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Policy Issue
Review

Primary health care-based programmes targeting potentially avoidable hospitalisations in vulnerable groups with chronic disease

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Expert Review

This report has been reviewed by Associate Professor Zahid Ansari (Manager, Health Intelligence Unit, System Intelligence and Analytics, Department of Health and Human Services, Victoria). Associate Professor Ansari has extensive experience and is well-published in the area of potentially avoidable hospitalisations.

Table of contents

Figures

Tables

Acronyms

ABS	Australian Bureau of Statistics
ACCHS	Aboriginal Community Controlled Health Service
ACSC	Ambulatory Care Sensitive Condition
ACT	Australian Capital Territory
AIHW	Australian Institute of Health and Welfare
CAD	Coronary artery disease
CCSS	Care Coordination & Supplementary Services
CNC	Clinical Nurse Consultant
APHID	Assessing Preventable Hospitalisation InDicators
CDMP	Chronic Disease Management Programme
COAG LSOP	Council of Australian Governments Long Stay Older Patients
COPD	Chronic Obstructive Pulmonary Disease
ED	Emergency Department
ED presentation	Emergency Department presentation/visit
GP	General Practitioner
GPMP-TCA	General Practitioner Management Plan with Team Care Arrangement
GRACE	Geriatric Rapid Acute Care Evaluation
HF	Heart Failure
HACC	Home and Community Care
HARP	Hospital Admission Risk Program
HARP BCOP	Hospital Admission Risk Program – Better Care for Older People
HIP	Health Independence Program
HITH	Hospital In The Home
ICDMS	Inala Chronic Disease Management Service
LHD	Local Health District
LOS	Length of Stay
LTFU	Lost to Follow Up
MHEC-RAP	Mental Health Emergency Care – Rural Access Programme
MHG	My Health Guardian
NPHA	National Health Performance Authority
NSW	New South Wales
NT	Northern Territory
NZ	New Zealand
PAC	Post-Acute Care
PAH	Potentially Avoidable Hospitalisation
PPH	Potentially Preventable Hospitalisation
PRA	Priority Response Assessment
QLD	Queensland
RACF	Residential aged care facility
RCT	Randomised controlled trial
RHP	Restoring Health Programme
SA	South Australia
SEIFA	SocioEconomic Index for Area
SES	Socioeconomic status
TREAT	Triage and Rapid Elderly Assessment Team
UK	United Kingdom
US	United States of America
Vic	Victoria
WA	Western Australia

Executive summary

This report reviews outcomes of intervention programmes targeting reductions in potentially avoidable hospitalisations (PAHs) and/or avoidable Emergency Department presentations (ED presentations) among people with chronic disease. The focus is on the role of primary health care and where possible programmes targeting specific vulnerable populations, namely Indigenous Australians, rural and remote residents and those at socioeconomic disadvantage. This report also aimed to examine trends in PAHs and ED presentations among people with chronic disease.

This report examines PAH and ED presentations according to the following structure:

- Trends in PAH and ED presentation rates: describes the current trends and rates in Australia, including recent epidemiological surveys on associated risk factors
- Overview of findings from systematic reviews: examines high level systematic review evidence identifying risk factors and the evidence base for potential intervention strategies
- Programmes to reduce PAHs and ED presentations: examines the success or otherwise of 'real world' implemented programmes targeting vulnerable populations.

Policy context

Reductions in PAHs and ED presentations are important health care policy benchmarks and represent potential for improved health outcomes, efficiency and cost savings.

- PAH is a National Health care Agreement (NHA) performance indicator, relating to the outcome *Australians receive appropriate high quality and affordable primary and community health services*. The proportion of total separations that were for PAHs is an NHA benchmark (AIHW, 2015a, p 89)
- Potentially avoidable GP-type presentations to emergency departments is an NHA indicator for the outcome area of *Australians receive appropriate high quality and affordable primary and community health services*
- In 2015, the Australian government announced formation of a Primary Health Care Advisory Group (PHCAG) to examine opportunities for the reform of primary health care in improving the management of people with complex and chronic disease (Australian Government Department of Health, 2015b). Eliminating waste and improving efficiency is part of the stated long-term strategy, and to this end achieving reductions in PAHs and ED presentations is likely to make a significant contribution.

Key findings

Trends in PAH and ED presentation rates

- In the general population, PAH rates are generally high, but stable for chronic and acute conditions, whereas they have increased for vaccine-preventable conditions
- Compared with the general Australian population, PAHs are higher in vulnerable populations (Aboriginal and Torres Strait Islander peoples, rural/remote residents, socioeconomic disadvantaged, elderly)
- ED presentations have steadily increased (beyond population growth), with the largest increases occurring in those aged 0–4 years and 20–24 years (Victorian data). ED presentations are also high in those aged 60 and over. However, increases may be related to increases in absolute number of acute presentations rather than GP-like non-urgent presentations
- Chronic diseases account for more than half of all PAHs. Chronic obstructive pulmonary disease is the most common chronic disease PAH in all states of Australia.
- Although chronic disease management programmes have been implemented Australia-wide, generally there is no statistically significant reduction in the rates of PAH and ED presentation

- Lack of consistency in the definition and use of PAHs as an indicator of primary health care access may influence findings across studies; and may not adequately determine truly avoidable events, particularly among chronically ill elderly people.

Overview of programmes to reduce PAHs and ED presentations

Systematic reviews of randomised controlled trials (RCTs), comparative cohort studies and evaluations of programmes suggest:

- Key predictors of PAHs, ED presentations and hospital readmissions include: older age, low socioeconomic status (SES), ethnicity, rurality, comorbidities, mental illness and substance use and relationship status (widowed/separated)
- Elements in successful programmes are largely context- and condition-specific as PAH rates vary according to different chronic conditions and disease severity; therefore, flexibility in approaches is needed
- Primary health care-based interventions that showed significant reductions in the rates of PAH and ED presentation included:
    - continuity of GP care, but condition-dependent (reduced rates for asthma, but not for diabetes or coronary heart disease)
    - increased GP supply, but this is likely to be more relevant in US and Canadian settings. In other settings outcomes are generally inconsistent (with the exception of asthma or hypertension where increased GP supply is associated with reduced rates of PAH and ED presentation)
    - GP management plan with team care arrangement (GPMP-TCA), particularly for patients with diabetes
    - multidisciplinary teams are likely to be important for reducing PAHs/ED presentations
    - for elderly patients, multidisciplinary teams with specialist gerontologist and integrated with social care needs reduced ED presentations
    - comprehensive, flexible vertical and horizontal integration of primary health care with hospital and community-based services
    - capacity to provide care in peoples' homes, particularly for socioeconomically disadvantaged and the elderly
    - care coordinators within a multidisciplinary team to liaise with GPs, hospital and home care services improve rates of PAH for all vulnerable populations
    - strong governance structures and clear but flexible guidelines are a common element
- Hospital-based interventions showed reduced PAHs in heart failure patients (hospital outpatient), but included intensive monitoring over a prolonged period
- For Aboriginal and Torres Strait Islander peoples, evidence is highly variable and condition-specific:
    - Remoteness is only one factor that influences rates of PAH and ED presentations, as many Indigenous peoples have multiple disadvantage, including more advanced illness, multimorbidity, low SES and poor health literacy
    - Programmes that are culturally appropriate and involve integration with other health and social service sectors are more likely to reduce rates of PAH/ED presentation
- For rural and remote-dwelling people, problems related to access and social isolation (and multiple disadvantage) may impact on rates of PAH. Successful programmes include:
    - Flexible design and implementation (e.g., on-line, telehealth services), such as HARP-BCOP and MHEC-RAP

- For low SES, cost of accessing health care, multimorbidity and low health literacy are key barriers. Factors that influence rates of PAH include:
    - Flexible, individualised approach
    - Use of nurse coordinator
    - Integration across primary health care, acute and community care (e.g., HARP-RHP, Southampton model)
- Programmes demonstrating a significant impact on rates of PAH and ED presentation across vulnerable populations include HARP, Inala-ICDM, Silver Chain Group, ACE, My Health Guardian
- Fitzroy Valley Partnership is a promising programme initiative awaiting robust evaluation.

Policy considerations

Evidence from the literature suggests that the following factors may be important to consider in developing policies related to reducing PAHs, ED presentations and hospital readmissions:

- Better validated indicators are needed. Use of PAHs as an indicator of primary health care access and health system performance may not be very reliable; and PAHs data for vulnerable groups is often lacking. Findings from an alternative indicator (APHID) are awaited
- The impact of advanced patient age on the potential of primary health care to reduce PAHs should be taken into consideration. For example, NZ does not include those aged over 75 in PAH rates
- Robust evaluation data on programmes to reduce PAHs in vulnerable populations is lacking; there is a need to incorporate routine evaluation into programme implementation
- Robust and detailed time-series data on rates of chronic PAH are lacking; this limits capacity to investigate the impact of local and national policy and programme initiatives
- All vulnerable groups would benefit from well-integrated care, involving multidisciplinary teams that include: primary health care, relevant specialists, care coordinator, and links to home care services and relevant social care needs, where required
- Culturally appropriate services for Indigenous Australians are essential, including mainstream services
- A targeted approach that is 'fit for purpose' may be needed to ensure that programmes reach those who are most in need (often also the costliest proportion of the population). For some programmes that failed to reduce PAHs and ED presentations, many patients were not frequent users of EDs or their disease was in an advanced stage and hospital care was unavoidable. Given the differences in rates of PAH across jurisdictions and between chronic conditions, dedicated condition-specific programmes, with flexibility to tailor to patient's needs, geographical location and circumstances may be required.

Some but not all evaluated chronic disease management programmes have demonstrated statistically significant reductions in PAH and ED presentation rates; despite increasing rates of chronic disease in the population, the rates of PAH have remained relatively stable, which may reflect the contribution of more successful programmes.

Background

The care and management of people with chronic disease has been a central focus of Australian health reform over the past two to three decades (George Institute for Global Health et al., 2014). While mortality rates for chronic diseases have generally decreased in Australia, chronic diseases account for approximately 85 per cent of the total burden of disease (AIHW, 2014b) and 48 per cent of potentially avoidable hospitalisations (PAHs) in Australian hospitals for the period 2013-14 (AIHW, 2015a). Achieving reductions in chronic disease-associated PAHs and avoidable Emergency Department presentations (ED presentations) is likely to produce cost savings and reduce the practical burden imposed on hospital services.

In 2013–14, approximately 22 per cent of the chronic disease PAH burden was attributed to chronic obstructive pulmonary disease (COPD), and 14 per cent to diabetes (AIHW, 2015a). Overall rates for chronic disease-related PAHs are greatest among people identifying as Aboriginal and Torres Strait Islander and people living in the lowest socioeconomic areas (AIHW, 2015a). Smoking, which is one of the key social determinants of health (AIHW, 2015b), is a major risk factor for COPD and the proportions of smokers or former smokers among Indigenous people and those from lower SES are as high as 40–50 per cent of the population (Winstanley and White, 2012). Although exact figures are lacking, the prevalence of chronic disease in Australia is thought to be very high, with current estimates of 50–80 per cent of all Australian adults having at least one chronic condition (Taylor et al., 2010, Knox et al., 2008, AIHW, 2014b). In addition, while chronic conditions are commonly associated with older age groups, the proportions are also high in those aged under 60 years.

Terminology, definitions and indicators

PAHs are also referred to in the literature as ambulatory care sensitive conditions (ACSC) or potentially preventable hospitalisations (PPHs). These terms refer to hospitalisations that may (potentially) have been avoided by the provision of timely and effective non-hospital or primary health care, including preventive care (NHPA, 2015). For consistency, the term PAHs will be used in this report.

There are three broad categories of PAHs described in the Victorian Ambulatory Care Sensitive Conditions (ACSC) Study[1] (Victorian Government Department of Human Services, 2004):

- *Vaccine-preventable*. These diseases can be prevented by proper vaccination and include influenza, bacterial pneumonia, tetanus, measles, mumps, rubella, pertussis and polio. The conditions are considered to be preventable, rather than the hospitalisation.
- *Acute.* These conditions may not be preventable, but theoretically would not result in hospitalisation if adequate and timely care (usually non-hospital) was received. These include complicated appendicitis; dehydration/gastroenteritis; pyelonephritis; perforated ulcer; cellulitis; pelvic inflammatory disease; ear, nose and throat infections; and dental conditions.
- *Chronic*. These conditions may be preventable through behaviour modification and lifestyle change, but they can also be managed effectively through timely care (usually non-hospital) to prevent deterioration and avoid hospitalisation. These conditions include diabetes complications, asthma, angina, hypertension, congestive heart failure (HF) and chronic obstructive pulmonary disease (COPD) (AIHW, 2015a, p 89)[2].

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[1] Based on classifications by Billings et al. (1993).

[2] The current list of ICD-10-AM chronic conditions included in the Australian National Health Care Agreement to define PAHs has been expanded beyond the above list to include bronchiectasis, iron deficiency anaemia, nutritional deficiencies and rheumatic heart disease (AIHW, 2015e).

Although vaccine-preventable and acute PAHs contribute to just over half of PAHs, the rapidly increasing prevalence of chronic diseases and population ageing have prompted formulation of a number of policies and initiatives to target chronic disease-associated PAHs.

Determining which hospitalisation events are preventable is not clear cut. The definition of PAH, and in particular the list of conditions included as ACSC, is not without debate and it has been highlighted that the list of ACSCs originally used to identify PAHs was reached by consensus more than two decades ago but has not been verified to date (Solberg, 2015). In addition, the list of specific conditions included in measures of PAH are known to vary and this influences the estimated rates and general relevance of programmes aimed at reducing PAHs (Bourret et al., 2015). The validity and value of PAH as a measure of health system performance is uncertain but is currently being investigated in the Australian setting by the Assessing Preventable Hospitalisation InDicators (APHID) study (Jorm et al., 2012). Further, not all chronic disease-associated hospitalisations will be avoidable as the natural progression of some chronic conditions may result in planned (or unplanned) hospitalisation events; and increasing levels of multimorbidity may also contribute to more hospitalisations.(Manski-Nankervis et al., 2014) The Australian National Health Performance Authority (NHPA) notes in reports of PAHs across Australia that "it is important to recognise that a potentially avoidable hospitalisation may have become unavoidable by the time a patient was admitted."(NHPA, 2013, pV).Therefore, a broad-based definition of PAH may overestimate the number of actual hospitalisation events that could have been managed through timely non-hospital care.

Potentially avoidable GP-type ED presentations for chronic disease and resulting in hospitalisation is another NHA indicator for the outcome area of *Australians receive appropriate high quality and affordable primary and community health service* (AIHW, 2014b). In 2012–13, an estimated 2.2 million ED presentations fulfilled the three [3] interim criteria for potentially avoidable GP-type ED presentations (AIHW, 2014b). Although the proportion of GP-like presentations specifically due to chronic conditions was not reported, as stated above almost 50 per cent of PAHs are for chronic conditions. However, the GP-type ED presentation indicator is problematic and in the 2013–14 Australian hospital statistics report for ED care, potentially avoidable GP-like ED presentations were not reported because the previously applied specifications were deemed as not fit for purpose and this outcome measure awaits improvement in the future (AIHW, 2014e). The term, GP-like ED presentations is used only where it is reported in the literature.

In a previous PHCRIS report, the concept of PAHs as an indicator for primary health care accessibility and effectiveness was examined (Katterl et al., 2012). Evidence showed a relationship between poor access to primary health care and higher rates of PAH; and factors having the strongest effect on PAH rates were age, SES, Indigenous status, rurality and comorbidity (see Table 4 in Katterl et al., 2012). In addition to providing extensive discussion on the concept of PAHs and its role as an indicator for primary health care effectiveness, Katterl et al. (2012) compiled a list of programmes aimed at reducing PAH rates for three of the most common ACSC conditions: diabetes complications, COPD and dental problems (see Katterl et al.'s report for more information). For some of the programmes, evaluation data were not available at that time, and currently there is no overview of which programmes reduced PAHs and ED presentations in people with chronic disease, or which aspects of those programmes facilitate success or lead to failure.

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[3] Interim criteria for GP-type presentations: allocated a triage category of semi-urgent (ATS4) or non-urgent (ATS5), and did not arrive by ambulance or by police or correctional vehicle, and at the end of the presentation, was not admitted to the hospital was not referred to another hospital, and did not die (AIHW, 2014b).

Policy context

Chronic disease imposes a burden not only on individuals, but also on the health system and the Australian economy, and is an important driver of health system utilisation and costs (Willcox, 2014). PAHs contribute to this burden and, based on the potential for non-hospital care or primary health care to prevent these events, they are a National Health care Agreement (NHA) performance indicator, relating to the outcome *Australians receive appropriate high quality and affordable primary and community health services*. The NHA uses the proportion of total separations that were for PAHs as a benchmark (AIHW, 2015a); and the PAH performance target for 2014–15 is 8.5 per cent of total hospital admissions (AIHW, 2015d). In 2013-14, the AIHW reported that 6.2 per cent of all hospital separations, 8.1 per cent of public hospital separations and 3.4 per cent of private hospital separations were PAHs, but it is relevant to note that 78 per cent of all PAHs were reported from public hospitals (AIHW, 2015a).

Targeting chronic disease management through non-hospital care and primary health care is thought to have the greatest potential for reducing PAHs and the associated cost. Nine of the 21 conditions included to assess PAH are chronic conditions (AIHW, 2015e), and in 2013–14, people with chronic disease accounted for approximately 48 per cent of separations for PAHs (AIHW, 2015a).

In 2015, the Australian government tasked a Primary Health Care Advisory Group (PHCAG) with examining opportunities for the reform of primary health care to improve the management of people with complex and chronic disease (Australian Government Department of Health, 2015b). Eliminating waste and improving efficiency is part of the stated long-term strategy, and to this end achieving reductions in PAHs and ED presentations is likely to make a significant contribution.

Aim

The aim of this research was to review outcomes of intervention programmes targeting reductions in PAHs and/or avoidable ED presentations among people with chronic disease. The focus was on the role of primary health care and where possible programmes targeting the following vulnerable populations:

- People living in socioeconomic disadvantage
- Rural and remote residents
- People identifying as Aboriginal and Torres Strait Islander peoples.

This report also aimed to examine trends in PAHs and ED presentations among people with chronic disease.

Methods

This report follows a 'rapid review' format. Rapid reviews are short literature reviews that focus on research evidence with a view to facilitating evidence-based policy development (Grant and Booth, 2009). Due to the limited timeframe for this review (eight weeks), searches and critical appraisal of the literature were pragmatic rather than systematic. The primary area of interest was programmes targeting PAHs or ED presentations among people with chronic disease, and identifying with one or more[4] of the following vulnerable populations: those at socioeconomic disadvantage, rural and remote residents, and those identifying as Indigenous Australians.

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[4] Substantial overlap occurs in these populations. That is, they are not mutually exclusive groups and many live with multiple disadvantage.

Although not explicitly searched for, where information relating to other vulnerable groups was identified (e.g., for the elderly, and those with mental health issues), this was also included if relevant. Similarly, programmes targeting hospital readmission were not explicitly searched for, but articles relating to this topic were included if considered relevant.

A thorough review of Australian and international literature was undertaken to search academic and grey literature sources including, but not restricted to: PubMed, Trove, Google Scholar, Scopus, PHCRIS primary health care search filter, and publicly accessible websites of relevant organisations including Australian Institute of Health and Welfare, Healthinfonet and individual chronic disease programmes. Keyword terms applied in the searches included combinations of chronic disease 'AND' one or more of the following terms: avoidable hosp*; preventable hosp*; socioeconomic disadvantage; low income; emergency admission; emergency service; emergency hospital*; rural health; rural health service; Indigenous. Searches were restricted to English language, publication period 2009–September 2015[5], and the following settings: Australia, the United Kingdom (UK), Canada, and New Zealand (NZ) as these countries have similarities to Australia in their health care systems. Relevant systematic reviews identified in the searches were appraised for quality using the Critical Appraisal Skills Programme checklists as recommended by the National Institute for health and Care Excellence (CASP UK, 2013, NICE, 2014) (See checklist for CASP in Appendix).

The list of chronic diseases used to identify PAHs aligned with the Australian Government National Healthcare Agreement (2015): asthma, congestive cardiac failure, diabetes complications, COPD, bronchiectasis, angina, iron deficiency anaemia, hypertension, rheumatic heart disease (AIHW, 2015e). To assess progress being made towards addressing PAH and ED presentation rates in the 'real world', literature searches were conducted to identify systematic reviews (high level evidence) and to identify updates of programmes highlighted in the previous PHCRIS report on this subject for those with chronic diseases. Where relevant, newer programmes reporting outcomes data were also included. Only programmes reporting outcome data were included.

General caveats

Ongoing debate pertaining to the definition of PAH, including which conditions are included and circumstances around hospitalisation, is beyond the scope of this report; but it is important to note that different definitions may influence the statistical analyses and reported findings in the literature. The ACSC categorisation of chronic conditions was originally proposed by Billings et al. (1993), and since then has been widely applied in studies of PAHs (Rosano et al., 2013). However, variation in the list of included conditions can lead to significant differences in estimated rates of PAH depending on the population being studied (Bourret et al., 2015). This review has adopted the NHA selected list of chronic conditions used to identify PAHs (AIHW, 2015e).

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[5] Final report based on literature available before November 2015.

Findings

This report examines chronic disease-related PAHs and ED presentations according to the following structure:

- Trends in PAH and ED presentation rates: describes the current trends and rates in Australia, including recent epidemiological surveys on associated risk factors
- Overview of findings from systematic reviews: examines high level systematic review evidence identifying risk factors and the evidence base for potential intervention strategies
- Programmes to reduce PAHs and ED presentations: examines the success or otherwise of 'real world' implemented programmes targeting vulnerable populations.

Trends in PAH rates

Despite the fact that all Australian states and territories have supported initiatives and policies that focus on reducing PAHs (Katterl et al., 2012, CEHSU, 2009), the overall rates of PAH in Australia have remained high, but relatively stable over the past five years, with very little change between 2009–10 and 2013–14, apart from a 41 per cent increase in vaccine-preventable PAHs (Figure 1) (AIHW, 2015a). Between the states and territories of Australia there was very little variation in rates of PAH for chronic conditions with the exception of very high rates in the NT (Figure 2). COPD was the most common chronic condition PAH in all states and territories of Australia for 2013–14. PAH rates for individual chronic conditions varied markedly between states. For example, iron deficiency and anaemia accounted for 20 per cent of chronic condition PAH separations in Victoria and Tasmania, but only seven and 11 per cent in the NT and QLD respectively. Similarly, rheumatic heart disease accounted for seven per cent of chronic PAHs in the Northern Territory but approximately one per cent in NSW, QLD and WA. The relationship, if any, of these differences to specific factors such as Indigenous status, age, SES or rurality has not been reported. However, caution should be taken when interpreting these differences, because although certain chronic conditions are known to be highly prevalent within some vulnerable populations, the proportion of PAHs attributed to specific conditions will also be influenced by factors such as the overall burden of other conditions and completeness of reporting. For example, anaemia is often associated with diabetes and people presenting with both conditions may be listed as having one or both of the conditions, and this would affect reported relative proportions for the individual conditions.

