PCPs reported that the implementation of the strategy was proceeding strongly, particularly in relation to the key areas of partnerships, service coordination and health promotion. • The main motivation for agencies to be involved in their PCP was to improve relationships and achieve better health and wellbeing outcomes for the community. • The majority of PCPs reported that they were well advanced in their service coordination activities, with most reporting that they were advanced in their implementation of a consistent approach to supporting initial contact, initial needs identification, and care planning. • There was a significant increase in the agencies' self-rated performance in relation to activities associated with service coordination from 2003 to 2005, both at the agency level and in relation to the intended impacts on consumer experiences. <p>As a part of evaluation process, a state-wide self management mapping exercise was undertaken in 2006-07. Integrated CDM was identified as an organisational priority by 71% of the respondents and suggested that health coaching, motivational interviewing and the Flinders model of care planning are the most common approaches being applied in practice, with 78%, 72% and 54% of practitioners trained in the approach using it in practice.</p> | The effectiveness of this program on health outcomes and impacts on reducing the rate of PPH has not been assessed. |

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