Chronic condition PAH rates including diabetes indicate a decrease in the years 2009 to 2011 (Figure 1), but this largely reflects changes in coding practices rather than any real change in specific event rates (AIHW, 2014c). These changes in reporting from year to year mean that any time series data should be viewed with caution.

Overall, data on vulnerable populations demonstrate higher rates of PAH compared with the general population. For Indigenous people, PAH rates continue to be much higher compared with non-Indigenous people. Similarly, data indicate that geographical and socioeconomic gradients in PAH exist, with higher rates in rural and remote areas and low SES areas (compared with city/metropolitan and high SES areas, respectively). However, more detailed information has also revealed wide variation within these categories (Harrold et al., 2014). Trends in chronic disease-associated PAH rates are presented in more detail in the section on specific programmes (from page 20) for the following specific populations - those at socioeconomic disadvantage, rural and remote residents, those identifying as Indigenous Australians, and the elderly.

A

B
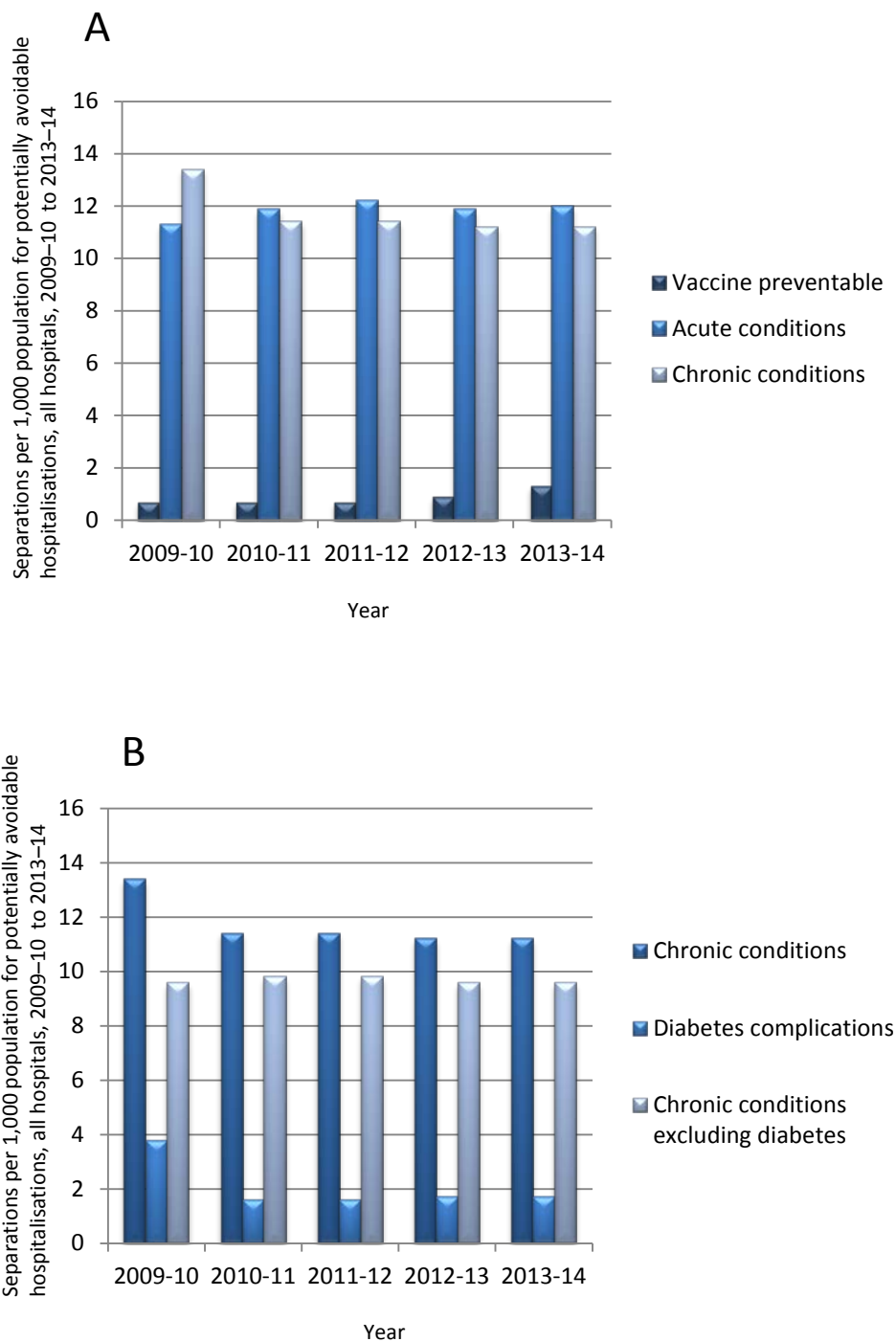
Figure 1   Trends in PAHs for A: all causes and B: chronic conditions only

Source: based on data from (AIHW, 2015a)
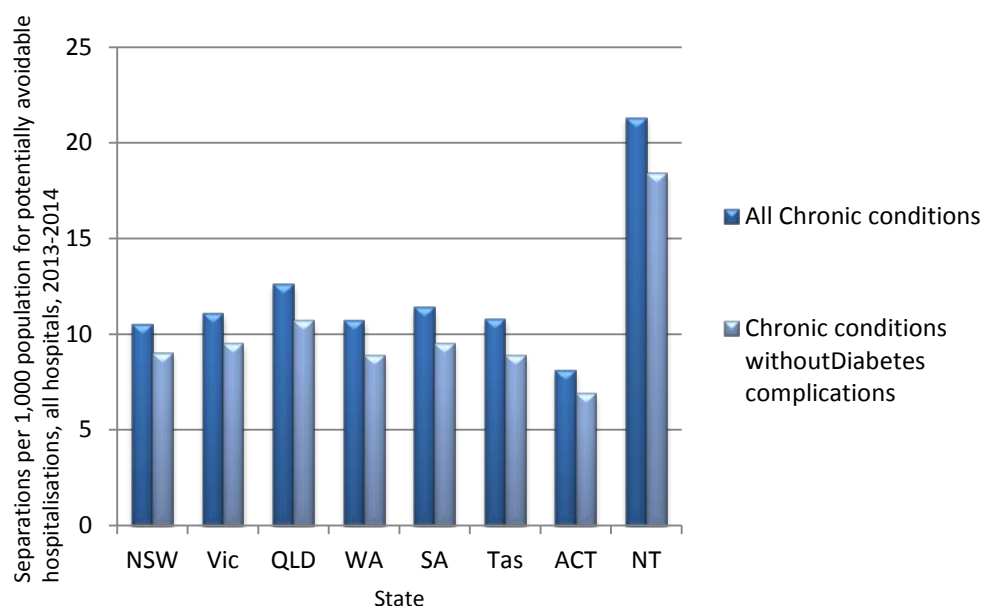
Figure 2   Rates per 1 000 population for PAHs in different states and territories of Australia for the period 2013–2014

Source: based on data from (AIHW, 2014e)

Finally, a NZ report of high relevance to the Australian setting has retrospectively analysed data for a nine-year period following substantial funding increases to primary health care aimed at improving access (Milne et al., 2015). Although access and use of primary health care improved in NZ, changes in PAH rates were inconsistent and for most age groups did not show long-term reductions in PAH or expected relationships to increased funding. It is also worth noting that the NZ Ministry of Health's definition of ambulatory sensitive hospitalisations (equivalent to PAH) only applies to patients aged 74 years or less due to the likelihood of comorbidities in older patients (Milne et al., 2015).

Trends in ED presentation rates

ED presentations have steadily increased in absolute numbers across Australia between 2009 and 2014 (Figure 3). This increase is above and beyond population growth (Freed et al., 2015b), and is likely to impact on the provision of hospital services. It is widely speculated that elderly people with chronic disease use ED services for GP-type consultations (Freed et al., 2015b). Currently, there is no accepted measure for GP-type ED presentations, although prior to 2013–14 an interim measure[6] based on Australian Triage Scale (ATS) level 4 and 5 presentations was used by AIHW (AIHW, 2014b). ATS levels 4 and 5 are equivalent to semi-urgent and non-urgent respectively (see Glossary). Based on this measure, it was estimated that approximately 39 per cent of public hospital ED presentations were GP-type presentations in 2010–11 and 2011–12 (AIHW, 2011b, AIHW, 2012).

Although the very young and the oldest age groups record the highest per population rates of ATS4-5 in an analysis of ED presentations in Victoria (2002–12), Freed et al. (2015) showed that, at least for that state, the greatest increases in absolute number of ED presentations involved younger age

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[6] Interim measure for GP-type ED presentations: was allocated a triage category of 4 or 5, and did not arrive by ambulance or police or correctional vehicle, and was not admitted to the hospital, was not referred to another hospital, and did not die (did not have an episode end status of Admitted to this hospital, Non-admitted patient emergency department service episode completed - referred to another hospital for admission or Died in emergency department as a non-admitted patient).

bands and acute ATS1-3 level presentations. Specifically, increases in ATS1-3 by 89 per cent and 95 per cent were evident for age bands 0–4 and 20–24 years respectively, compared to an increase by 63 per cent for those aged 75–79 years (age band above 60 years with greatest increase) over the decade examined. The corresponding increases for ATS4-5 were more modest at 16, 32 and 27 per cent respectively. In terms of absolute number of ED presentations for ATS 1–3 the age band 0–4 record the greatest number followed by 20–30 years although numbers do not drop off strongly until after 80 years of age, while for ATS 4-5 the same two age bands predominate but with a sharp linear reduction beyond 20–24 years. When the absolute number of age-related triage 4 and 5 ED event data reported in Freed et al. (2015b) are presented as proportions of all such events, it is apparent that children account for approximately 30 per cent of presentations and people aged 60 years and over for 20 per cent of such presentations Figure 4. Freed et al.'s (2015b) data confirm and extend an earlier study for Victoria (Lowthian et al., 2012), where similarly the greatest absolute increase in ED presentations (between 1999 and 2009) was for ATS categories 2 and 3. These data suggest that elderly people with GP-type ED presentations are unlikely to be the main contributor to overall increases in ED presentations, at least in the state of Victoria. In the earlier study, elderly people aged 85 years or older were more likely to be triaged as ATS 1-3, and have longer length of stay (LOS) in ED, reflecting increased complexity and urgency of their conditions (Lowthian et al., 2012, Freed et al., 2015b). However, elderly people arriving by ambulance because they do not have alternative transportation options might be elevated to ATS1-3, despite having ATS4-5 presentations (Freed et al., 2015b). Even if they were triaged as ATS 4 or 5, such presentations would not be counted as GP-type using the interim measure. In summary, and acknowledging that available data for ED presentation rates are for all causes and the detailed data from Freed et al. (2015b) is for the state of Victoria only, recent increases in ED presentations are likely to reflect increased presentation by the very young (age 0-4 years) and young adults (20-30 years) for all ATS categories. Elderly people aged 60 years and over have the highest per population rate for all ATS categories, but are more likely to present with ATS 1-3. However, the elderly also represent approximately 20 per cent of ATS4 and 5 ED presentations in terms of absolute number of events, with approximately half of this involving people aged 75 years or more. Children aged less than 19 years account for approximately 30 per cent of ATS 4 and 5 presentations.

Pertinent questions might be why the younger age groups are turning to ED, and whether this reflects barriers to accessing primary health care, and what proportion of events among the elderly are avoidable. To examine more closely those factors potentially contributing to the high rates of ED presentation in Victoria, Freed et al. (2015b) conducted a study of general practice access and found high level availability of same-day GP appointments with bulk-billing for low acuity conditions in children. These outcomes suggested that access and cost barriers are unlikely to be prime drivers of high rates of ATS 4 and 5 ED attendances for children in metropolitan Victoria (Freed et al., 2015a). From a primary health care perspective it would be important to know the nature of presenting conditions and whether timely intervention could have avoided the need for ED attendance. Although further investigation of this is beyond the scope of the current report, the reasons for ED attendances by children were indicated in a separate Victorian survey from 2014, where 66 per cent of ATS4-5 ED presentations for children aged <9 years were for illness (injury accounting for remainder) and most did not make prior use of the *HealthDirect* telenursing triage service (Turbitt and Freed, 2015). Specific details on the illnesses involved were not available. However, in a similarly aged cohort, data from Western Australia a decade earlier indicated that approximately 64 per cent of ED presentations were related to acute lower respiratory infections or asthma (Moore et al., 2012).
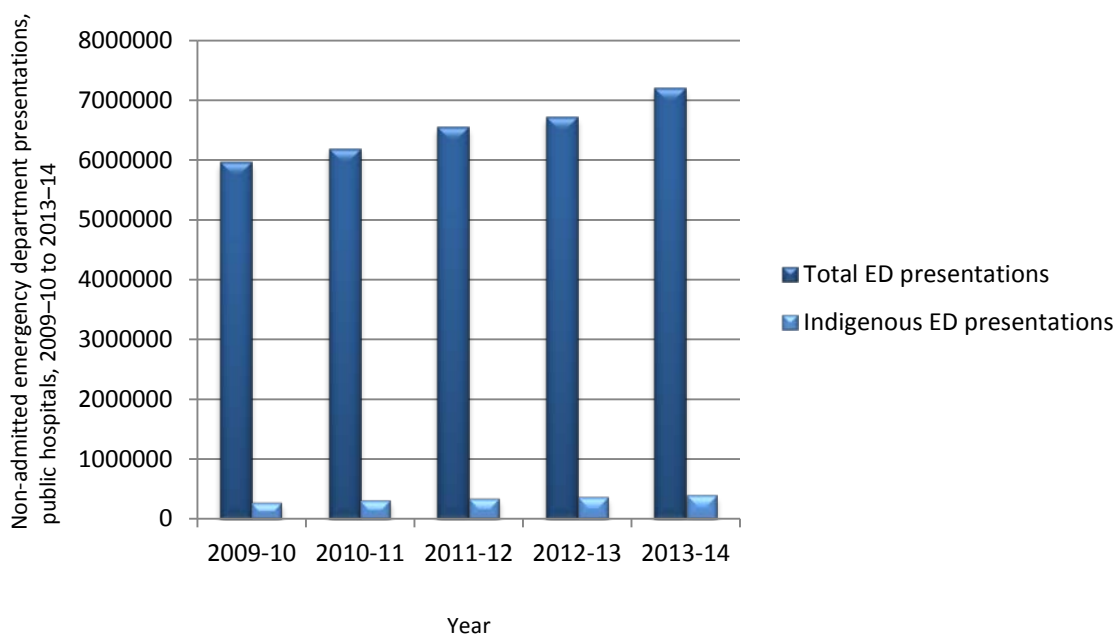
Figure 3   Trends in total ED presentations

Source: (AIHW, 2014e). To generate a time series for Indigenous events individual annual reports of Australian hospital statistics Emergency department care were used available from http://www.aihw.gov.au/hospitals-publications/. (Due to absence of reported data, for Indigenous 2010–11 a value at 5% of total ED presentations is assumed based on previous and subsequent years data).
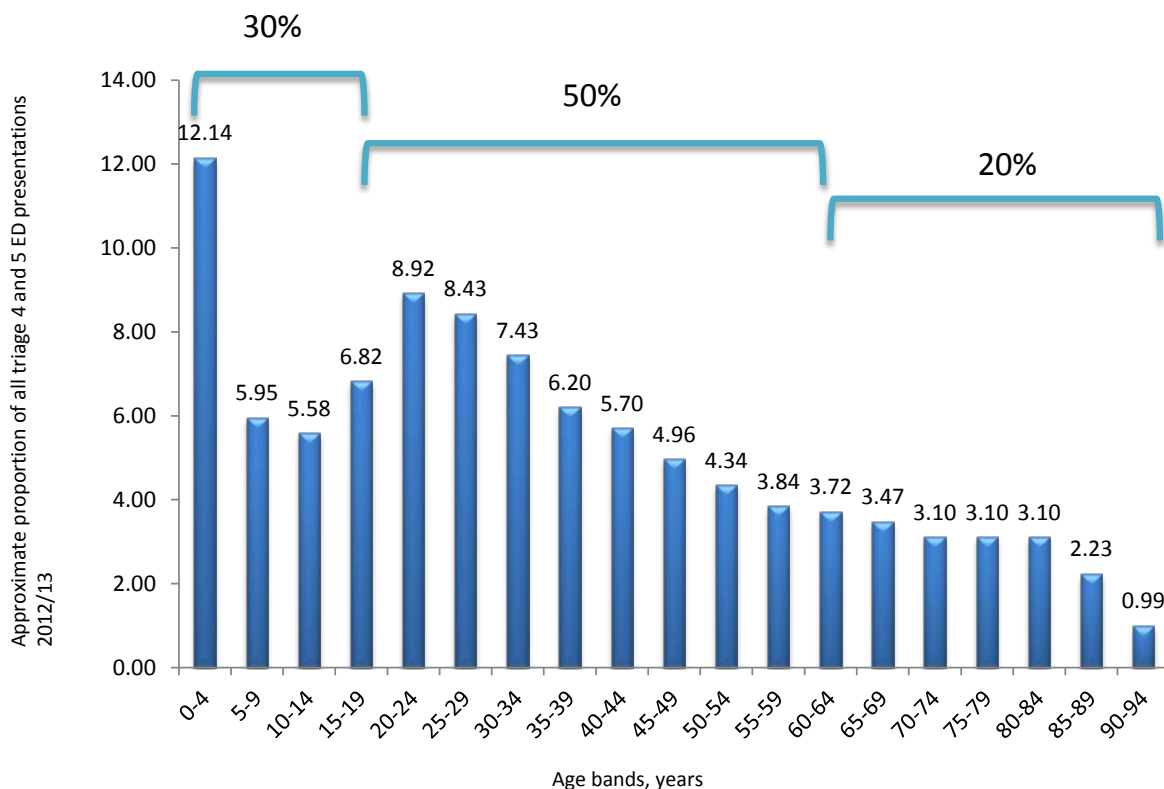
Figure 4   Approximate age related proportion of all triage 4 and 5 ED presentations in Victoria 2012–13.

Source: Based on data (from Figure 1 in Freed et al., 2015b)

In summary, overall rates of PAH are stable for acute and chronic conditions but increasing for vaccine preventable hospitalisations. Rates of chronic disease-related PAH have not changed substantially despite chronic disease management programmes implemented in most Australian states and territories. This raises questions about the proportions of chronic disease-related PAH events that are truly avoidable and why chronic disease management programmes are not having more impact on PAH rates. ED presentations have increased steadily since 2009, but due to data limitations it is not possible to determine the contribution of vulnerable populations with chronic disease to this trend or the proportion of GP-type presentations.

More detailed time-series investigation at the state and territory level together with an improved measure of GP-type presentations according to age bands (also Indigenous status, rurality, SES) would be helpful to better investigate this relationship. As noted above, it is also hoped that the Assessing Preventable Hospitalisation InDicators (APHID) study will provide more appropriate indicators for PAH that reflect truly avoidable hospitalisation events (Jorm et al., 2012). Similarly, alignment of PAH and ED presentation rates with national, state and local policy initiatives and intervention programmes as recently published for the Fitzroy Valley region of WA (Reeve et al., 2015) would be more informative in terms of evaluating the impact of these measures on PAH rates.

PAH risk factors

Rates of PAH were recently reported for the 45 and Up Study, a longitudinal study of healthy ageing aimed at answering important health and quality-of-life questions for a range of conditions such as cancer, heart disease, depression, obesity and diabetes. With an enrolled cohort of 267 091 people living in NSW this cross-sectional self-administered survey of people aged 45 and over has been shown to be representative of the relative risk estimates for the NSW population (Falster et al., 2015, Mealing et al., 2010). Sub-cohort analyses for the 45 and Up Study indicate that after adjustment for confounding factors a number of additional factors are related to increased risk for PAH but these may vary depending on the chronic condition and/or characteristics of the care provided in Table 1. For example, among study participants with chronic conditions, the rate of PAHs was generally related to Indigenous status, self-rated health, comorbidities, functional limitations, and age, but to a lesser extent or not at all to number of GPs per 10 000 residents, employment status, education level, body mass index, or psychological distress (Falster et al., 2015). However, for people with hypertension or asthma, fewer hospitalisations were reported as GP numbers increased (Falster et al., 2015). For people with diabetes, although GP management plan or team care arrangements with review were associated with lower rates of PAH, greater effects were noted for the involvement of certain allied health workers, the greatest impact being reported for involvement of a physiotherapist or diabetes educator (Comino et al., 2015). In the 45 and Up Study, smoking was shown to significantly increase the risk of PAH among people with COPD, and to a lesser but still significant extent among those with diabetes, angina or congestive HF (Tran et al., 2015a). Similarly for this group of chronic conditions, increasing positive behaviours, specifically any of non-smoking, low-to-moderate alcohol consumption, sufficient physical activity, sufficient fruit and vegetables intake, health sitting time and health sleeping time, were also associated with lower rates of PAH (Tran et al., 2014)

In the most recent report of the 45 and Up Study, data from 266 930 participants (average age 63 ± 11 years) were used to develop a predictive risk model for emergency hospitalisations with the final models including age, sex, annual average number of GP visits, number of comorbidities, prior admission and self-rated health (model 1) or functional limitation (model 2) (Lewis, 2015b). The final c-statistic was 0.733 for both models, and according to Kansagara et al. (2011), this represents

acceptable discrimination. For both models the risk for hospitalisation (hazards ratio) was approximately two to four times greater for those aged 75 years or more compared to 45–54 year old study participants. For participants aged 55–74 the corresponding increased risk was lower at 1.2 and 1.6 times. Lewis (2015b) also provided details on annual age and sex standardised rates of chronic disease PAH for the 45 and Up Study cohort over the period 2006–2011 with stratification according to metro, outer metro and regional local health districts. These data included both private and public hospital admissions, and demonstrated reducing rates of chronic PAH in all three geographical regions from 2007 onwards for this elderly cohort (see Figure 5). The significance of these changes was not addressed in the report, and it is not known whether data coding changes that impacted on state and national level data had any influence on the 45 and Up Study data. However, data for acute event PAHs demonstrated no change or small increases over the same period in the 45 and Up Study cohort (Lewis, 2015b).
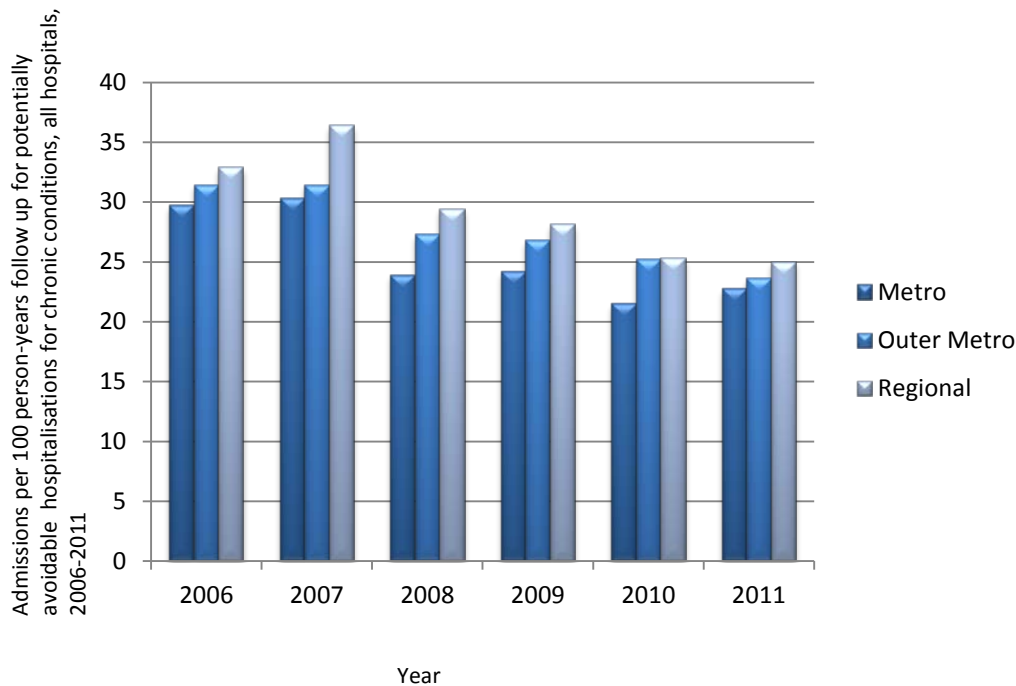
Figure 5   Potentially avoidable hospitalisations for chronic conditions among the 45 and Up Study cohort between 2006 and 2011.

Source: Based on age and sex standardised data (Table 2b in Lewis, 2015b)

Table 1   Selected outcomes of the prospective observational 45 and Up Study for factors influencing rates of PAH among people with chronic disease

Reference	Chronic conditions	Factors influencing PAH rates	Comment
(Tran et al., 2015a)*	Any	Current smoking HR 1.89 (1.75-2.03)	Smoking intensity and quitting smoking also influenced rates of PAH
	COPD	Current smoking HR 6.81 (5.87-7.89)	
	CHF	Current smoking HR 1.41 (1.14-1.74)	
	Diabetes	Current smoking HR 1.25 (1.10-1.42	
	Angina	Current smoking HR 1.32 (1.15-1.52)	
(Tran et al., 2014)**	Any history or none (62% without)	Number of healthy behaviours[§]: 0 - HR 1.13 (0.8-1.61) 1 – HR 1.00 2 – HR 0.82 (0.73-0.92) 3 – HR 0.76 (0.69-0.85) 4 – HR 0.57 (0.51-0.63) 5 – HR 0.49 (0.44-0.54) 6 – HR 0.46 (0.41-0.52)	Individually, smoking and physical activity had the greatest impact
(Comino et al., 2015)***	Diabetes	Continuity of care HR 0.92 (0.89-0.96) Annual cycle of care HR 0.77 (0.74-0.80) GPMP/TCA preparation HR 1.04 (1.01-1.07) GPMP/TCA review HR 0.92 (0.89-0.96) Urinary microalbumin monitoring HR 0.54 (0.53-0.56) Multidisciplinary team HR 0.92 (0.89-0.96) Diabetes educator HR 0.76 (0.68-0.86) Physiotherapist HR 0.63 (0.58-0.69) Podiatrist HR 0.98 (0.94-1.02) Exercise physiologist HR 0.75 (0.64-0.89) Dietician HR 0.86 (0.79-0.94)	Increased risk for PAH with Medicare record of claim for: Increased GP visits, long consultation, insulin, GPMP/TCA preparation, ophthalmologist eye examination, cholesterol monitoring Decreased risk for PAH with Medicare record of claim for: Oral antidiabetic medication, annual cycle of care, GPMP/TCA review, HbA1c monitoring, urinary micro-albumin monitoring, eye examination by practice nurse, multidisciplinary care (HR with individual providers as listed)
(Falster et al., 2015)# from supplementary figure 3.	Any or none (62% without)	Incidence rate ratios (IRR) for chronic disease PAH: Age 45–54 1.0 (reference group) Age 65–74 years IRR 2.38 (2.22-2.54) Age 75–84 years IRR 3.15 (2.94-3.37)	Higher rates of admission associated with older age and poorer health

Reference	Chronic conditions	Factors influencing PAH rates	Comment
		Indigenous status IRR 2.06 (1.85-2.28) Widowed or separated (versus married or partnered) IRR 1.14 (1.10-1.17) Four healthy behaviours$^\beta$ (versus one) IRR 0.81 (0.76-0.86) Self-rated health poor (versus excellent) IRR 5.38 (4.85-5.97) One comorbidity (versus none) IRR 1.59 (1.51-1.67) Three or more comorbidities (versus none) IRR 4.11 (3.9-4.33) Psychological distress$^\yen$ very high (versus low) IRR 0.85 (0.79-0.93) Functional limitation$^\delta$ severe (versus none) IRR 2.32 (2.17-2.48)	

* Adjusted for age, sex, BMI, education, marital status, household income, remoteness, language other than English, private health insurance, prior PAH admission in past 12 months and number of positive health behaviours. **Adjusted for age, sex, education, marital status, income, remoteness, language other than English, private health insurance, history of chronic diseases, prior PAH admission and mutually adjusted for other health behaviours.***Adjusted for age, gender, country of birth, education, household income, ARIA+, duration of diabetes and number of chronic conditions;§Healthy behaviours were non-smoking, <14 alcohol drinks per week, ≥2.5 hours physical activity per week, ≥2 servings of fruit and 5 servings of vegetables per day, <8 hours sitting time per 24 hours, ≥7 hours sleeping time per 24 hours; #Adjusted for all person-level variables and area-level quintiles of full time workload equivalent GPs; HR = hazard ratio; IRR = Incident Rate Ratio; β healthy behaviours were non-smoking, <14 alcohol drinks per week, ≥2.5 hours physical activity per week, ≥2 servings of fruit and 5 servings of vegetables per day; ¥Psychological stress measured using the Kessler-10 scale;δ Functional limitation measured using the Medical Outcomes Study physical functioning scale..

With respect to the importance of management plans, retrospective examination of data for almost six thousand elderly Australian veteran patients with HF also showed a significant association between use of general practitioner management plans with team care arrangements and delayed time to next PAH for HF, Hazard Ratio = 0.77 (0.64-0.92) (Vitry et al., 2014). However, approximately 60 per cent of the intervention group reported at least one any cause hospitalisation in the previous year compared to only five per cent of controls, and as noted by Vitry et al. (2014) this between-group difference may be a source of confounding that in part explains the reported outcomes. The authors also listed a number of other potential confounders, and this reflects the non-controlled study design.

In summary, factors influencing rates of PAH (and potentially ED presentation) in the Australian context vary depending on the chronic condition, but are likely to include age, prior admission, Indigenous status, health status, functional status, comorbidity, and health behaviour. Interventions likely to impact on rates of PAH are those programmes based on access to multidisciplinary teams and general practitioner management plans. Future programmes may also benefit from addressing health behaviour and functional status. Findings on the impact of smoking are particularly pertinent to PAHs in vulnerable groups that have higher rates of smoking, such as Indigenous Australians, those living in rural/remote areas and those in lower socioeconomic status (SES) (Winstanley and White,

2012). However it should also be noted that the evidence from the 45 and Up Study highlighted here requires confirmation in other relevant cohorts and may be context specific.

Overview of findings from systematic reviews

The primary focus of this report is to identify programmes aimed at reducing rates of PAH and ED presentations for people with chronic disease, and identifying as Aboriginal and Torres Strait Islander, and/or rural or remote resident, and/or at socioeconomic disadvantage. Systematic reviews represent high level evidence that minimises the inherent bias of single cohort studies, and pooling of studies is used to identify specific intervention- and patient-related factors likely to be relevant across different settings. Knowledge of these factors provides a framework with which to review programmes addressing PAHs and ED presentations among the target groups.

Six systematic reviews were identified relating to patient-level variables and prediction of PAH, ED presentation or readmission risk, and 12 reviews explored the relationship between primary health care or hospital-based interventions and risk for PAH, ED presentation or hospital readmission (Table 7). Assessment of the systematic reviews indicated that most were of acceptable quality, although many were restricted to English language publications and in some instances the applicability of outcomes to the Australian setting was limited by the inclusion of very few Australian studies and/or a high representation of US-based studies.

Patient-level predictors

Patient-level predictors identified in systematic reviews generally confirmed the importance of age, socioeconomic status, ethnicity, and rurality in risk for PAHs and ED presentations, and also for hospital readmission as highlighted in the previous PHCRIS review (Table 6) (Henson et al., 2015, Kansagara et al., 2011, Muenchberger and Kendall, 2010, Ross et al., 2008, van Tiel et al., 2015, Wallace et al., 2013, Katterl et al., 2012). In addition, relationship status and comorbidity/multimorbidity is associated with higher rates of PAH, ED presentation and readmission, while mental health and alcohol or substance use were implicated in some systematic reviews. Many of the studies included in these reviews were aimed at development of predictive risk models for the purpose of risk stratification of patients according to risk for hospitalisation. As recently reviewed, the predictive accuracy of these models is modest but similar, and while targeting those at most risk can improve sensitivity and positive predictive value, this may potentially lead to health care inequalities (Lewis, 2015a, Oliver-Baxter et al., 2015)

Interventions to reduce PAH and ED presentations

Thirteen systematic reviews were identified that addressed primary health care and hospital-based interventions aimed at reducing rates of PAH (Gibson et al., 2013, Rosano et al., 2013, Thomas et al., 2013, van Loenen et al., 2014, Stokes et al., 2015), or ED presentation (Fan et al., 2014, Flores-Mateo et al., 2012, Huntley et al., 2014, Soril et al., 2015), or hospital readmission (Benbassat and Taragin, 2013, Leppin et al., 2014, Takeda et al., 2012), or hospitalisation and ED presentation (Hickam et al., 2013). A summary of findings from these reviews is presented below.

Potentially avoidable hospitalisation (PAH)

Continuity of care with a primary health care provider was associated with reduced rates of hospitalisation in most settings (Huntley et al., 2014, van Loenen et al., 2014). However, this outcome varied depending on the presenting condition, and was supported for asthma but not diabetes or CHD, although the number of studies was small (Huntley et al., 2014).

Systematic reviews supported the relationship between improved primary health care access (or GP number) and reduced PAHs in the US and Canadian settings, but generally not in non-US health care systems such as the UK (Rosano et al., 2013, Huntley et al., 2014, van Loenen et al., 2014). An exception to this was one systematic review (Gibson et al., 2013) judged to be of lower quality, where improved access to primary health care was associated with reduced PAHs among patients with diabetes or chronic disease in non-US countries. This review also showed that an increased number of primary health care visits (primary health care use) was associated with increasing rates of PAH (Gibson et al., 2013). Associations with other factors such as workforce number and composition were inconclusive (van Loenen et al., 2014). Finally, with respect to practice characteristics, outcomes were inconsistent. The availability of practice nurses was associated with less PAHs among COPD and asthma patients; and this was only true for diabetes patients where a community health worker was also involved (van Loenen et al., 2014, Gibson et al., 2013). In a review of outpatient case management[7] Hickam et al. (2013) found no evidence that this influenced hospitalisation rates among people with chronic disease, but did find that it was associated with reduced ED presentations for those with COPD (based on 17 studies). However, case management was associated with improved self-management particularly among those with progressive disease or serious social problems (Hickam et al., 2013). The most recent analysis of case management for 'at risk' patients in primary care included 36 individual studies in a meta-analysis and also found no evidence for a reduction in primary or secondary care use or total costs (Stokes et al., 2015). Separate analyses were made to account for study design, strength of primary health care orientation (characteristics of health system policy that are conducive to primary care, as well as characteristics of clinical practice), multidisciplinary team versus single case manager, type of risk tool used, and inclusion of a social worker. However, with the exception of patient satisfaction (small effect size) none of the outcomes examined reached significance even after accounting for the identified study differences. According to the authors, the evidence did point to more effective care with programmes that included multidisciplinary teams and a social worker. It was also noted by the authors that pooling the results from programmes conducted in different contexts is problematic because accounting for programme differences is very difficult and challenged by inconsistent reporting. This should be viewed as a potential limitation of meta-analysis for complex programmes. A small number of effective programmes may be masked by ineffective programmes unless the critical differences have been identified and accounted for.

One systematic review examined the impact of hospital-based interventions on PAH rates among adults (Thomas et al., 2013). This is relevant to the current review because it provides a comparative measure against which to evaluate the impact of hospital-based programmes incorporating primary health care. Findings from 10 RCTs of interventions for HF patients, found a significant impact on PAHs of specialist clinics located in hospital outpatient centres (Thomas et al., 2013). The predominantly European studies suggested collectively that intensive monitoring over the first two months after discharge and three monthly visits thereafter resulted in a 58 per cent reduction in relative risk for emergency admission.

Emergency Department (ED) presentation

Four systematic reviews were identified that explored primary health care-related variables and ED presentations, although the applicability of outcomes to the Australian setting may be limited (Huntley et al., 2014, Flores-Mateo et al., 2012, Fan et al., 2014, Soril et al., 2015). Based on 36 weak

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[7] A health care service in which a single person, working alone or in conjunction with a team, coordinates services and augments clinical care for patients with chronic illness.

to moderate quality studies, seven common elements of intervention models aimed at reducing ED presentations among elderly people were identified (Fan et al., 2014). These elements were:

- multidisciplinary team and gerontological expertise
- integrated and enhanced primary care
- integrated social and medical care
- risk screening and geriatric assessment
- care planning and management
- discharge planning and referral coordination
- follow-up and regular group visits.

Most community-based and some hospital-based intervention studies were associated with significant reductions in ED presentations (Fan et al., 2014). All of the effective community-based interventions included multidisciplinary teams and gerontological expertise.

Increased access (numbers of primary health care centres or GPs) was associated with reductions in ED presentations by as much as 40 per cent (Flores-Mateo et al., 2012). Similarly, after hours service provision was associated with ED presentation reductions, but telephone services were not, with a suggestion that they delay rather than resolve the problem (Flores-Mateo et al., 2012).

There was moderate support for the value of case management in reducing frequent ED presentation, but limited and inconclusive evidence for individualised care plans and information sharing (Soril et al., 2015).

Evidence for practice features such as size and location, depending on setting (US versus UK) and condition (asthma versus diabetes) was inconsistent (Huntley et al., 2014). Huntley et al. summarises the current evidence base as providing no clear support for any particular policy change. Similarly a non-systematic review (Purdy, 2010) also found insufficient evidence for the impact of care plans on reducing rates of PAH.

Hospital readmission risk

Publications reporting on hospital readmission were not specifically searched for in the current review. However, an overview of relevant articles identified during the search of data sources provides an update to the previous PHCRIS report.

In a high quality meta-analysis of six studies targeting patients with HF, case management generally involving a specialist nurse was associated with a significant reduction in HF-associated readmissions at six months and 12 months (odds ratios 0.64 (0.46-0.88) and 0.47 (0.30-0.76) respectively) (Takeda et al., 2012). However, the authors concluded that it was not possible to say what the optimal components of the case management-type interventions were. Although not specific for chronic conditions, a separate analysis of 47 studies with overall low risk of bias, found that intervention characteristics associated with reduced hospital readmission included improving patient capacity for self-care, having a high degree of intervention complexity (five or more unique components), and involving two or more individuals in care provision (Leppin et al., 2014). Studies published after 2002 were found to be less effective, and the authors suggest a number of possible explanations for this including general improvement in levels of care leading to lower rates of readmission among control groups and less room for improvement, or a move towards high tech interventions with less emphasis on human interaction. In a very comprehensive meta-review of 57 published meta-analyses covering various patient groups, Benbassat and Taragin (2013) concluded that for people with HF, a combination of community-based interventions including discharge planning, disease

management, patient education, home visits and pharmacist care reduced rates of hospital readmission, but telephone or outpatient clinic follow-up did not. However, with the possible exception of coronary heart disease and bronchial asthma, for most other chronic conditions intervention outcomes were inconsistent or failed to reach significance.

Summary

Overall, systematic reviews of predominantly retrospective database and prospective studies confirmed the importance of age, socioeconomic status, ethnicity, and rurality in risk for PAHs and ED presentations, and also for hospital readmissions. Relationship status, comorbidity/multimorbidity, mental health and alcohol or substance abuse were also implicated in some systematic reviews.

With respect to systematic reviews of interventions, currently available evidence from mostly controlled trials suggests that reduced rates of PAHs and ED presentations are likely with continuity of GP care, and possibly multidisciplinary disease management programmes including use of practice or specialist nurses. In the US, availability of GPs is associated with reduced rates of PAH and ED presentation, but the evidence is less consistent for other countries. In contrast, increasing number of GP visits may indicate an increased risk for PAHs; although again this may differ between health care systems depending on accessibility to specialists. However, it is important to acknowledge that these findings are largely based on intervention trials and outside of this context many patients may be hospitalised or present to ED despite having good access to a GP of their own choice, and interventions based only on GP access may have variable impact in different 'real world' settings (Manski-Nankervis et al., 2014). Demonstration that outcomes are sensitive to the population or chronic condition studied, particularly where vulnerable groups are concerned, emphasises the importance of tailoring approaches aimed at characterising and targeting PAHs to the specific population and context (Purdey and Huntley, 2013).

Programmes to reduce PAHs and ED presentations

As noted above, despite all states and territories having supported implementation of chronic disease programmes, there has been little change in PAH rates among people with chronic disease over the past decade. Although this observation should be regarded with caution due to data limitations, this is similar to the NZ experience where improved access to primary health care has not correlated with reductions in PAH (Milne et al., 2015). A large evaluation of 16 pilot programmes for integrated care in the UK also concluded that there was no evidence of a general reduction in emergency admissions for programmes that predominantly concentrated on improving horizontal integration between primary care and community-based services (RAND Europe, 2012). However, there was a significant reduction in planned admissions. As noted in a non-systematic review of programmes (Purdey and Huntley, 2013), in light of uncertainty surrounding evidence for interventions to reduce ED presentation activity there is a need for "robust evaluation of services as they are introduced into health and social care systems" (p 340). Although numerous relevant programmes were identified through searching of literature data bases and specific website content, most did not report outcomes data or provide a rigorous evaluation and therefore were not included in the current review. In many cases, reporting was minimal for eligible programmes, and it is recommended that future evaluation of interventions is built into programmes as was done for the NSW CDM and the ACE programmes outlined in the following sections.

Details of thirteen eligible programmes included in the current review are provided in Table 8 and Table 9 of the appendices. Due to overlap between the vulnerable population categories considered in the current review, with many participants identifying with all three, a number of the programmes

have been included in more than one category. In the following sections, the aim was to provide examples of programmes implemented for a particular vulnerable population and to summarise the intervention-associated outcomes in that context. Due to the pragmatic nature of the current rapid review, the list of programmes is not exhaustive but illustrative, and only those directly relevant to rates of PAH and/or ED presentation have been included.

Overall, results showed that programmes targeting vulnerable populations achieved the greatest significant reductions in PAH and ED presentation rates through provision of comprehensive but flexible integration of primary health care and hospital- or community-based services. The more successful programmes (in terms of reducing PAH) incorporated care coordinators who worked in close collaboration with GPs, or delivered care in the patients' homes. For Indigenous people, culturally appropriate services were key facilitators. For both disadvantaged and elderly people, care within a person's own home was a key factor in overcoming barriers to accessing care. The MHG online education and monitoring programme also achieved significant reductions in PAH rates, and although more modest than some of the more intensive programmes, the less resource-intensive nature of this approach is likely to reflect positively on cost-effectiveness, although this was not reported. In contrast, programmes that failed to achieve effective vertical integration between hospital and primary health care services did not achieve reductions in PAHs or ED presentations. It should be noted that a lack of impact on rates of PAH and ED presentation does not mean that a programme is without impact, as other outcomes including improved quality of care and patient satisfaction are also relevant to patient care. Additional programmes of interest, but not specifically targeting the vulnerable groups of primary interest to this report, include the Diabetes Care Project and the Evercare programme (UK). Both of these programmes failed to achieve statistically significant reductions in PAH events, but provide valuable insights into implementation of programmes, as discussed below.

The Diabetes Care Project was a coordinated model of primary health care aimed at improving quality of care for people with diabetes. Participants were allocated either to a control group, an enhanced model of care (Gp1), or an enhanced model of care with flexible funding and increased funding for care facilitation and quality improvement payments (Gp2) (Australian Government Department of Health, 2015a). Based on a three-year follow-up period for almost 7 000 patients[8], the change in PAH for Gp2 versus control was a 0.9 per cent reduction (not statistically significant). Although PAH-related costs were reduced, this was largely due to reduced LOS and again not statistically significant. An important finding was that 62 per cent of PAH-related costs were accounted for by five per cent of the most costly participants (average $48,623 per year versus an average of $4 670 for the least costly 80% of the cohort).

The UK-based Evercare programme was based on the successful US Evercare programme targeting older people at risk of ED hospitalisation. The programme involved delivery of an intensive, nurse-led case management strategy with the aim of reducing PAHs. In the US, Evercare enrolment was based on being resident in a nursing home (mean age for intervention 83.7 ± 8.7 years), and led to a 50 per cent reduction in hospitalisation events (Kane et al., 2003). In the UK, the Evercare model had almost no impact on admissions, an outcome that was attributed to failure to recruit only those patients most likely to benefit (Gravelle et al., 2007, Boaden et al., 2006, Ross et al., 2011). In the UK, the original criteria for selection were age ≥65 years and two or more ED admissions in the previous year. However, this was later broadened to include a history of ED admissions, and in many sites there was a shift towards case-by-case clinical judgement; case selection was generally less systematic than in the US (Boaden et al., 2006, Gravelle et al., 2007). The US model also included

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[8] 6,853 active patients at baseline after final risk stratification.

intensive home nursing care when participants fell ill, but this was not implemented in the UK (Boaden et al., 2006). These findings suggest that programmes should be fit for purpose, and there needs to be some indication that improvement is possible. For example, the Inala programme discharges participants when it is judged that no further improvement is possible; and HARP and Silver Chain Group both have an array of sub-programmes targeting people in different circumstances. In a review of case management strategies (including Evercare UK), Ross et al. (2011, p 1) suggest that successful case management programmes require inclusion of "good access to primary care services, supporting health promotion and primary prevention, and co-ordinating community-based packages for rehabilitation and re-ablement".

Indigenous people with chronic conditions
Background

According to the 2015 Australian Institute of Health and Welfare (AIHW) report on the health and welfare of Australia's Aboriginal and Torres Strait Islander peoples, expenditure on PAHs for Indigenous people was approximately $219 million in 2010–11, and almost 53 per cent of this was on chronic conditions of which COPD and diabetes together accounted for one third of expenditure (AIHW, 2015b). However, although average expenditure on PAHs for Indigenous people was 2.22 times that for non-Indigenous, the highest ratio of Indigenous to non-Indigenous PAHs expenditure was for pelvic inflammatory disease (4.56) and influenza/pneumonia (4.47) (AIHW, 2015b). In 2010-2011, substantial funding was provided for Indigenous health, with total spending amounting to $7 995 for every Indigenous Australian compared to $5 437 for every non-Indigenous Australian (Russell et al., 2013b). Despite this, two thirds of the gap between Indigenous and non-Indigenous in terms of health is due to chronic disease (Russell et al., 2013b).

Based on the AIHW Access Relative to Need index (ARN)[9], a report from the Royal Flying doctor Service (RFDS) noted that Indigenous people in all regions of Australia (but particularly in very remote areas) are poorly serviced compared to non-Indigenous people (The Centre for International Economics, 2015). The ARN for Indigenous and non-Indigenous respectively show values of approximately 6.0 versus 7.8 for inner regional areas and 0.47 versus 5.8 for very remote. The importance of access to primary health care was supported by a recent analysis of data corresponding to 14 184 remote community-dwelling Indigenous patients with chronic disease and accessing primary health care in the period 2002–11 in the Northern Territory (Zhao et al., 2014). In that retrospective study of 54 communities, medium-level primary health care use (defined as 2–11 visits annually) was shown to be associated with reductions in PAH by 60–85 per cent depending on the chronic condition and compared to low level primary health care use (≤2 visits annually). Based on the same data set for Indigenous people, it was estimated that the cost of preventing one hospitalisation for diabetes was $248 based on medium-use of primary health care compared to an average cost for a single hospitalisation of $2 915 (Thomas et al., 2014).

In contrast to these findings, a retrospective analysis of data for RFDS aeromedical evacuations and GP access in 20 remote NT communities over a shorter two-year study period (2008–10) and based on all medical conditions, found that increased GP access was associated with increased hospitalisation (Hussain et al., 2014). The majority of aeromedical evacuations were for three

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[9] ARN index = access to primary health care relative to predicted need for primary health care and population mobility. Scores range from 0 to 12; higher numbers indicate better access relative to need, whereas lower numbers indicate poor access relative to need. The Indigenous ARN measure used by AIHW is based on linkage between the measure of the capacity of the general practitioners (GPs) accessible to the population residing in a given area to meet the total demand of all the populations they serve, and the Indigenous-specific predicted need for primary health care and estimated mobility (AIHW, 2014a).

diagnostic categories: respiratory (20.5%), injury/poisoning (19.2%) and ill-defined (16.2%). The authors postulated that this unexpected finding was potentially due to one or more of the following: increased burden of chronic disease, poor health literacy leading to delay in access and outcompeting of opportunities for preventive intervention, over-caution with respect to responding to Indigenous clients as a consequence of increased scrutiny, or GP workload reducing the opportunity to help with time-consuming events. Care should be taken when interpreting these studies because both were based on retrospective data analysis, and neither included data from Aboriginal Community Controlled Health Services (ACCHS). It should also be noted that while the research of Zhao et al. (2014) was based on hospital admission data, the RFDS evaluation (Hussain et al., 2014) does not necessarily equate to hospitalisation.

Although the rates of PAH among Indigenous and non-Indigenous are known to vary with remoteness, a detailed NSW study based on data for the period 2003–2008 demonstrated that higher rates of PAH among Indigenous people are not solely due to the increased likelihood of living in rural and remote areas (Harrold et al., 2014). Illustrating the complex and context-specific nature of Indigenous rates of PAH in both remote and regional areas, measures of high disparity compared to non-Indigenous were found but also areas such as the remote area of Hay where there was little or no difference.

Rate and trends

Indigenous Australians have high reported rates of PAH. Selected[10] PAH rates for Aboriginal and Torres Strait Islander peoples were reported to be five times the non-Indigenous rate between July 2008 to June 2010 (Australian Government, 2012). Vaccine preventable conditions accounted for around three per cent of all ambulatory care sensitive hospital admissions, acute conditions for 33 per cent of admissions and chronic conditions for 64 per cent of admissions (AIHW, 2015a). Diabetes and COPD are the most common causes of PAH among Indigenous people (Australian Government Department of the Prime Minister and Cabinet, 2014) (Figure 6).

Separations per 1,000 population for potentially avoidable hospitalisations, July 2011 to June 2013
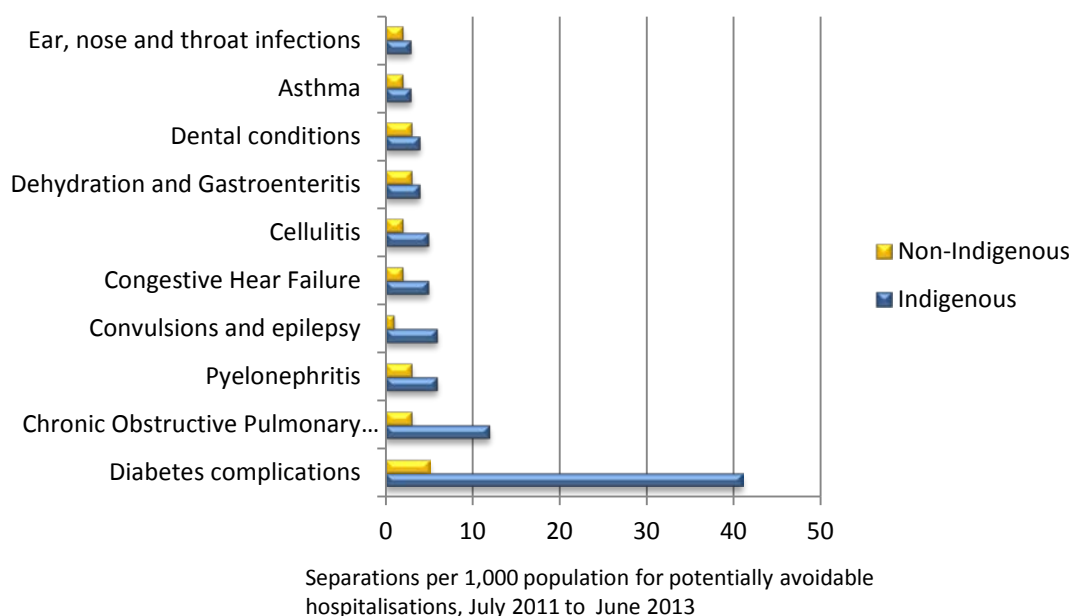
Figure 6   Top 10 PAHs, by Indigenous status, July 2011–June 2013.

Source: (see Figure 3.07-3 in Australian Government Department of the Prime Minister and Cabinet, 2014)

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[10] Based on AIHW coding practices- For more information on coding used refer to the AIHW National Healthcare Agreement; PI---22 selected potentially preventable hospitalisations, 2012.

In the period 2012–13, rates of chronic condition PAH for Indigenous people were reportedly 4.3 times higher than for non-Indigenous people (67 per 1 000) (Edith Cowan University, 2015). Current figures (2013–14) for chronic condition PAHs of Indigenous Australians indicate a rate of 23 per 1 000 population, over three times the rate for non-Indigenous Australians at six per 1 000 population (AIHW, 2015a). Based on these figures, and recognising limitations in data collections for the purpose of identifying series trends, hospitalisation data trends in PAHs for Indigenous people have been reported as remaining stable (Table 2).

However, rates of PAH for Indigenous people also vary according to remoteness. While non-Indigenous PAH rates for 2010–12 were similar for residents of remote and very remote areas versus major cities (1.4 and 1.2 times respectively), Indigenous people living in remote and very remote areas were respectively 4.3 and 1.6 times as likely as those living in major cities to experience a PAH (AIHW, 2015b).

Consideration must also be taken for under-identification of Aboriginal and Torres Strait Islander people. This is a persistent limitation in most administrative data collections; and is considered a major problem in hospital and mortality data collections, particularly for some states and territories (Australian Government, 2012, ABS, 2008).

Table 2   Separations per 1 000 for PAH for chronic conditions, by Indigenous status 2012–14

Recording Period[11]		
	2012-13	2013-14
Indigenous	67.1	23.5
Non-indigenous	15.5	6.1

Source: (AIHW, 2015a, Edith Cowan University, 2015).

Nationally, 5.4 per cent of all ED presentations were for Indigenous Australians who represent about 2.6 per cent of the Australian population (AIHW, 2014e). The quality of the data reported for Indigenous status in EDs has not been formally assessed; therefore, caution should be exercised when interpreting these data (AIHW, 2014e).

Programmes to reduce PAHs and ED presentations
Although only two programmes with outcomes data relevant to PAH and/or ED presentations were identified for Indigenous Australians with chronic disease, the approaches and outcomes were very different and highlight the importance of vertical integration, and cultural appropriateness in attempting to improve outcomes for PAH and ED presentation rates among Indigenous people. A third programme, the Chronic Care for Aboriginal People—Model of Care (CCAP) has not been evaluated to date, but a key component of this model is the Walgen Tilly 48-Hour Follow-Up programme and preliminary reports have associated this with a four per cent (significance not reported) decrease in hospital readmissions (Havrlant and Simons, 2013). An evaluation report for the 48-Hour Follow-Up programme is currently being prepared and is likely to include rates of hospital readmission, ED presentation, mortality and adverse events (Simons, 2015).

NSW CDMP
The NSW chronic disease management programme (NSW CDMP) is a Local Health District (LHD)-based programme targeting potentially avoidable acute service use among individuals already engaged with specialists and acute care for one or more of the following chronic diseases: diabetes, COPD, congestive HF, coronary artery disease (CAD), or hypertension (George Institute for Global Health et al., 2014). The NSW CDMP predominantly recruited non-Indigenous people. However, recruitment of Indigenous participants was targeted with a bias towards over-representation compared to the Australian population average, and reached 5.5 per cent of the cohort.

A total of 2 423 Indigenous participants were included in the evaluation of the NSW CDMP programme, and most were aged 50–65 years, and commonly classified as being in the most disadvantaged SEIFA categories (George Institute for Global Health et al., 2014). Model features designed to improve intervention appropriateness for Indigenous people included planned intersection between the NSW CDMP and primary health care delivered by the ACCHSs, and referral of participants through the Care Coordination and Supplementary Services (CCSS) and 48-Hour Follow-Up programmes. Additional approaches reported by LHDs included co-case management, case conferencing, sharing care plans with service providers, and hiring specialist staff with skills and experience working with Indigenous people. Each LHD site was to deliver the NSW CDMP based on relationships with these organisations, and with mainstream primary health care and Medicare locals.

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[11] Due to changes in coding of selected diseases and data uncertainty any year to year differences should be regarded with caution.

Unexpectedly, the longitudinal evaluation study based on comparison of all participants with propensity score-matched controls, found that for both intervention and control groups rates of PAH and ED presentation initially decreased sharply due to regression to the mean, before gradually increasing; but rates among CDMP participants were consistently and significantly higher than for controls (overall difference: 0.29 PAH per patient per year, p<0.001). Evaluation of outcomes for Indigenous people enrolled in the programme were similar, with consistently higher rates of PAH and readmissions compared to matched controls (overall difference: 0.45 PAH per person per year, p<0.001). However, rates of ED presentation among Indigenous people were not significantly different between CDMP participants and controls.

Potential explanations provided for the poor outcomes included: the acute care location for recruitment of participants (for Indigenous people, this was often through the 48-Hour Follow-Up Program and the CCSS) and that most of the programme care coordinators were located in hospitals; there was minimal engagement of GPs; and almost no engagement of ACCHSs or consumers. As noted in the evaluation report, case finding in the acute setting may have identified unmet need (i.e., bias towards selection of patients judged to need admission to hospital). Case study comparisons of three NSW regions with high numbers of Indigenous people highlighted the GP-centric implementation of the programme in the Western NSW region, versus the mixed GP/LHD and LHD-centric implementations for Hunter New England and Western Sydney, but it was reported that findings in each of the LHDs were similar to the overall findings (George Institute for Global Health et al., 2014). Analysis of key variables including socio-demographic characteristics, geographic location, and acute service utilisation in the year preceding enrolment identified two factors significantly associated with the between group difference in PAH; pre-enrolment ED presentation in the previous year and CAD. Between-group difference in PAH was less with one ED presentation in the previous year but greater for two or more. Between-group differences were not significant for participants with CAD, suggesting that this condition may be more amenable to management with the NSW CDMP.

For the NSW CDMP people with complex chronic disease, care needs were generally identified at a peak time of acute service utilisation. Therefore, the implemented CDMP can be viewed as a reactive model of care rather than a pro-active model, and this contrasts with the fundamental core of most chronic disease management programmes (George Institute for Global Health et al., 2014). As stated in the evaluation report, this could be regarded as a "disconnect between the Program's ambitions and effective risk identification and mitigation" (George Institute for Global Health et al., 2014, p 24).

Fitzroy Valley
The Fitzroy Valley partnership supports a community comprising approximately 80 per cent Aboriginal and Torres Strait Islander peoples. The partnership demonstrated the impact that culturally appropriate vertical and horizontal integration of existing services and targeting people at all levels of need can have on health care use and ED presentation (Reeve et al., 2015). Essentially this programme formalised a partnership between the hospital, ACCHS, and community health services to share responsibilities and improve the acceptability of health care services for Indigenous people. The partnership was based on previously published rural health care framework and a clear programme logic approach as recommended by the National Strategies for Improving Indigenous Health and Health Care (Dwyer et al., 2004, Tham et al., 2010). Clear definition of roles with a single governance structure and shared, flexible funding facilitated the partnership (Reeve et al., 2015). Each provider service had distinct but synergistic responsibilities.

Once fully operational and funded, the main outcomes were increased use of primary health care including chronic disease care plans, and approximately 50 per cent reduction in ED presentations

over a two-year period (Reeve et al., 2015). To facilitate Indigenous engagement, a key enabler was the communication between local Indigenous communities and community primary health care hospital services via the ACCHS, and flexible funding arrangements to enable MBS listing of care plans.

Rural and remote residents with chronic conditions

Background

People in rural and remote regions are more likely to delay access to health care than those living in urban areas, and it is suggested that there are three broad reasons contributing to this: geography (need to travel long distances); availability of health professionals; and rural culture (importance of self-reliance and sense of alienation in urban-based facilities) (Brundisini et al., 2013). In terms of chronic diseases, the delay in appropriate treatment is likely to lead to disease progression and increased rates of unavoidable hospitalisation for secondary complications. Rates of PAH vary considerably across Australian rural regions. This is at least in part due to variations in socioeconomic disadvantage and the proportions of Indigenous people, but beyond these factors there is evidence for the influence of self-rated health, number of comorbidities, and functional limitations (Falster et al., 2015). However, isolation leading to loneliness among rural people, particularly the elderly, has also been proposed as one factor contributing to high rates of PAH and ED presentation among rural people with chronic disease (Longman et al., 2013). In that qualitative study of carer insights, practical consequences of social isolation included not taking medication, not accessing services, or poor self-monitoring. Telehealth is primarily used to improve access in rural and remote areas (Katterl et al., 2012).

Rate and trends

Living rural or remotely is linked to higher rates of chronic condition PAH. Table 3 shows that, in the period 2012–13, the overall rate of chronic condition PAH was highest for residents of *Remote* and *Very remote* areas (32 and 41 per 1 000 population, respectively) and lowest for residents of *Major cities* (16 per 1 000) (AIHW, 2014c). Similarly, for the period between 2013–14, the overall rate of PAH was highest for residents of *Remote* and *Very remote* areas (17 and 24 per 1 000 population, respectively) and lowest for residents of *Major cities* (11 per 1 000). Residents of *Remote* and *Very remote* areas had the highest rates of PAH across the three categories of PAHs (vaccine-preventable, acute or chronic) (AIHW, 2015a).

Table 3   Rates of PAH per 1 000 population for chronic conditions by remoteness area of residence 2011–14

	Recording Period		
	2011-12	2012-13	2013-14
Major cities	12.1	16.1	10.5
Inner regional	13.3	16.8	11.7
Outer regional	15.0	19.2	13.3
Remote	30.6	31.7	16.8
Very remote	33.8	40.5	23.9

Source: (AIHW, 2015a, AIHW, 2013, AIHW, 2014c).

However, within geographic regions there remains additional variation in rates of PAH. In a selective comparison of PAHs for chronic conditions in 2009–2011, the NHPA reported that urban rates per 100 000 people ranged from 848 in the Metro 1 region to 1032 in Metro 2 (NHPA, 2013, p17). Although this variation is in part due to socioeconomic disparity, within areas of geographic and

socioeconomic equivalence, there was evidence of further variation as reflected in the wide ranges. Variation between Medicare Local areas in the Metro 1 region ranged from 643 to 1 130 and in the rural 2 region from 1 477 to a high of 2 237 per 100 000 people. Differences in rates of PAH between Indigenous and non-Indigenous residents, and according to socioeconomic status is likely to explain some of the variation within both urban and rural areas (Australian Government Department of the Prime Minister and Cabinet, 2014). As shown in Figure 7, differences according to geographical region are greater among Indigenous Australians than for non-Indigenous Australians.
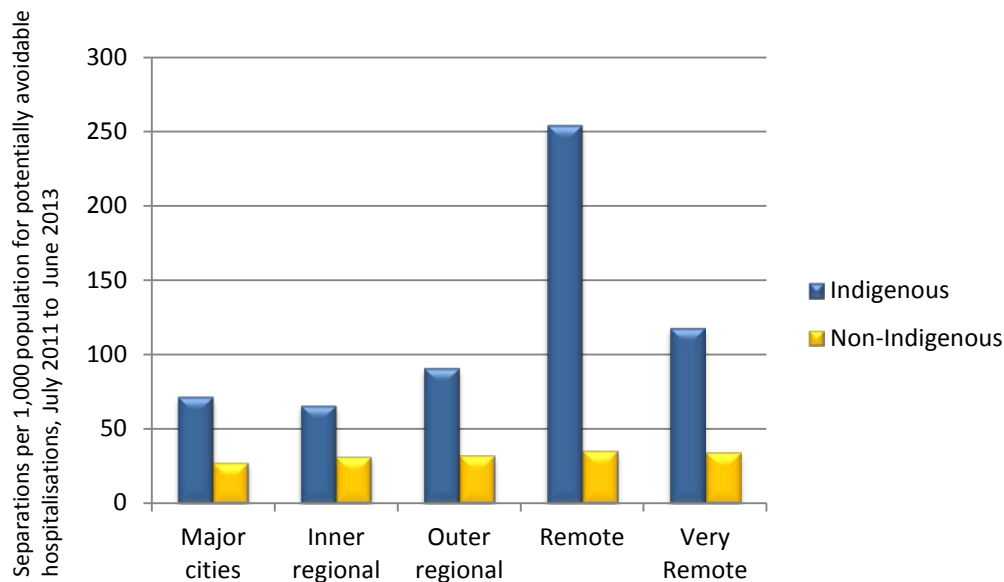
Figure 7   PAHs, by Indigenous status and remoteness, July 2011–June 2013.

Source: (Figure 3.07-1 in Australian Government Department of the Prime Minister and Cabinet, 2014)

Programmes to reduce PAHs and ED presentations

Programmes implemented in rural areas need to overcome a number of issues specific to the non-urban context including isolation, reduced access to care facilities and workforce issues. Programmes demonstrating success in targeting PAHs and ED presentations among people with chronic disease in the rural setting were characterised by flexibility in programme design and implementation, and the use of online and telehealth approaches. Examples of these are described below.

HARP BCOP

The Victorian HARP Better Care for Older People (BCOP), which is based on consortia between acute and community-based health care providers, was initially piloted in 13 rural regions before being taken up into the Council of Australian Governments Long Stay Older Patients (COAG LSOP) Victorian Government initiative (Australian Healthcare Associates, 2011). This programme is equally relevant to the vulnerable population of elderly people. Although evaluation reports for the individual rural pilot centres were not identified, the overall outcomes reported included significant 64 per cent reduction in PAHs, and 55 per cent reduction in ED presentations (State Government of Victoria, 2014, Australian Healthcare Associates, 2011). The remote and rural regions of Victoria located in Gippsland and the western areas of the Loddon Mallee are included in the HARP BCOP catchment areas. However, specific details for service provision in these geographical areas have not been identified but may be of value to other remote regions of Australia. The HARP BCOP service has since been mainstreamed into the Victoria HARP (Russell et al., 2013b, Australian Healthcare Associates,

2011). No further evaluation report has been identified corresponding to the period since the service was mainstreamed.

Key elements of this programme included:
- effective communication through information processes/systems
- access to education and training for staff
- patient-centred programmes
- clinician engagement
- community involvement and empowerment
- community outreach
- strong support from senior leadership
- information systems to facilitate communication (Australian Healthcare Associates, 2011).

As for all HARP initiatives, the HARP guidelines formed the basis of implementation, but each regional HARP BCOP centre was required to draw up an individual implementation plan. An evaluation found that most stakeholders considered the programme to be "well planned, well thought through and well executed" (Australian Healthcare Associates, 2011, p 29). Specific aspects of the programme to ensure appropriateness for the rural regions have not been published, but there was an emphasis on development of local implementation plans including consideration of local needs and resources. Areas identified as barriers in rural settings included the limited funding for home oxygen, and difficulty of completing blood gas analysis to qualify for home oxygen. It was also noted that rural people often face long waiting lists and must endure extensive travel to access HARP BCOP-based care and this is often difficult for people with chronic diseases. These could represent areas for future resource and funding improvement to the programme.

Tele-CDSMP
The Canadian telehealth Chronic Disease Self-Management Program (Tele-CDSMP) delivers self-management programmes to rural patients via telephone and video connection (Jaglal et al., 2014, Jaglal et al., 2013). Demonstrating the potential of telehealth-based programmes, tele-CDSMP service provided in 13 rural and remote communities of Ontario, Canada demonstrated a non-significant 41 per cent decrease in ED presentation (p=0.08) among participants aged older than 66 years (including 55% with heart disease and 84% with arthritis), but no impact on rates of hospitalisation. Although significance of outcomes was not reached, the authors noted that in view of the relatively low rates of pre-programme ED presentation and hospitalisation it is likely that cohorts of patients at greater risk might gain more benefit.

Mental health emergency care – rural access programme (MHEC-RAP)
The mental health emergency care—rural access programme (MHEC-RAP) is a telephone/video-based mental health triage and assessment service based in regional Australia to provide rural patients and health care providers with 24/7 access to mental health services (Saurman et al., 2014b). Although not located within primary health care, this programme provides support to GPs and primary health care providers, as well as referring patients to these services as needed. The impact of this service on PAH and ED presentation has not been reported, but the MHEC-RAP services handled 10 000 calls over a four year period and led to an overall reduction in hospitalisation by referring patients to more appropriate care based on telephone triage. This triaged-based care coordination approach is similar to many of the hospital avoidance programmes featured in the current report. Future analysis to identify the impact of MHEC-RAP service availability on ED presentation and PAH could be useful, and the details of service provision would be instructive.

Socioeconomic disadvantaged people with chronic conditions

Background

As reviewed extensively in the 2012 PHCRIS report, both Australian and International evidence strongly indicates that individuals from low SES backgrounds have poor health, difficulties accessing primary health care and high rates of PAH compared with those from high SES backgrounds (Katterl et al., 2012). Common approaches to preventing PAHs among people of low SES include improving access to care, identification of high-risk individuals through use of predictive risk models, and multifactorial approaches to provide medical, psychosocial and cultural health support (Katterl et al., 2012).

Rate and trends

Social disadvantage is linked to increased rates of PAH. For 2013–14, the overall rate of total PAHs generally decreased with increasing levels of socioeconomic advantage, ranging from 19 per 1 000 for residents of areas classified as being in the highest SES group to 31 per 1 000 for residents of areas classified as being in the lowest SES group (see Table 4.23 in AIHW, 2015a). Similarly, for people with chronic conditions (Table 4), PAHs generally decreased with increasing levels of SES ranging from almost 15 per 1 000 (2013–14) for residents of areas classified as being in the lowest SES group, through to less than eight per 1 000 for residents of areas classified as being in the highest SES group (AIHW, 2015a). More than one chronic condition may be reported with a PAH; however, the available data do not report the number of conditions by PAHs, therefore preventing analysis according to multimorbidity/comorbidity.

Similar overall trends have been reported in ED presentations that may have been potentially avoidable. For 2012–13, absolute number of GP-type ED presentations were highest for patients living in areas classified as being the lowest SES group (517 000 presentations, 24% of total) and lowest for patients living in areas classified as being the highest SES group (341 000 presentations, 16% of total) (AIHW, 2014c).

Table 4 Rates per 1 000 population for PAH for total chronic conditions by SES 2011–2014

SES	Recording Period		
	2011-12	2012-13	2013-14
1- Lowest	17.5	22.0	14.5
2	13.8	18.4	12.3
3	14.1	18.8	11.0
4	11.0	14.2	9.8
5- Highest	8.4	10.9	7.8

Source: (AIHW, 2015a, AIHW, 2014c, AIHW, 2013).

Programmes to reduce PAHs and ED presentations

Programmes aimed at reducing PAHs and ED presentations among people of low SES are likely to be challenged by low health literacy levels, poor health service utilisation, and lower overall health status compared to more advantaged groups (Katterl et al., 2012). The three successful programmes highlighted here have in common an intensive, individualised approach with a strong nurse coordinator presence and the flexibility to accommodate individual circumstances and to call on a wide range of expertise as needed.

Inala Chronic Disease Management Service (ICDMS)

ICDMS is a community-based integrated programme encompassing multidisciplinary team approaches to improving care and self-management among those with complex chronic disease. Central to the ICDMS are the clinical fellows (up-skilled local GPs) who work in a 'beacon practice' with an endocrinologist, diabetes educator and a podiatrist to deliver coordinated care, drawing on additional expertise from allied health professionals as required. This upskilling approach allows specialist endocrinologists time to see more patients. After 12 months, or when no further improvement is considered likely, patients are referred back to their usual GP.

An evaluation of the ICDMS for people from the low socioeconomic area of Inala, and with complex type 2 diabetes demonstrated a significant reduction by approximately 50 per cent in the incidence of PAH with type 2 diabetes as the principal reason for admission (Incidence rate ratio 0.53, 95% CI 0.29-0.96, p=0.04) (Zhang et al., 2015). The most common reasons for hospital admissions among programme participants were ophthalmic complications and foot ulcer (indicating continued hospitalisation for these complications despite programme participation). Both of these are late stage complications of type 2 diabetes (Forbes and Cooper, 2013). No mention is made of programme components specific for people from a low SES, but the programme evaluation was based on care for complex diabetes cases among lower SES residents of Inala.

Southampton model

The UK-based Southampton model is a primary care-based programme of education and case-finding delivered to patients at high risk for COPD and resident in Southampton, a city identified as severely deprived in socioeconomic terms (Wilkinson et al., 2014). Following intervention implementation in the region, 30-day readmission was reduced from 13.4 per cent to 1.9 per cent (p<0.01) in just 12 months (Wilkinson et al., 2014).

This reduction was largely based on provision of work packages designed to improve GP and nurse COPD education, use of spirometry, patient review and screening across the primary care practices in Southampton, together with targeted specialist-based intervention for high-risk COPD patients. Uptake of the work packages across primary health practices was very good, with only two of 36 practices approached declining. In the second part of the programme, a review of hospital admissions for COPD led to identification of 34 COPD patients with three or more admissions in the previous 12-month period, who were then targeted with an admission avoidance strategy involving an at-home appointment with a COPD consultant, open access to a respiratory centre and consultants, and after-hours COPD nurse community teams.

Wilkinson et al. (2014) noted that this approach was based on redesign of an early discharge service already in place at the Southampton hospital; and transferability of these outcomes to other settings would depend on the availability of similar early discharge services. Support of practice nurses was identified as a key component of the programme's success in that they were responsible for the majority of diagnoses and management of respiratory disease. With respect to the programme participants, and in view of the known poor health service utilisation among people from lower SES, the at-home consultations and after-hours access may have contributed to the overall success.

HARP Restoring Health Programme

The Restoring Health Programme (RHP) is a Victorian-based, multi-disciplinary model of care for patients with chronic conditions including lung diseases, HF, and diabetes (Howard et al., 2008). The programme was established under the Victorian Government Hospital Admission Risk Program (HARP) to improve quality of life and function for patients with these target chronic diseases and also to reduce acute health care utilisation at St Vincent's Hospital Melbourne (SVMH). The RHP

incorporates both acute and community-based resources. These include hospital-based key contact liaisons (one in the community for when they are home-based and one in the hospital); community-based outreach nursing and allied health staff; outpatient disease-specific rehabilitation programmes incorporating patient education, exercise, avoidance of risk factors, and psychosocial support; and a rapid access outpatient clinic for urgent medical assessment (Howard et al., 2008). A large proportion of SVHM patients are pensioners and/or from socially disadvantaged communities, so there is no cost to patients to participate in the programme.

A longitudinal study of a cohort (N = 351 patients) showed reduction in ED presentations, hospital admissions, and LOS (Howard et al., 2008). All decreased significantly from six months pre-recruitment compared with six months post-recruitment (P < 0.001). Clinically, this translated to 1540 fewer days in hospital (mean decrease in LOS of 4.39 days per person [95% CI, 3.61–5.62]), 164 fewer ED presentations (a mean per person decrease of 0.47 [95% CI, 0.31–0.62]), and 190 fewer hospital admissions (mean 0.55 [95% CI, 0.41–0.67]) in the six months after recruitment to the RHP. When the cohort was split into three chronic disease groups, the same trends continued, with all groups showing statistically significant decreases in their acute care utilisation. It is possible that results are confounded by the influence of other hospital or other health sector initiatives, but analysis was beyond the scope of this study.

No subsequent published evaluation of the RHP (since 2008) has been located although recent publications reported on ED readmission HARP models in elderly people experiencing pain (Howard et al., 2014) and a prospective observational study (N=185) that found marital status of "divorced/separated/widowed" was associated with 3.5-fold increased risk for ED presentation even after enrolment in RHP (Tran et al., 2015b). However, personal correspondence (Howard, 2015) has clarified that the St Vincent's Hospital Melbourne continues to operate a number of HARPs. Difficulty finding publicly available programme outcomes occurs partly because the programme is transitioning and being renamed HIP (Health Independence Programs) by the Victorian Department of Health. Additionally, analyses involve reviewing internal data sets and the delivery of acute-focussed programmes, which are not often made publicly available. The HIP programmes encompass all sub-acute ambulatory care programmes, of which a number are focussed on particular target groups that are high users of the acute system. These include those affected by the homelessness, substance mis(use), family violence, chronic diseases, Aboriginal and Torres Strait Islander peoples and aged care. A Residential In-reach Programme which involves a rapid response specialist nursing/medical support service to residential aged care facilities, to support GPs and aged care facilities to manage their residents' issues on-site rather than presenting to ED is currently under evaluation.

Other vulnerable groups

Elderly

Definitions of 'old' are subjective, and although many people aged 65 years might not regard themselves as being 'old', for the purposes of this report and based on Australian retirement age and chronic disease development, elderly is defined in the literature as aged 65 years and older. However, in line with AIHW reporting, where possible, distinction is made between those aged 85 years and older. Rates of PAH increase with increasing age (Figure 8); so too does the prevalence of chronic disease; and as the population of Australia ages, this means that the absolute number of chronic disease-associated PAHs is likely to increase in the future. Based on this, policy and planning programmes aimed at reducing hospital utilisation among people with chronic disease tend to target patients over 65 years of age even though a significant proportion of younger people also have chronic disease (Whyatt et al., 2014).
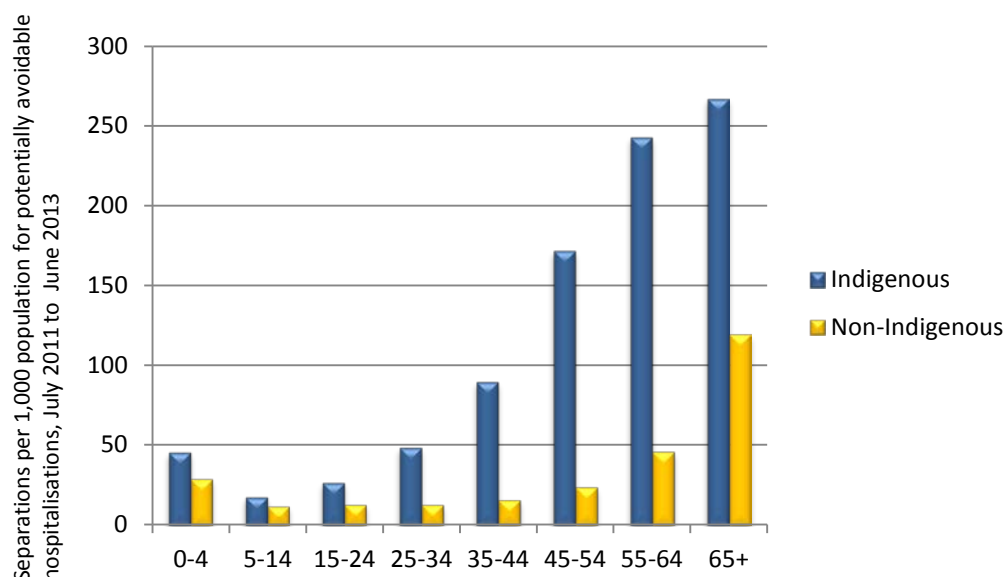
Figure 8   PAHs, by Indigenous status and age group, July 2011–June 2013

Source: (Australian Government Department of the Prime Minister and Cabinet, 2014).

Rate and trends for PAHs and ED presentations

Rates of PAH are not routinely reported according to age band by the AIHW (2011a). However, over half of *Emergency* patients were aged 45 years and over (AIHW, 2010). In the absence of PAH data for older Australians, patterns of hospital separations have been reported (Table 5). Between 2009–10 and 2013–14, there were large increases in number of separations for persons aged 65 to 74 years and for persons aged 85 and over by approximately six per cent each year (AIHW, 2015a). However, overall proportion of hospital separations accounted for by those aged 65 and over remained relatively stable at about 40 per cent of total, and similarly for those aged 85 and over, hospital separations remained at seven per cent in the periods covering 2011–13 to 2013–14 (AIHW, 2015a, AIHW, 2013, AIHW, 2014c).

Table 5   Proportion of hospital separations for older Australians

	Recording Period		
	2011-12	2012-13	2013-14
> 65 years	39%	39%	40%
> 85 years	7%	7%	7%

Source: (AIHW, 2015a, AIHW, 2013, AIHW, 2014c)

Programmes to reduce PAHs and ED presentations

Five examples of programmes having a significant impact on PAH rates among the elderly were identified: HealthOne, Silver Chain group, HARP, MHG and ACE. Each of these programmes employs a flexible patient-centred approach with, in most cases, a central role for nurse coordinators and close collaboration with primary health care. Provision of services in the patient's home was a common strength in the HealthOne, Silver Chain group and MHG programmes. In contrast, the UK hospital-based TREAT programme designed to reduce LOS and hospital admission rates among patients aged 70 or over through early specialist input and alignment of primary, community and acute care, had no overall effect after two years (Wright et al., 2013). Similarly, the Western Sydney Care Navigation (CN) programme based on in-hospital nursing staff to coordinate care of predominantly elderly

patients presenting to ED did not have a significant impact on re-presentations or readmissions (Plant et al., 2015). However, as discussed below these overall outcomes may mask underlying positive impacts with these programmes.

HealthOne

HealthOne is an initiative of the NSW Government to bring state-funded primary and community care services together with Commonwealth-funded general practice (McNab et al., 2013). The core driver of the HealthOne model of care is the employment of GP liaison nurses who use received referrals and assessment to identify the patient's needs and coordinate care as appropriate. Based on a hub-and-spoke model of delivery, the GP liaison nurses work closely with community health services and GPs. Participants recruited for the chronic and complex disease arm of the Mount Druitt programme were selected based on criteria consistent with the elderly, including: aged ≥75 years, at risk for falls, and cognitive impairment. An extensive and detailed evaluation report is available for the Mount Druitt cohort (McNab et al., 2013). A total of 125 HealthOne participants were enrolled in Mount Druitt, NSW, and mean age was approximately 68 years.

Based on comparison of data for people with chronic and complex conditions, in the 12 months prior and 12 months post-enrolment, significant improvements were noted for average number of ED presentations per patient respectively from 3.1 (2.7–3.4) events to 2.3 (2.0–2.7) events (p=0.006). Similarly, average time spent by a patient in ED decreased (12.5 versus 6.6 hours, p=0.009), as well as average LOS in hospital (6.3 versus 3.7 hours, p=0.041). Average number of ward admissions per patient did not change significantly (1.4 versus 1.2 per 12 months, p=0.082). Implementation of this model also resulted in reductions in referrals for community health services particularly referrals from acute care, and the interested reader is referred to the evaluation report for a more detailed review of these outcomes (McNab et al., 2013).

One of the key achievements of HealthOne was to:

> … provide people with a broader range of health and social care services and a better quality of life in their own homes and so has reduced the impact of their illnesses and in some instances the disability associated with these illnesses (McNab et al., 2013, p 8).

Patient care coordination by a GP liaison nurse, and the impact of this on improved coordination and working relationships between health workers, was seen as critical to success. Qualitative surveys among GPs indicated that the top benefits associated with the programme were: improved range of health services in Mount Druitt; closer working links with other organisations/more comprehensive planning for individual clients; and enhanced relationships with health workers/better service coordination for patients with multiple needs. Case studies emphasised the importance of non-medical community-based services such as home-help in relieving patient anxiety and improving quality of life, and the importance of community-nurses to communicate with patients about their condition (often on a repetitive basis). Flexibility to adapt to local conditions was also reported as important.

Silver Chain Group

Silver Chain group provides health care services coordination by a nurse coordinator with the aim of assisting people to remain in their own home, and most, but not all, recipients are elderly. The core services of the Silver Chain Hospital in the Home (HITH) service are: Hospital At The Home (HATH), Post Acute Care (PAC), Priority Response Assessment (PRA) and Community Nursing (CN), Home and Community Care (HACC). HITH is a true hospital substitution, PRA is a hospital avoidance programme,

PAC is a post-discharge care in the home, CN is also a hospitalisation alternative for sub-acute interventions, and HACC combines services as required for elderly patients.

While the Silver Chain group programmes have a number of impacts on patients and service provision, with respect to PAHs, reductions by 29 per cent (significance not indicated) were achieved overall with HACC, and this was further improved on through implementation of the home independence programme (HIP) that aims to promote independence and minimise the need for ongoing support by improving functionality, health literacy, and nutrition. Based on comparison to HACC, the HIP was significantly less costly by 30 per cent over a 2-year period, and although not significant the odds ratio for ED presentation was reduced to 0.81 (0.6-1.1, p=0.183), and odds ratio for hospital admission reduced to 0.85 (0.62-1.17, p=0.316) (Lewin et al., 2014). Potential reasons for not reaching significance were not discussed in the publication.

A Silver Chain group telemonitoring service for people with COPD also demonstrated reduced rates of PAH particularly over winter months. As with HealthOne, the Silver Chain Group programmes provide health care service in the patient's home, and liaise closely with all service providers to ensure patients receive the care required based on their personal needs.

HARP BCOP

As noted above, the HARP BCOP programme implemented in rural centres for elderly people achieved significant reductions in PAH by 64 per cent, and led to a 55 per cent reduction in ED presentations (State Government of Victoria, 2014).The tailoring of HARP BCOP to community needs is likely to include measures that reflect the needs of aged populations as appropriate.

Aged Care Emergency (ACE)

Based on a central nurse coordinator and application of clinical algorithms to address the needs of residential aged care facility residents, the aim of ACE was to reduce ED presentations and the time spent in ED by elderly patients. The central nurse coordinator has responsibility for the patient but an older persons technical assistant under direction from the central nurse coordinator provides assistance with screening of older people (e.g., for cognitive impairment, pain, carer strain), improving patient and carer's experience, and supporting delirium prevention, as well as documenting and communicating the needs of ACE patients. The ACE programme was implemented at the John Hunter Hospital ED, with an evaluation study being completed in 2012 (Conway and Higgins, 2012). Based on this, ACE was associated with a 35 per cent reduction in hospital LOS, a 16 per cent reduction in ED presentations (p=0.009), and a 19 per cent reduction in ED admissions for patients aged 75 years and older and coming from a residential aged care facility (Conway and Higgins, 2012) p67). This programme is currently in place in 10 NSW hospitals and is undergoing further development and evaluation. Improved relationships between staff located at both facilities were noted, and is a likely key facilitator of success. The programme is specifically designed for the elderly, and while the role of the older person technical assistant is undergoing further evaluation, the assignment of a dedicated staff member to communicate with and monitor the elderly patient was nominated as an important contributor to outcomes (Conway and Higgins, 2012).

My Health Guardian (MHG)

The core of MHG is an online programme offering health assessments, health action plans, personalised health support, education and health behaviour tracking (Hamar et al., 2015). Registered nurses provide telephone support to assist self-management, and this is facilitated by the availability of patient data, assessments, individual action plans tailored to patient data and assessment responses. The online MHG programme targeted a cohort of almost 5 000 individuals, where 80 per cent were aged 60 years and over and the average number of chronic conditions was

1.39 with 44 per cent reporting diabetes and 73 per cent CAD (Hamar et al., 2015). Over a four-year period, the odds ratio for hospital admission and readmission were 0.73 (95% CI 0.69-0.78) and 0.55 (95% CI 0.48-0.63), respectively compared to a matched control group. This represented a 27 per cent and 45 per cent significantly decreased odds for each event, respectively, and programme benefits increased as time in the programme increased up to four years (end of evaluation period). Savings per member for the four-year period were $3 549 for intervention versus control. Participant satisfaction with the online programme was reflected in the retention rate of 83 per cent of enrolees after four years.

Triage and Rapid Elderly Assessment Team (TREAT)

The aim of the UK-based TREAT programme was to avoid ED admission among older people (Wright et al., 2013). Based on rapid response to all admissions of people aged 70 and over with a medically stable but complex condition or social needs, TREAT involves an in-hospital patient review by a doctor and a number of initiatives to ensure comprehensive assessment and supported discharge appropriate for geriatric patients. Programme evaluation after two years based on comparing pre- and post-TREAT hospital data, showed that despite significant reduction in LOS, there was "no significant impact on same-day discharges across all geriatric admissions" (Wright et al., 2013, p 119). However, when controlled for the Healthcare Resource Group treatment coding (has overlap with propensity matching), there was a significant increase in same-day discharges (i.e., avoidable admissions). It was suggested that outcomes may have been impacted by organisational improvements resulting in increased capacity to admit patients and/or limited availability of community discharge placements. Programme development is ongoing, and the ease of set-up using existing services and staff was regarded as a major benefit.

Western Sydney Care Navigation (CN)

The Western Sydney CN programme predominantly targeted elderly people presenting to ED, and relied on in-hospital nursing staff with clearly defined roles to coordinate patient assessment, within-hospital care, and post-hospital discharge and care coordination including communication with and involvement of GPs (Plant et al., 2013, Plant et al., 2015). Nurse titles reflected the stage of responsibility for patient care; Inbound, Inflight, and Outbound CN nurses. Although there was a clear requirement to liaise with GPs and allied health providers, and improvements in the processes of care following discharge support the effectiveness of the programme with respect to this, overall there was no change in rate of re-presentations to ED, rate of hospital readmissions, or quality of life. Although staff retention was a problem, analysis of results for the period of full staffing also demonstrated a lack of impact on the primary outcomes. While poor integration of primary and secondary health care services could affect outcomes, there was no evidence to suggest that this was the case and since non-significant reductions in outcomes were noted it is possible that the trial length was simply too short to reach significance.

Summary and discussion

Systematic reviews confirm the importance of age, SES, rurality, and Indigenous status on risk for PAH and ED presentation. These predictive factors have been consistently implicated across different settings. Additional factors likely to indicate risk for PAH and ED presentation include relationship status, comorbidity/multimorbidity and mental health issues.

In general, systematic reviews of international trials and cohort studies have found inconclusive evidence for the impact of an array of interventions on rates of PAH, ED presentation and hospital readmission. Improved availability of GPs appears to reduce PAH rates in the US and Canada but not in other countries. However, continuity of care and possibly disease management programmes with multidisciplinary team involvement were associated with reduced PAHs in all countries. According to Rosano et al. (2013), a likely explanation for this is the differing role and system linkages of GPs in the country-specific models of health care. One important practical difference with respect to primary health care in the systems frequently reported on in the analyses of predictors of PAH is that, in the US, people often have parallel access to primary and specialised care; but in the UK and Australia, referral by a GP is required to access specialised care and so the GP has a 'gatekeeper' role with respect to accessing the system (Rosano et al., 2013). Therefore, separation of US and non-US studies and possibly distinction according to specific chronic condition is an important consideration in the context of identifying predictors and interventions relevant to the Australian setting. Drawing definitive relationships in the analysis by Rosano et al. (2013) was further confounded by the observation that even in the US the inverse relationship between primary health care service/access and rates of PAHs was weaker for vulnerable populations (children, elderly, socioeconomic disadvantaged) compared to the general adult population.

The positive impact of continuity of care and multidisciplinary teams has been further demonstrated by programmes implemented in 'real world' settings. The HARP, Silver Chain Group, ACE and Inala programmes, which are centred on multidisciplinary teams and GP collaboration, have achieved significant reductions by as much as 64 per cent in rates of PAH and/or ED presentation among people at high risk for these events. Referral from, and back to, usual GP care and care coordinator communication with usual GPs were key to success and ensured continuity of care. In contrast, the unsuccessful NSW CDMP in practice centred on hospital-based teams that were generally isolated from primary health care (although this was not planned).

Successful interventions also tended to incorporate flexible management programmes delivered in the community and health care facilities, but also within patients' homes where needed (or exclusively, as in the case of Silver Chain Group). In this way, not only the elderly can be assisted, but also those confined to their homes for reasons such as anxiety or a lack of interest in their own health until an emergency arises. Such programmes target hard-to-reach people.

The NSW CDM programme experienced major difficulties in recruitment that impacted on the time allocated to implementation. As noted above, most of the centres in that study operated from within hospitals without effective connection to primary health care services and this is thought to be a major contributor to the poor results. Recruitment of patients at a time of acute need is also likely to bias against intervention due to regression to the mean; although successful programmes such as HARP also target those at greatest risk. In contrast, more successful programmes highlighted in this report generally recruited patients from both acute and primary health care services and collaborated closely between all health care sectors, and often with social services. The UK Evercare programme failed to repeat the US achievements of a 50 per cent reduction in PAHs with the same

programme, ostensibly because patients were not selected based on their potential to benefit. The Diabetes Care Project also had no statistically significant impact on PAHs, but revealed that a very small group of patients accounted for more than half the costs associated with PAHs. Targeting those most likely to benefit, and reaching those who are reluctant or find help difficult to access is likely to reduce rates of PAH.

However, despite the success of the Victorian HARP programme, and at least 35 services being operational across Victoria, Australian hospital statistics for 2013–14 demonstrate very little difference in overall rates of chronic PAH compared to other states and territories with the exception of the NT where rates are particularly high. These observations could be due to a number of factors. First, although programmes like HARP have been widely implemented, they may not have sufficient reach or coverage at this point in time and greater numbers of eligible patients need to be enrolled. To address this, it is likely that increases in funding and workforce numbers would be required. Second, change takes time, and while evaluation is critical, studies need to allow sufficient time for the programmes to have an effect (Oliver, 2014). The ACE programme has ten implementation sites and evaluation reports were prepared after just six months. Although the outcomes were generally positive, it is likely to be some time before the true impact is evident and evaluation at such an early stage is likely to reflect implementation outcomes rather than effectiveness. However, it is also of interest to note that in the NSW 45 and Up Study cohort, where data analysis was limited to older people, rates of chronic condition PAH did decrease continuously over the period 2007 to 2011, particularly in regional local hospital districts. While state and national level data sets are currently limited by year-to-year changes in data coding practices and reporting, chronic disease management programmes generally target older people, and it would be relevant to have a reliable time-series data set for chronic PAH with stratification according to age and rurality.

ED presentations are increasing at a rate that is beyond population growth. The implementation of chronic care programmes does not appear to have had any impact on this either, and the comments made for PAH rates would equally apply. The number of hospital beds per 1 000 population in Australia is lower than the OECD average (3.7 versus 4.8), and in all states and territories, rates for public hospitals are below 3.0 beds per 1 000 population (AIHW, 2015c). The impact of this and possible increases in ED presentations among younger age groups as seen in Victoria might explain in part the apparent lack of impact on ED presentations after a decade of chronic disease management programmes. That is to say, the elderly people with chronic conditions and 'taking up emergency department time' may not represent avoidable presentations, but rather patients who have not been admitted due to insufficient hospital beds. In NZ, people aged 74 years and older are not counted in PAH statistics because of the likelihood of comorbidities (Milne et al., 2015).

Some debate continues regarding the 'avoidability' of some PAH events and the accuracy and utility of basing estimates for PAH on admission for chronic conditions, particularly where the stage of a disease and occurrence of previous hospitalisations are not taken into account. For example, among patients with type 2 diabetes, lower PAH rates for those on oral hypoglycaemic agents compared with those on insulin may reflect different stages or complexity of the condition (Comino et al., 2015, Fonseca, 2009).

Conclusion

Much of the trial-based evidence regarding intervention factors that impact on rates of PAH and ED presentation is inconclusive. Although a number of chronic disease management programmes targeting PAHs have been implemented, very few have reported outcomes for evaluation of programme effectiveness. This has made it difficult to provide detailed information on programmes specifically targeting the vulnerable populations of Indigenous, rural and remote residents, and socioeconomically disadvantaged.

However, programmes such as the Victorian HARP, Inala CDM, Silver Chain Group, and the online MHG have demonstrated significant reductions in PAH and/or ED presentation rates among vulnerable people. Future funding to increase the reach of these programmes in particular is supported by the evidence and may impact on overall population level event rates once a critical level of service provision has been reached. Generation of reliable time-series data for chronic PAH with stratification according to age may improve monitoring of programme impact at state and national levels. Support of promising initiatives such as demonstrated by the Fitzroy Valley Partnership that optimise service provision based on better coordination of existing health care services, as well as vertical and horizontal integration between Indigenous and non-Indigenous providers should also be encouraged and further supported by flexible funding arrangements.

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Appendices

Table 6   Patient-related variables identified in systematic reviews as influencing rates of PAH, ED presentation or hospital readmission

Predictor variable/study	Muenchberger 2010	Wallace 2014	Henson 2014	Van Tiel 2015	Ross 2008	Kansagara 2011
	PAH	ED presentation	ED presentation	ED presentation	Hospital readmission,	Hospital readmission
Cohort condition	Chronic disease	all	Cancer, end of life	non-US	heart failure	All
Included study types	Varied but mostly prospective cohort and retrospective database or population studies	Retrospective or prospective cohort studies	varied	Mostly models based on retrospective databases	Varied	Mostly models based on retrospective databases
Medical history						
Specific medical diagnoses	✓	✓	✓	✓	✓	✓
Triage category	✓		✓	✓		✓
Multimorbidity / comorbidity	✓	✓	-		✓	✓
Ambulatory care sensitive conditions		✓		✓		
Mental illness		✓		✓		✓
Cognitive impairment		✓				✓
Alcohol or substance misuse	✓			✓		✓
Hypertension	✓					
Functional status		✓				✓
Health status	✓					
Patient demographics and social characteristics						
Relationship status/ number people in home	✓	✓	✓?	✓	✓	✓
Gender	✓	✓	✓	-	✓	✓
Age	✓	✓	✓		✓	✓
Race	✓	✓	✓		✓	✓
Socioeconomic status	✓	✓	✓	✓	✓	✓
Rurality	✓		✓?			✓
Smoking	✓					
Immigrants				✓		
BMI	✓					
Atmospheric conditions	✓					
Care giver availability	✓	✓				✓

Predictor variable/study	Muenchberger 2010	Wallace 2014	Henson 2014	Van Tiel 2015	Ross 2008	Kansagara 2011
Quality of Life						✓
Unemployment	✓					
Clinical and laboratory findings						
Clinical examination findings	✓	✓				✓
Laboratory findings		✓				✓
Medications/treatment						
Prescribed specific medications/treatment	✓	✓	✓?			
Polypharmacy		✓				
Self -management	✓					
Health care utilisation						
Prior emergency admission		✓				
Prior hospitalisation	✓	✓				✓
Prior elective admission		✓				
Prior ACSC admission		✓				
Prior ICU admission		✓				
Prior ED visits	✓	✓				✓
Prior Out Patient visits		✓				
Prior specialist visits		✓	✓?	✓		
Prior GP visits	✓	✓		✓		
Registered with GP			✓?	✓		
Duration of GP registration		✓				
Clinic visits/ missed visits						✓
Palliative care services			✓			
No. previous bed days/index LOS	✓	✓				✓
Integrated care	✓					
Education	✓					
Access to care	✓					
Health insurance status	✓	✓		✓	✓	✓

? indicates high degree of uncertainty

Table 7   Systematic reviews of interventions to reduce rates of PAH, ED presentation or hospital readmission

Predictor variable/study	Target	Health condition	Quality of included studies	Publication search years to:	Number /type of studies	Study origins	Outcomes	Conclusion
(van Loenen et al., 2014)	PAH	All	Moderate to high	2013	49 Observational and intervention studies	30 US, 6 UK, 3 each Taiwan, Canada, 2 each Germany and Italy, 1 each Australia, Spain, and NZ	22 unique organisational factors were identified and categorised as: 1) system level characteristics; 2). access to PHC; 3) structural and organisational characteristics; and 4) care processes. For category 1, medical homes were associated with reduced PAH, and findings for HMO penetration were inconsistent. For category 2, GP supply was associated with lower rates in 9 studies but inconsistent in 4. For category 3, there were no consistent trends, although availability of practice nurses in PHC reduced PAH for patients with asthma and COPD but not diabetes. For category 4, in 9 studies continuity of PHC reduced PAH. While 5 studies of disease management were associated with reduced PAH, 3 were inconsistent.	Accessible and continuous PHC is important in approaches to reduce PAH. The former outcome is likely to relate to the high number of US studies included. Evidence for an impact of practice characteristics including nurse supply, IT services and support services is inconsistent.
(Rosano et al., 2013)	PAH	ACSC conditions	NR	2010	51 Mostly retrospective database or population studies	38 US, 4 Spain, 2 each for Canada, UK, Brazil, and one each Australia, Italy, NZ	PHC indicators of enhanced PHC, GP visits, number of GPs, PHC centres were examined. In countries where the GP has a gatekeeper role, PHC accessibility was inversely related to ACSC hospitalisation in some (7) but not all (4) studies. In the US and Canada an inverse relation was noted in 31 of 38 studies, while rates increased in 5 studies and had no impact in 4 studies. However this inverse relationship was attenuated	The relationship between PHC indicators and PAH for ACSC conditions depends on the health system in place. Improved access to PHC is likely to have more impact in the US and Canada, than in Australia and the UK.

Predictor variable/study	Target	Health condition	Quality of included studies	Publication search years to:	Number /type of studies	Study origins	Outcomes	Conclusion
							among people with low SES, the elderly, and children.	
(Thomas et al., 2013)	PAH	Heart failure	Moderate	2010	17 RCTs	8 European countries, one each NZ and US	Specialist HF clinics located in hospital outpatient departments and providing clinic appointments and monitoring over a 12-month period reduce PAH. Greater impact with intensive intervention within two months of discharge.	Incorporation of trained specialist nurses, patient education and ready access to clinicians trained in HF reduces PAH among people with HF over a 12-month period.
(Gibson et al., 2013)	PAH	Chronic disease	NR	2012	10 Mostly prospective cohort and cross sectional studies	NR	Access to and use of PHC resources influenced PAH, but there is a paucity of evidence. For use, 3/4 studies showed increased use led to increased PAH. For access, 6/8 studies reported an inverse association with PAH.	Study findings are inconclusive.
(Soril et al., 2015)	ED presen-tation	Any	Low to moderate	2015	17 Controlled trials or comparative cohort studies	8 US, 2 each Australia and Sweden, one each NZ, Canada, Scotland, Taiwan	Interdisciplinary teams: variable outcomes, stronger impact in comparative cohort studies vs RCTs. Individual care plan: inconclusive Information sharing systems: inconclusive	Support for a moderate positive impact with interdisciplinary case management teams, but limited cost analysis showed moderate cost savings.
(Fan et al., 2014)	ED presen-tation	Elderly	Weak to moderate (only 4 strong)	2014	36 Studies with control or comparison groups	15 US, 9 Australia, 8 Canada, one each in UK, France, Italy, Singapore	Identified seven core elements common to community-based interventions or hospital-based interventions. Significant reductions achieved in community-based programmes including multidisciplinary teams and gerontological expertise. Other positive elements also identified but not always included.	Community-based interventions (n=16) more successful than hospital-based (n=20), and more likely to have used an RCT design in evaluation. Nurses are key element, and multidisciplinary team with gerontological expertise is optimal.

Predictor variable/study	Target	Health condition	Quality of included studies	Publication search years to:	Number /type of studies	Study origins	Outcomes	Conclusion
							Hospital-based interventions characterised by risk screening, geriatric assessment, discharge planning and referral coordination. Minimal but significant reduction in ED presentation for 5 studies and significant increase for 3.	
(Huntley et al., 2014)	ED presen-tation	Any	Moderate	2012	24 Mostly cross-sectional studies	16 US and Canada, remainder from UK, Spain, Israel, Netherlands, Denmark	ED presentation: proximity to facility, continuity of care, associated with reduced use. Access to GPs only has an impact in the US and Canada. ED hospitalisation (mostly UK) inconclusive for GP access, practice size, continuity of care, quality of care indicators	Main feature of PHC associated with reduced ED presentation and ED hospitalisation is continuity of care. For the US and Canada better access to PHC also has positive impact but not elsewhere.
(Flores-Mateo et al., 2012)	ED presen-tation	Any but excluding disease-specific studies	Poor	2012	25 Mostly observational studies	9 US, remainder from UK, Australia, Canada, Spain, Sweden, Brazil	ED presentation: reduced visits via increased numbers of PHC centres or GPs, cost-sharing. Inconclusive for after-hours service. No effect for Telephone triage, patient education,	Effective interventions were increased PHC accessibility and cost-sharing. But cost-sharing also impacts on urgent ED presentation, i.e., patients delay visits even when needed.
(Hickam et al., 2013)	PAH and ED presen-tation	Chronic diseases, and separately diabetes and CHF	Low to moderate	2013	20 Chronic 12 diabetes, 12 CHF RCTs and observational studies	International	For chronic disease and CHF specifically evidence was inconclusive. For diabetes there was low strength of evidence (small study number) in support of an inverse relationship.	The impact of Chronic disease management programmes is inconsistent; no conclusions as to effectiveness can be made.
(Stokes et al., 2015)	PAH and ED presen-tation	Adults with long-term conditions	Variable, but mostly moderate to high	2014	36 studies, 78% RCTs	Varied but 21 from US and 5 from Canada	With the exception of patient satisfaction (effect size 0.2) no impact of PHC-based case management was found for mortality, self-assessed health status, total cost of services, utilisation of primary and non-specialist care, or	Current evidence does not provide support for a significant association between PHC based case management and reduced hospitalisation or ED presentation. There was

Predictor variable/study	Target	Health condition	Quality of included studies	Publication search years to:	Number /type of studies	Study origins	Outcomes	Conclusion
							utilisation of secondary care.	some indication that multidisciplinary teams and inclusion of a social worker were associated with improved outcomes. The validity of pooling different complex case management studies, as done here, is open to debate.
(Takeda et al., 2012)	Read-mission	CHF patients	High	2009	25 RCTs	Varied but mostly European (approximately 5 from US and Canada)	Case management generally led by HF specialist nurse and incorporating intense monitoring after discharge significantly reduced CHF-related readmissions after 6 months (odds ratio 0.64) and 12 months (odds ratio 0.47). All cause readmissions only reduced at 12 months. Multidisciplinary interventions bridging between hospital and home require more evidence to be conclusive, but there is very limited evidence to support interventions based on follow up in a CHF clinic.	Case management with intense follow-up and potentially interventions based on multidisciplinary team approaches are likely to reduce readmission of patients with CHF.
(Benbassat and Taragin, 2013)	Read-mission	Chronic diseases	Low-high	2012	57 meta-analyses RCTs	Varied	Interventions before hospital discharge (multidisciplinary care plans, geriatric case management, pharmacological consultations) had no effect, while geriatric assessment was inconclusive. Community-based interventions significantly reduced readmission rates in patients with HF, coronary heart disease and bronchial asthma by 12-75 %. Secondary prevention	Based only on medium to high quality studies (AMSTAR 7 or more) , home or community care reduces readmission rates for patients with HF, coronary heart disease and bronchial asthma, but not for other chronic conditions. The optimal components of these programmes differ according to the condition. For HF

Predictor variable/study	Target	Health condition	Quality of included studies	Publication search years to:	Number /type of studies	Study origins	Outcomes	Conclusion
							programmes among those with prior coronary heart disease reduced hospital admissions by 16% (significance not indicated), and positive impacts were also reported for those with bronchial asthma or elderly and at risk for falls. No or inconsistent impact was evident for those with stroke, hip fractures, and unselected chronic diseases.	patients, home care is important, and so too the mode of care delivery e.g., structured telephone follow-up outperformed non-structured telephone contact or clinic follow-up. In-hospital interventions fail to produce consistent results.
(Leppin et al., 2014)	Read-mission	Any	High	2013	42 RCTs	Varied but 23 out of 42 were US based studies	Pooled relative risk of readmission was 0.82 (95% CI 0.73-0.91), I^2=31%. Intervention components that interacted positively with measured effectiveness were; rating of intervention to augment patient capacity for self-care, having at least five unique components, having 2 or more people involved in delivery. No interaction for patient workload (although in most studies high rates of declining to participate because of workload would render this finding invalid), or site of delivery. Studies published post 2002 were less effective.	Interventions have a positive impact on reducing readmissions, particularly those that are more complex and seek to enhance patient capacity to access and enact post discharge care.

ACSC=Ambulatory care sensitive conditions; CHF=Chronic heart failure; ED=Emergency Department; HF=Heart failure; HMO=Health maintenance organisation; PHC = primary health care; RCT=Randomised controlled trial; UK=United Kingdom; US=United States of America

Table 8   Summary of programmes, target population, key features and evaluation findings

Programme[12]	Target population	Key features of the programme or policy	Evaluation findings[13]	Status as of June 2015
Chronic Disease Management Program (**CDMP**), NSW	Complex chronic disease (including Indigenous and elderly people)	• CDMP provides care coordination and self-management support (builds on CCC and other NSW programmes, and integrates Indigenous 48-Hour Follow Up Programme (CCAP) and the Care Coordination and Supplementary Services Program (CCSSP) for Indigenous people) • Major aim was to reduce PAH and ED presentation • Commenced 2009, evaluated 2011-14	• No clear differences in PAHs, ED presentations, and readmissions between CDMP participants and controls (no CDMP) • Indigenous people recorded CDMP-associated increases in PAH and readmissions; rates of ED presentation similar and very high for participants and controls	Evaluation published 2014, ongoing programme review to guide further development (George Institute for Global Health et al., 2014).
Walgan Tilly project (core of the Chronic Care for Aboriginal People (**CCAP**)) (NSW Department of Health, 2010)	Indigenous people with chronic disease	CCAP is an overarching model of care incorporating the eight elements of effective chronic care for Indigenous people as identified by the Walgan Tilly project including the 48-Hour Follow-Up programme the aims of which were: • Decrease PAH and readmissions • Increase use of care plans to reduce disease progression	Preliminary evaluation indicates 4% reduction in hospital readmissions	CCAP yet to be evaluated. 48-Hour Follow-up was incorporated into the NSW CDMP as a recruitment point, but that programme failed to achieve reductions in either PAH or ED presentation
Fitzroy Valley	Partnership	Central to this partnership is the shared	Over the 6-year study period, primary	Partnership is ongoing

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[12] Only programs that have been evaluated, or are being evaluated, are included here.

[13] Note: only the avoidable hospitalisation findings are reported here. See evaluations for the full results.

Programme[12]	Target population	Key features of the programme or policy	Evaluation findings[13]	Status as of June 2015
Partnership	programme between local hospital, and community based mainstream and Indigenous primary health care	governance structure and funding, along with shared electronic records to facilitate coordination of culturally sensitive care.	health care encounters increased from 2 to 10 per person per year, but there were no changes in HbA1c or blood pressure. Reduced mortality and a decreasing trend in ED presentations from approximately 8000 in 2009-10 to approximately 3000 in 2011-12.	
Aged Care Emergency (ACE) model	Aimed at improving patient transition from residential aged care facilities (RACF) and reducing hospital admissions and LOS	Developed largely based on the Geriatric Rapid Acute Care Evaluation (GRACE model), the ACE model includes defined response pathways and triage checklists that are used to guide patient care and transition in the event of an acute or sub-acute event. Key role for clinical nurse consultant (CNC), and close collaboration with GP.	ACE programme at the John Hunter Hospital ED reported 35% reduction in hospital LOS, a 16% reduction in ED presentations (p=0.009), and a 19% reduction in ED admissions for patients aged 75 years and older from RACFs	The Aged Care Emergency (ACE) programme at the John Hunter Hospital Emergency Department has subsequently been expanded to 9 additional hospitals. Evaluation reports are available but although positive, they are based on just 6 months of programme implementation.
Victoria: 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	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. These include: • Comprehensive assessment and individualised care planning • Comprehensive transition and discharge planning • Secondary preventive care • Ongoing monitoring and review • Specialist medical and GP management • Self-management advice	Based on comparison to propensity score matched controls, overall HARP has resulted in significant reductions: • 35% (22-46%) fewer ED attendances • 52% (44-59%) fewer ED admissions • 41% (30-50%) fewer emergency bed days 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. Outcome improvements for patients with pre-enrolment COPD or diabetes were greater than for all HARP	• HART BCOP: significant 64% reduction in PAH, 55 % reduction in ED presentation compared to pre-HARP BCOP, 39 % reduction in ED presentation post discharge from HARP BCOP. All significant (Australian Healthcare Associates, 2011) • HARP Western Consortium programme for elderly with multimorbidity and

Programme[12]	Target population	Key features of the programme or policy	Evaluation findings[13]	Status as of June 2015
		• Other specialist and allied services where needed. • After-hours support • Multidisciplinary team care • Carer involvement	patients or for those with pre-enrolment chronic HF (no change). HARP patients with multimorbidity experienced: • 49% (35-60%) fewer ED attendances • 61% (51-69%) fewer ED fewer emergency admissions • 57% (46-66%) fewer emergency bed days.	complex care needs (n=231): significant 27.9 % reduction in PAH, 20.8% reduction in ED presentation (versus increase by 5.2 % and decrease by 4.4% respectively in non-HARP comparator group) (Bird et al., 2007). In terms of PAH/patient/day for HARP participants this equated to pre and post rates of 0.0068 versus 0.0049 respectively. • HARP Western consortium for COPD (n=78) and CHF (n=67): for COPD-reduced PAH by 25% and ED presentation by 10% while controls increased both by 40-50% (p<0.008). For CHF reduced PAH by 36 % and ED presentation by 39% compared to reductions among controls of 20% and 26% respectively (p<0.008) (Bird et al., 2010). In terms of PAH/patient/day for HARP participants this equated to pre and post

Programme[12]	Target population	Key features of the programme or policy	Evaluation findings[13]	Status as of June 2015
				rates of 0.0098 versus 0.0063 respectively. • HARP Restoring Health, for patients with HF (n=122), COPD (n=173), or diabetes (n=56). Overall results for 6 months post versus 6 months pre-intervention were significant reductions in ED presentation by 0.47 (0.31-0.62) events and PAH by 0.55 (0.41-0.67) events per patient. Six month post intervention rates for ED presentation and PAH were 0.74±1.23 and 0.56±1.06 respectively (Howard et al., 2008). Programme is ongoing with 35 services in Victoria
HealthOne NSW (McNab et al., 2013).	General population with chronic conditions	• Integrated care provided by general practice and community health services (and other services – allied health, specialists) • Multidisciplinary team care (e.g., GPs, practice nurses, allied health professionals, health educators) • Continuum of care from prevention to management of complex/chronic conditions • Client and community involvement	Based on before and after comparison of data for 125 people with chronic and complex conditions enrolled at Mount Druitt: • between 12 months prior and 12 months post enrolment significant improvements were noted for average number of ED presentations per patient (3.1 versus 2.6) • reduced average time spent by patient in ED (12.5 versus 6.6 hours)	Evaluation for Mount Druitt released 2013. Programme ongoing.

Programme[12]	Target population	Key features of the programme or policy	Evaluation findings[13]	Status as of June 2015
			• reduced average LOS in hospital (6.3 versus 3.7 hours). • average number of ward admissions per patient did not change significantly (1.4 versus 1.2 per 12 months)	
Inala Chronic Disease Management Service (ICDMS)	ICDMS is a community-based integrated model of care	A core component of ICDMS is a 'beacon practice' comprising a day clinic with up-skilled GPs and a multidisciplinary team that coordinates patient care based on a devised management plan following referral from usual GP.	At 24 months intervention was associated with an incidence rate ratio of 0.53 (95% Cl 0.29-0.96) for PAH compared to controls	ICDMS is known to be active but very few evaluation or outcomes data have been made available
Emergency Care – Rural Access Program (MHEC-RAP)	MHEC-RAP is a rural emergency telehealth programme for health providers and patients	Although not included in PAH chronic conditions, mental health is a frequent comorbidity and for this reason has been included. A core component of MHEC-RAP is coordination of response to calls by trained nurses to direct callers to the most appropriate local (where possible) services.	PAH impact has not been reported, but 71% of callers are referred to outpatient care.	Evaluation completed but analysis with respect to PAH not done but would be useful.
My Health Guardian (**MHG**)	MHG is a free of charge health and well-being programme offered to members of The Hospitals Contribution Fund of Australia (HCF).	Core of MHG is an online programme offering health assessments, health action plans, personalised health support, education and health behaviour tracking. Registered nurses provide telephone support to assist self-management	• for the 4-year period odds ratio for hospital admission and readmission were 0.73 (0.69-0.78) and 0.55 (0.48-0.63) respectively • By end of evaluation 83% of enrolees were still enrolled • Savings per member for the four-year period were $3549 for intervention versus control	Published in 2015, programme is continuing
Silver Chain Group	At home service, primarily for elderly	Core services of the Silver Chain Hospital in the Home (HITH) service are; Hospital At The Home (HATH), Post-Acute Care (PAC), Priority Response Assessment (PRA) and	• For HITH generally, PAH decreased by 29%. • Odds ratio for ED presentation with HIP was 0.81 (0.6-1.1, ns) versus HACC	Programme implemented across WA, SA, NSW, and QLD. In WA an agreement with St Johns Ambulance to refer to Silver

Programme[12]	Target population	Key features of the programme or policy	Evaluation findings[13]	Status as of June 2015
		Community Nursing (CN). HITH is a true hospital substitution, PRA is a hospital avoidance programme, PAC is a post-discharge care in the home, and CN is also a hospitalisation alternative for sub-acute interventions. Also includes home and community care (HACC) and a Silver Chain Home Independence Program (HIP)	• Odds ratio for hospital admission was 0.85 (0.62-1.17, ns) versus HACC	Chain when appropriate has reduced ED presentations (no figures reported).
Western Sydney Care Navigation (**CN**)	In-hospital care coordination for the elderly (70 years or more for non-Indigenous, 45 years or more for Indigenous)	CN is a hospital-based model of care relies on 3 differentiated nursing roles that identify patients in need of care management, coordinate within hospital care, and coordinate safe and appropriate discharge into the community	• After 2 years no significant impact on rate of re-presentations to ED, rate of hospital readmissions, quality of life	
Ontario tele-**CDSMP**	Canadian telehealth service for chronic disease management in 13 rural communities	Leaders (one skilled professional and 2 trained community members with the chronic disease of interest) provide guidance in the online video delivery of 6 workshops on chronic disease management skills including treatment, health behaviours and medications. Workshops are interactive discussion based forums	• No significant impact on ED presentation after 12 months, but in participants aged 66 years and older there was a trend for decreased ED presentation (OR=0.59, 95% CI 0.33-1.06)	Further evaluation ongoing, but participants were not frequent users prior to programme and this may have limited the potential for improvement.
Triage and Rapid Elderly Assessment Team (**TREAT**)	UK-based programme designed to reduce LOS and hospital admission rates among patients aged 70 or over.	Rapid response to all admissions of people aged 70 and over with a medically stable but complex condition or social needs. Comprehensive geriatric assessment performed by specialist geriatrician determined eligibility with patients either directed to TREAT or inpatient management or to ED for discharge. Hours of operation 9-	• reduced LOS by 18.6 % • no significant impact on PAH, but non-significant 15% reduction	Not indicated

Programme[12]	Target population	Key features of the programme or policy	Evaluation findings[13]	Status as of June 2015
		5 on weekdays and 9-1pm on weekends.		

Notes on programmes referred to in previous PHCRIS report (Katterl et al., 2012). No further evaluations have been located for the following:

- Chronic Care Collaborative programme (now concluded with no further evaluations)
- Early Intervention in Chronic Disease in Community Health (**EIiCD**)
- Healthy at Home, NSW.

Two US-based programmes, Kaiser Permanente Southern California Transition in Care (TIC) and the Better Outcomes for Older adults through Safe Transitions (BOOST)

have subsequently reported absolute reductions in hospital readmission by approximately two per cent (Katterl et al., 2012, Kottke, 2013, Williams et al., 2014).

Table 9   PAH and ED presentation reduction programme descriptions[14]

Australian programmes

Aged Care Emergency (ACE)

Description	Based on the GRACE model of care and the Aged Care Triage (ACT) model developed at Concord Hospital, NSW health supported development of the ACE programme at the John Hunter Hospital Emergency Department, and this has subsequently been expanded to 9 additional hospitals (NSW ACI, 2015). The ACE model of care aims to address gaps in providing support to residential aged care facility (RACF) staff for non-life threatening acute care needs of their residents, and hence to avoid ED presentations, by providing an evidence-based telephone liaison service.

Flowchart:

- RACF patient unwell
- Is it life-threatening?
  - No → Refer to RACF ACE clinical resource manual and inform GP
  - yes → Does ACP/ACD specify do not transport to hospital?
    - yes → Refer to RACF ACE clinical resource manual and inform GP
    - (No) → Emergency
- Refer to RACF ACE clinical resource manual and inform GP → Problem solved?
  - Problem solved? → Notify GP of intervention
  - No → Notify GP for advice or review by RACF staff if ACP/ACD requests intervention
- Notify GP for advice or review by RACF staff if ACP/ACD requests intervention → GP available?
  - yes → RACF staff book tranfer and nominate time frame. ACE Clinician provide receiving ED relevant information and case manage resident in ED
  - (No) → Contact ACE service who will provide clinical support over the phone and establish goals of care and inform GP when able
- Contact ACE service who will provide clinical support over the phone and establish goals of care and inform GP when able → Patient for transfer to ED?
  - No → Patient managed in RACF with ACE phone support
  - yes → RACF staff book tranfer and nominate time frame. ACE Clinician provide receiving ED relevant information and case manage resident in ED
- Patient managed in RACF with ACE phone support → RACF staff book transfer and nominate time frame. ACE Clinician provide receiving ED relevant information and case manage resident in ED

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[14] Programme descriptions are based on publicly accessible literature and should be considered as indicative only.

Funding Details	Funding is from NSW Health through the Ministerial Taskforce on Emergency Care (MTEC). The pilot programme reportedly appears to be cost-effective but a full analysis has not been published.
Participants	Aged RACF care residents
Interventions	There are 4 key process elements: • Telephone consultation process with the staff from RACFs • Evidenced-based algorithms for common problems experienced by residents from RACFs so RACF staff can better manage the acute symptoms experienced by the resident • Establishing patient and ED goals of care prior to transfer • Proactive case management in ED. Core components of the service include: • an educative and supportive service to RACFs • a collaborative working relationship with GPs, community and hospital care providers. As with the original GRACE model, the ACE model is based on defined clinical algorithms that are used to guide patient care and transition in the event of an acute or sub-acute event. A central coordination role is undertaken by the clinical nurse consultant (CNC) usually a registered nurse from the ED Aged Services Emergency Team. The CNC has responsibility for the patient but an older persons technical assistant under direction from the CNC provides assistance with screening of older people (e.g., for cognitive impairment, pain, carer strain), improving patient and carer's experience, and supporting delirium prevention, as well as documenting and communicating the needs of ACE patients. The CNC is responsible in consultation with ED consultant, geriatrician or equivalent GP visiting medical officer as appropriate, for documentation of presenting problem and deciding which algorithm for care is most appropriate. Any outcomes and recommendations for follow-up are documented by the CNC and communicated to the RACF and GP. The CNC is also responsible for educating RACF staff with respect to the use of ACE clinical algorithms, and for maintaining relations with the RACF, GPs, and Medicare Local or equivalent. NSW Health has a general guideline for ACE that provides details of clinical algorithms and action flow charts.
Outcomes measured	Hospital ED presentation and admission
Results	Based on 6 months post implementation data, the John Hunter Hospital ED reported 35% reduction in hospital LOS (significance not stated), a 16% reduction in ED presentations (p=0.009), and a 19% reduction in ED admissions for patients aged 75 years and older from RACFs (significance not stated), and improved relationships between staff located at both facilities. In a sample of 97 calls over a 3-month period it was noted that almost 50% of calls resulted in patients remaining at the RACF. Final reports from 9 other sites confirm the impact of programme implementation. However, many report that the follow-up period of reporting is very short (6 months) and greater impact may be realised in the future.
Key enablers and barriers	Enablers of the ACE model have not been presented in detail but improved relations between RACF staff and the ED were noted as a positive changes resulting from programme implementation.

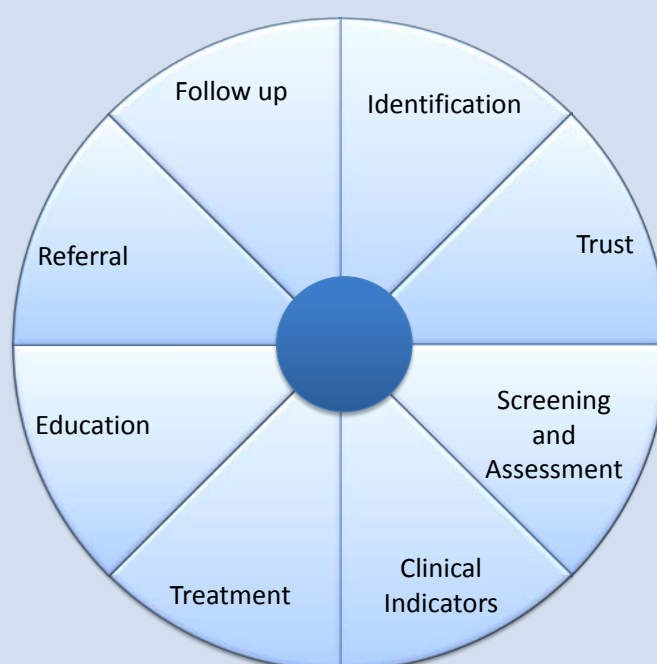| Workforce and cost implications | The ACE model hinges on access for RACFs and their GPs to a hospital-based ACE CNC responsible for care coordination. Specific staffing requirements for the John Hopkins hospital pilot were 1.0 FTE CNC, 0.5 FTE central nurse educator, 4 FTE technical assistants. In contrast, for establishment of GRACE on which the ACE programme is based it has been indicated that within a metropolitan general hospital required staff are as follows: 1.0 FTE GRACE CNC; 0.5 FTE geriatric registrar; 0.5 FTE project officer or CNC; an Aged care Services in Emergency Team; and a staffing profile in the Emergency Medical Unit for additional nursing care for elderly patients as required.[15] Post discharge, there is also likely to be a need for community nursing service and community acute/post care team input for patients with complex needs beyond the acute event (Reed et al., 2014). |

Source: (Conway and Higgins, 2012, NSW Health, 2006a, NSW ACI, 2015)

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[15] http://www.archi.net.au/resources/moc/older-moc/grace

Chronic Care for Aboriginal People – Model of Care (CCAP)

Description	Implemented in 2011, CCAP is an overarching model of care incorporating the Aboriginal vascular health programme, Aboriginal renovascular programme, the Aboriginal chronic care area health service standards, and outcomes from the Walgan Tilly project to provide an evidence base for effective interventions. Together with the NSW CDMP, the CCAP comes under the directive of the Agency for Clinical Innovation (NSW). New initiatives to better manage chronic disease among Indigenous people use the CCAP as a guideline for development and implementation. The 8 processes of care shown below form the core of CCAP and were identified through the Walgan Tilly Redesign project.

Follow up · Identification · Trust · Screening and Assessment · Clinical Indicators · Treatment · Education · Referral

Funding Details	Funding is provided by the NSW Government and other sources depending on the project.
Participants	Indigenous people (and their families) with or at risk for chronic disease
Interventions	Interventions are based on the 8 principles outlined above, but are tailored to meet local needs and resources.
Outcomes measured	Varies depending on project.
Results	No formal evaluation has been published for the CCAP. However, the 48-Hour Follow-Up component of the programme has been implemented in over 90 hospitals and was associated with a 4% reduction in hospital readmissions (Havrlant and Simons, 2013). Outcomes for the 48-Hour Follow-Up study have been collated, and a full evaluation report is in preparation (Simons, 2015).
Key enablers and barriers	Key elements include: identification of Indigenous people, establishment of local processes to gain trust, holistic view of health including cultural and non-medical factors, inclusion of Indigenous staff, use of outreach services and consideration of individual situation and requirements including non-medical.

Workforce and cost implications	Varies according to project, but inclusion of Aboriginal health workers is a key facilitator of success. The evaluation programme is currently assessing four different models of delivery with differing workforce requirements (Simons, 2015).

NSW Chronic Care Collaborative (CCC)	
Description	Initially launched in 2000 as the NSW Chronic care and complex care programme, the CCC aimed to prevent unplanned and avoidable hospital admissions as well as improving the quality of life for people with complex chronic conditions of HF and/or COPD and their carers. In the second phase this was extended to cancer care. Phase one ran between 2000 and 2003, and phase two 2003-2006, and phase three 2006-2009.
Funding Details	Phase 1 – not reported Phase 2 -$15 million, including $26 000 per participating Area Health Service Phase 3 - (NSW Health, 2006b)
Participants	People with COPD and/or HF
Interventions	The CCC programme consisted of a diagnostic bundle (clinical assessment, spirometry, echocardiography) and a management bundle (baseline investigation, smoking cessation, medications, referral to rehabilitation, self-management support, vaccinations, after hours point of contact, GP review, advanced care directives). Care coordinators connect patients with service providers, and in the NSW model these were either hospital- or community-based depending on whether specialised disease knowledge or generalist skills were called for respectively.
Outcomes measured	Unplanned hospitalisation, avoidable hospital admissions
Results	Moderate clinical benefits Achievements in 2004: • estimated 16 000 inpatient bed days saved through decreased hospital admission for COPD • estimated 9 000 inpatient bed days saved through decreased hospital admission for HF As a proportion of all NSW admissions[16], data showed: • HF admissions were significantly lower for October- December in 2004 than for the same months in 2003. • COPD admissions were significantly lower in November and December 2004 than for the same months in 2003, though in May and October there were significant differences in the opposite direction.
Key enablers and barriers	Appointment of care coordinators and medical champions were key facilitators. Executive leadership to facilitate change was also important.
Workforce and cost implications	Collaborative teams included hospital medical officers, acute hospital staff, community-based health services including GPs and allied health. Care coordinators formed a bridge between patients and service providers.

Source: (Schofield et al., 2005). and _http://www0.health.nsw.gov.au/pubs/2005/pdf/ccc_improve.pdf_

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[16] Tentative results only

NSW Health Chronic Disease Management Program (NSW CDMP)

Description	The NSW CDMP is a Local Health District (LHD)-based programme targeting potentially avoidable acute service use among individuals already engaged with specialists and acute care for one or more of the following chronic diseases: diabetes, COPD, congestive HF, CAD, hypertension. (George Institute for Global Health et al., 2014)

- Conducted from 2009/10 through 2015, the programme specifically aimed to reduce rates of avoidable hospitalisation by better integrating care and improving management of health conditions through care coordination and self-management.
- Governance for the programme was based on integration with other chronic disease governance structures and a broad range of representative groups on the Board. The least represented groups were the ACCHS sector and consumers, while GPs were represented in just under 50% of LHDs (George Institute for Global Health et al., 2014).
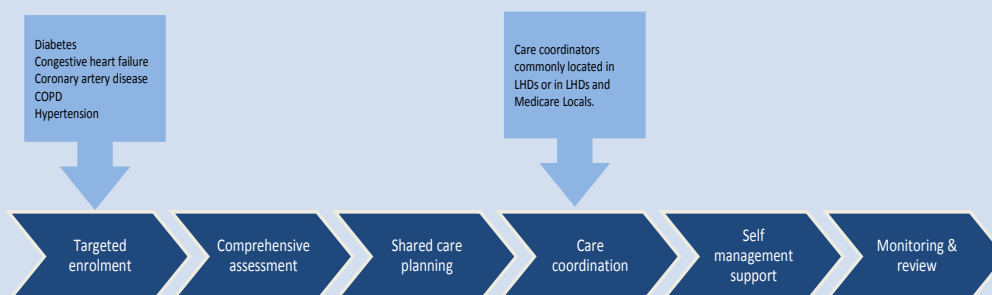
Funding Details	Over the 2009/10 through to 2015 period approximately $200 million has been invested in the NSW CDMP, including almost $40 million for the period 2014/15 (George Institute for Global Health et al., 2014).
Participants	Individuals with one or more of the following chronic diseases: diabetes, COPD, congestive HF, CAD, hypertension. For the evaluation study (2011-13) a total of 41,303 participants were included (88.8% of all enrolled participants), and of these 2,423 identified as Aboriginal or Torres Strait Islander.

- For the entire cohort most participants were resident in major cities and approximately half were aged 75 years or older. Overall the evaluation cohort was moderately disadvantaged, with one quarter being in the 3 most disadvantaged deciles on the SEIFA disadvantage scale.
- For the Indigenous cohort most were aged 50-65 years, and commonly classified as being in the most disadvantaged SEIFA categories.

Interventions	Participants were allocated to Care coordination or Health coaching depending on whether they were at risk for or had experienced a major acute event respectively.

- Care coordination was planned to be coordinated between primary, acute and community sectors with facilitation by Programme Care coordinators. This included the development of shared care plans with the patient, GP and specialists.
- The Health coaching focus was on ensuring that participants understood treatment plans and the value of positive health behaviours. Patients were provided with support to manage lifestyle risk factors, medication
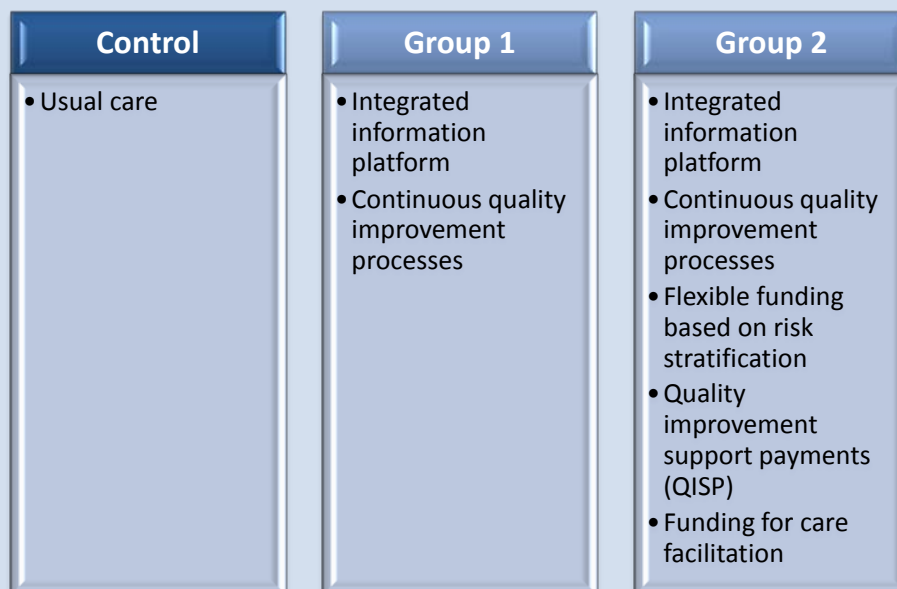
	management and support for interaction with health care providers or biometric monitoring.
	• For Indigenous participants referral was via the 48-Hour Follow-Up programme, the Clinical Care services CCSS programme, or the LHD outpatient services.
Outcomes measured	Health service utilisation, avoidable hospitalisation, ED presentation, LOS, mortality.
Results	Outcomes were compared for participants of the NSW CDMP versus propensity score matched control non-participants.
	Longitudinal evaluation for the complete cohort demonstrated consistently higher rates of PAH, ED presentations, and readmissions among CDMP participants compared to matched controls. Sensitivity analysis showed that these outcomes were unaffected by socio-demographic, health and service utilisation characteristics, with the exception of history of CAD in which case the difference in PAH between CDMP participants and controls was not significant.
	Longitudinal evaluation for the CDMP Indigenous cohort also demonstrated a consistently higher rate of PAH and readmissions among participants compared to controls. However, there was no difference between cohorts for ED presentations.
Key enablers and barriers	Key enablers of the programme included:
	• Pre-existing relationships between LHDs and Medicare Locals (MLs)
	• Programme visibility, integrity, funding and resources were positively influenced by high level executive sponsorship
	• Upgrading of information and communication systems for identifying and recruiting people, and also for real-time identification of presenting patients
	Key barriers included:
	• Low engagement of GPs (likely due to acute setting of programme)
	• Recruitment and retention of staff in chronic care services, particularly in rural areas
	• Integration of CDMP into clinical pathways was less likely in rural LHDs
Workforce and cost implications	• For care coordinators more than 25% of their time was devoted to patient navigation irrespective of whether they were located in LHD or ML.
	• In two thirds of LHDs GPs had a minor role in care coordination
	• LHD care coordinators spent most time on patient navigation and phone support and coaching, while ML based care coordinators spent more time on patient navigation and supporting referrals
	• Information sharing was in place or partly in place in all LHDs, but sharing between LHDs and GPs, MLs or ACCHS was non-existent for approximately 25, 40 and 60% of LHDs respectively.

Sources: (George Institute for Global Health et al., 2014).

Diabetes Care Project

Description	A 3-year pilot programme which analysed new models of health care delivery for adults with type 1 and type 2 diabetes

Control	**Group 1**	**Group 2**
• Usual care	• Integrated information platform • Continuous quality improvement processes	• Integrated information platform • Continuous quality improvement processes • Flexible funding based on risk stratification • Quality improvement support payments (QISP) • Funding for care facilitation

Funding Details	The project was funded by the then Department of Health and Ageing, Australian Government and the Victorian Government.
Participants	154/184 practices (approximately 50 practices per trial arm[17]) and 5,651/6,853[18] participants completed the project. Control (1,579; 13% LTFU[19]); Group 1 (1,997, 21% LTFU); Group 2 (2,518, 18% LTFU)
Interventions	Usual Care – care as usual Group 1 tested improvements that could be made within the current funding model—specifically adopting an integrated information platform and continuous quality improvement processes. Group 2 tested the same components as Group 1, as well as flexible funding based on risk stratification, payments for quality and funding for care facilitation
Outcomes measured	Primary outcome- HbA1c Secondary outcomes- changes in other biochemical and clinical metrics, incidence of diabetes-related complications, health-related quality of life, clinical depression, success of tailored care and economic sustainability (e.g., cost utility analysis).
Results	Mean HbA1c levels in Group 2 changed significantly by -0.19% overall compared to the Control Group, but the decrease was larger for those with higher starting levels of HbA1c. In Group 2 other statistically significant improvements were systolic blood pressure (-1.11mmHg, p=0.045), total cholesterol (-0.07, p=0.012), LDL (-0.06mmol/L, p=0.005), triglycerides (-0.07mmol/L, p=0.007), waist

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[17] Range in number of practices per trial arm = 45-59 (14-18% practice withdrawal rate across arms).

[18] Approximately 17.5% patients withdrew or were lost to follow-up.

[19] LTFU = Lost to follow up.

circumference (-0.41cm, p=0.031), PHQ-9 depression score (-0.63 points, p<0.001), and diabetes-related stress (-1.33 points, p<0.001). Participants in Group 2 experienced a reduction in depression during the trial period compared to the Control Group. The mean change in PHQ-9 scores in Group 2 was -0.63 points compared to the Control Group (p<0.001).

Key enablers and barriers	IT system designed to enable most facets of the integrated care model. Practice Nurses were the main users of the tool, accessing webpages about 5 times as often as GPs. Use of a patient portal Health professionals engaged in continuous quality improvement conversations.
Workforce and cost implications	Workforce In Group 2, there was increased adherence to recommended clinical processes and more visits to AHPs. The percentage of participants on a care plan increased from 75% to 96%, the percentage of participants with a completed annual cycle of care increased from 35% to 53%, and the number of AHP visits increased from 2 to 6 per year. The mix of visits across AHP services in Group 2 also changed, with participants accessing a greater diversity of specialties compared to the Control Group. The mix of consultation types changed with the introduction of new consultation types. Standard or typical consultations accounted for 91% of Group 2 visits in the baseline period, but only 56% during the trial period. The remainder were nurse consults (20%), group assessments and consults (14%), extended consults (7%), phone consults (3%), and short consults with podiatrists (1%. Group 1 created more care plans but showed no changes in other processes or in the mixture of AHP visits Costs In comparison to the control group, costs in Group 1 and Group 2 increased by $718 and $203 per person per annum respectively, after adjusting for differences at baseline. Neither difference was statistically significant overall (p=0.275 and p=0.758 respectively), largely because of the wide variation in hospital costs. There was a high degree of fluctuation in MBS, PBS, NDSS and hospital costs over time, with no clear pattern across groups over time.

Source: (Leach et al., 2013, Australian Government Department of Health, 2015a)

Fitzroy Valley Partnership	
Description	Co-located hospital, main community clinic and ACCHS form the partnership and have a single governance structure for fund allocation, shared e-medical records system and for delineating areas of responsibility. The aim of the partnership was to move from a reactive model of care to a more comprehensive primary health care approach. Responsibilities are as shown below.

Single governance structure & partnership

Shared electronic records

Nindilingarri Cultural Health Services (NCHS)	Fitzroy Crossing Hospital (FCH)	Kimberly population Health Unit (KHPU)

Responsibilities

Health promotion, environmental health, cultural safety	Acute inpatient care, primary care clinic, specialist care	Public health, screening and primary care community clinics

- Targeting of people with chronic disease for care plans
- Implementation of smoking and alcohol quit programmes

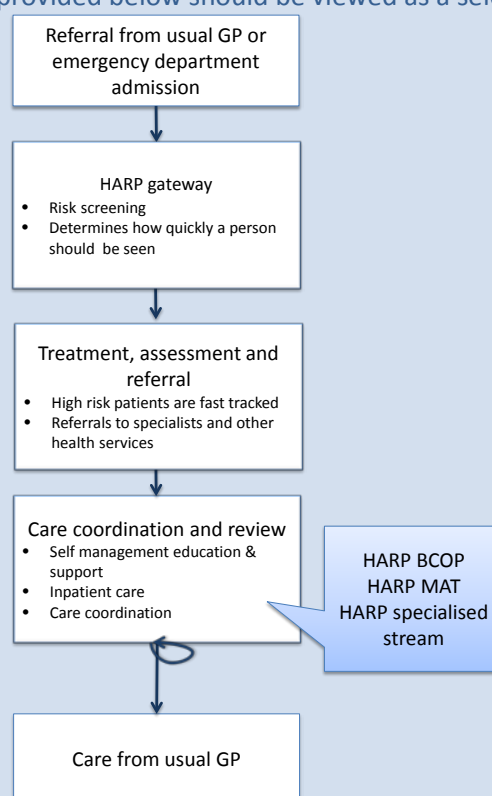| **Funding Details**	Shared funding within partnership. WA state health funding through COAG for chronic disease. Section 19(2) exemption to allow Medicare billing for primary care patient visits.
Participants	44 communities of Fitzroy Valley, n=3,500, 80% Indigenous.
Interventions	Identification of patients with chronic disease or its risk factors and placing them on care plans with regular interdisciplinary follow-up.
Outcomes measured	Primary health care activity, ED presentations and hospitalisations
Results	Over the 6-year study period, primary health care encounters increased from 2 to 10 per person per year, but there were no changes in HbA1c or blood pressure. Reduced mortality and a decreasing trend in ED presentations from approximately 8000 in 2009-10 to approximately 3000 in 2011-12 (based on Fig 2 in Reeve et al., 2015).
Key enablers and barriers	Partnership formalisation and shared funding were key enablers, as was the implementation of alcohol restrictions driven by local community leadership. Regular feedback from the Indigenous community via the ACCHS enabled health services to ensure cultural appropriateness. Provision of transportation to attend appointments.
Workforce and cost implications	This programme largely appears to have drawn on services already in place. The focus was on better integration vertically and horizontally.

Source: (Reeve et al., 2015)

Hospital Admission Risk Program (HARP)

Description	First implemented in Victoria in 2001 the HARP programme for chronic care has since expanded to cover much of the state, and as of July 2010 there were 35 state-wide HARP services. Key objectives of the Wagner Chronic Care Model based programme are to: reduce PAH and ED presentation, improve patient health and wellbeing related outcomes, and integrate care across and within hospital sectors. Governance is provided by a Health Service committee including at least one representative of primary care partnership, Division of General Practice (or equivalent), Community Health Service, Local Government, consumer and carer groups.

The guidelines for HARP are extensive but not prescriptive, and individual sites tailor the programme to meet local needs. This extends to development of specialised HARP programmes targeted at local populations. For example, the HARP Better Care of Older People, HARP BCOP, which has been expanded to urban and non-urban areas including 13 rural HARP BCOP services initiated in 2010.

At the Alfred Hospital, Melbourne, HARP coordinators have expanded service options to include case management e.g., for hospitalised elderly patients within the disease management unit (DMU), mobile assessment and treatment service primarily targeting elderly people, and a specialised chronic disease stream for patients with complex chronic medical conditions and admitted or at risk of admission to an Alfred hospital. A mental health HARP pilot was approved for funding in 2012 (Commonwealth of Australia, 2012), and is to be piloted at a minimum of 3 EDs to target people with mental illness and other comorbid conditions who are frequent ED users. The outcome of measure will be reduction in ED presentation. Due to the diversity of programmes being conducted across the state and the limited publication of outcomes, results provided below should be viewed as a selected example only.

Funding Details	Based on a competitive model of funding for individual hospital initiatives.
	Between 2001 and 2005 approximately $150 million was invested by Victorian government through the 'Hospital Demand Management' strategy, to fund the 87 HARP projects involved in the 4-year evaluation period.
	Expansion of HARP in 2010 was funded through the Commonwealth of Australian Governments (COAG) Long Stay Older Patients (LSOP) initiative.
	Mental Health HARP received approximately $2.5 million from the Department of Health over 4 years as part of the Supporting National Mental Health Reform (Peninsula Health, 2015).
Participants	People at high risk for PAH and ED presentation, i.e., with chronic heart disease, respiratory disease, diabetes, older people with complex needs, people with complex psychosocial needs and people with chronic diseases and complex comorbidities.
Intervention	Intervention is based on care coordination, self-management support and coordination of specialist medical care. Point of entry is referral from the usual GP or in-hospital identification and referral to a gatekeeper assessment point. Generally care facilitators are trained nurses with responsibility to coordinate and facilitate patient access to care and education. Case conferences involving multidisciplinary teams are held to review medical records and design an individual care plan. Once participants are stable they are handed over to their usual GP for care. HARP guidelines (Department of Human Services) are used to establish and implement programme basics but further development is site specific.
Outcomes measured	PAHs and ED presentations
Results	• In the pilot phase 2002-2005 HARP implementation was overall associated with 35% (range 22-46%) reduction in ED presentation, and 52% (range 44-59%) reduction in PAHs compared to propensity matched non-HARP patients. The post implementation rates of PAHs per person per year were 1.7 versus 3.6 for HARP and non-HARP groups respectively (Victorian Government Department of Human Services, 2006). For patients with pre-enrolment admission for COPD or diabetes or any combination COPD/diabetes/chronic HF, reductions in ED presentations and PAHs were greater than overall results (see Table 13 in Victorian Government Department of Human Services, 2006)). Approximately 40-53% of patients with COPD, chronic HF or complex needs but only 13% of those with diabetes required more than 12 weeks HARP intervention (51% of those with diabetes required a one-off service only). All outcomes were based on patients who survived at least one year after enrolment, average age was 63 years ($\pm$20 years).
	• HARP BCOP: significant 64% reduction in PAHs, 55% reduction in ED presentations (State Government of Victoria, 2014, Australian Healthcare Associates, 2011)
	• HARP Western Consortium programme for elderly with multimorbidity and complex care needs: 27.9% reduction in PAHs, 20.8% reduction in ED presentations, p<0.001 for both (Bird et al., 2007). For pre and post HARP rates of PAH/patient/day were 0.0068 and 0.0049 respectively (rates for non-HARP control group were 0.0068 and 0.0065 respectively).
	• HARP Western consortium for COPD and chronic HF: for COPD reduced PAHs by 25% and ED presentations by 10% while controls increased both by 40-50%, between group p<0.008. For chronic HF, HARP participation reduced

PAHs by 36% and ED presentations by 39% compared to reductions among controls of 20% and 26% respectively, p<0.008 (Bird et al., 2010). For pre and post HARP rates of PAH/patient/day were 0.0087 and 0.0065 respectively with COPD, and rates with chronic HF were 0.0098 and 0.0063 respectively.

- Alfred DMU: for patients with 3 or more chronic illnesses (n=2,341), after DMU enrolment admissions reduced by 3.54 (95% CI 4.71-2.37) admissions per 1 000 patients per month over 50 months (Linden et al., 2011).
- Restoring Health (St Vincent's Hospital, Melbourne) for patients with chronic lung diseases, chronic HF and diabetes (n=351). Baseline rates after 6 months achieved significant mean per person decrease of 0.47 (95% CI 0.31-0.62) ED presentation and 0.55 (95% CI 0.41-0.67) hospital admissions (Howard et al., 2008).
- Rapid aged care assessment (Treatment, Response & Assessment for Aged Care or TRAAC) St Vincent's Hospital, Melbourne targets elderly patients aged 65 years and above. At 12 months, achieved 53% reduction in ED presentation, and 46% reduction in ED hospitalisation (Roberts et al., 2007).

Key enablers and barriers	A detailed list of key factors assisting the development of HARP projects is provided in Table 5 of (Victorian Government Department of Human Services, 2006). Care coordinators and facilitators are key members of the HARP integrated group, and together with pooled funding within or across agencies, links with other HARP projects and GP involvement they are key facilitators of HARP programmes. Weekly fact-to-face meetings between acute sector contacts and community-based services has been identified as a key enabler, along with referral strategies, use of the interRAI tool (*www.interrai-au.org*) for assessment and the Service Coordination Tool Templates (SCTT) to facilitate sharing of information between acute, primary and community-based services (Reed et al., 2014). Barriers to project implementation included the challenge represented by traditional service sector boundaries, limited access to experienced and skilled staff and constrained access to GPs and community and specialist services (Victorian Government Department of Human Services, 2006).
Workforce and cost implications	The HARP gateway clinic, from which patients are referred back to their usual GP once their condition has stabilised, may include GPs with special interests, disease specific specialists, nurses, practice managers and aged care workers.

Sources: (Department of Human Services, Bird et al., 2010) (Bird et al., 2007) (Roberts et al., 2007) (Reed et al., 2014, Victorian Government Department of Human Services, 2006)
http://www.health.vic.gov.au/harp/about.htm ,

HealthOne – Mount Druitt (HOMD)

Description	HealthOne is an initiative of the NSW Government to bring state-funded primary and community care services together with Commonwealth-funded general practice (NSW Health, 2015). Based on a hub-and-spoke model of co-located services and outreach clinics in areas with poor access to primary health care, the 5 objectives of HealthOne NSW are to:

1. Prevent illness and reduce the risk and impact of disease and disability
2. Improve chronic disease management in the community
3. Reduce avoidable admissions (and unnecessary demand for hospital care)
4. Improve service access and health outcomes for disadvantaged and vulnerable groups
5. Build a sustainable model of health care delivery.

HealthOne has two arms of operation, one for chronic and complex disease and a second model for child and family health. Only the model for chronic and complex disease is referred to in the following, and all evaluation data are based on outcomes from the Mount Druitt HealthOne programme for 125 participants enrolled for 12 months.
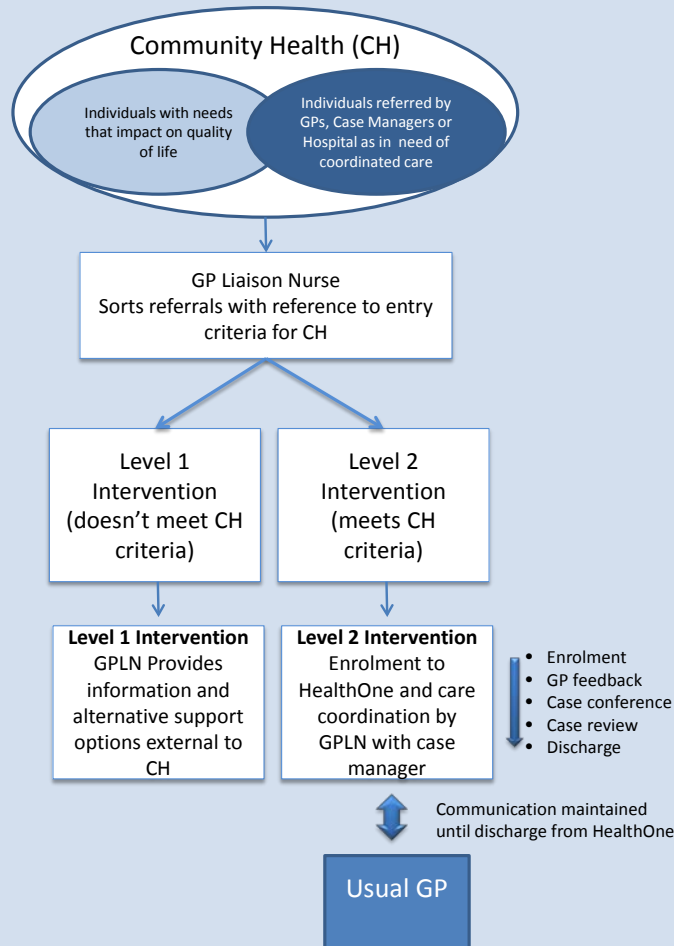
Funding Details	As stated on the HealthOne NSW website (NSW Health, 2015), the NSW Government has committed almost $46 million for capital development and a further $5 million per annum has been made available to Local Health Districts to support nursing, allied health and service integration positions (McNab et al., 2013).

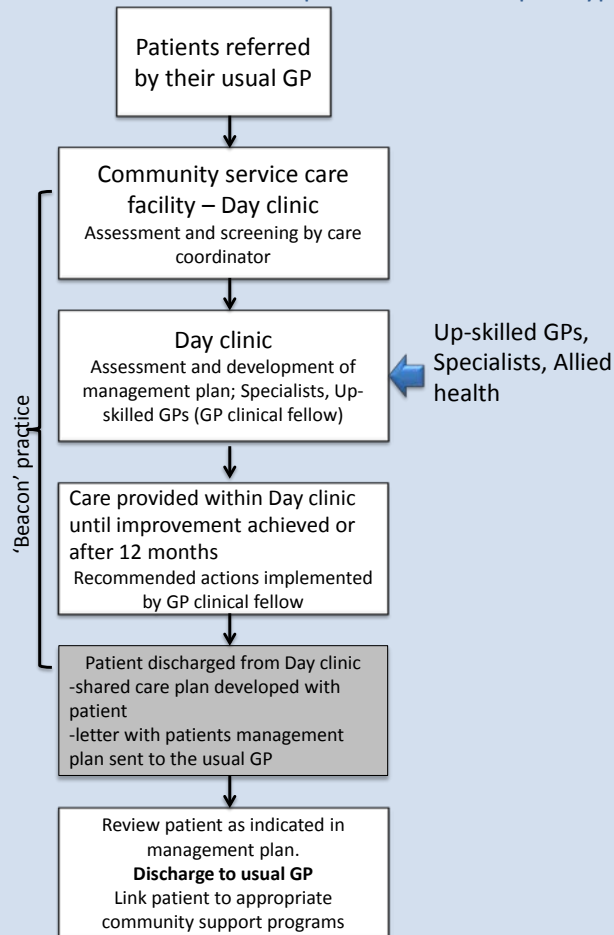| Participants	Potential clients identified by GPs, community health, hospitals, or GP liaison nurses, are enrolled into HealthOne once appropriately screened and assessed. All enrolments need to meet *at least ONE* of the following criteria to be eligible: • Diagnosis of chronic and complex illness • Severe end stage disease • Risk factors for older age such as≥75 years • Risk of falls • Cognitive impairment • Reduced nutritional status • 4 or more ED/Hospital presentations in past 12 months • Acute exacerbation • Readmission to hospital within 28 days A total of 125 HealthOne participants enrolled in Mount Druitt, NSW. Mean age was 68.4 years, but the evaluation report did not indicate the mean number of chronic conditions, or SES for evaluated participants, and was unable to provide complete data for ethnicity. However, for the estimated area population of 102,309 people approximately 4% identify as Aboriginal or Torres Strait Islander, and unemployment ranged between approximately one third and half of all adults depending on stratification, and the SEIFA IRSD is 903.
Interventions	HealthOne programme as depicted above and based on a key role for GP liaison nurses (GPLN).
Outcomes measured	Number of ED presentations in the 12 months following enrolment in HOMD, compared to the 12 months prior to enrolment? LOS in the ED in the 12 months following enrolment in HOMD, compared to the 12 months prior to enrolment? Number of referrals to community health practitioners in the 12 months following enrolment in HOMD, compared to the 12 months prior to enrolment?
Results	Based on comparison of data for people with chronic and complex conditions, in the 12 months prior and 12 months post enrolment significant improvements were noted for average number of ED presentations per patient (3.1 versus 2.6, p=0.006) and average time spent by patient in ED (12.5 versus 6.6 hours, p=0.009), as well as average LOS in hospital (6.3 versus 3.7 hours, p=0.041). Average number of ward admissions per patient did not change significantly (1.4 versus 1.2 per 12 months, p=0.082) For people with chronic and complex conditions almost 30 % had no hospital presentations in the 12 months after enrolment into the programme.
Key enablers and barriers	Based on a qualitative survey of GPs and other health professionals, a majority indicated that the GPLN played a key role in effective communication and information exchange between clients and service providers, as well as the effective crossing of traditional professional boundaries. Continued funding for GPLNs was seen as essential for the sustainability of the programme; as was including influential GPs in the leadership group and maintaining community health flexibility and involvement in planning activities.
Workforce and cost implications	HealthOne is based on an integrated model of care underpinned by a multidisciplinary team approach with a key role for GPLNs who accept referrals from GPs and then coordinate care between the different health professionals and other providers, including facilitating communication and case conferencing.

Source : Mount Druitt evaluation report (McNab et al., 2013).

Inala Chronic Disease Management Service (ICDMS) for Type 2 diabetes

Description	The ICDMS is a community-based integrated model of care for people with chronic disease, and a high proportion of participants have diagnosed type 2 diabetes. Following evaluation of the programme for care quality and service cost, an evaluation study about the impact of programme participation on PAH rates was undertaken for patients with complex type 2 diabetes.

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│  Patients referred      │
│  by their usual GP      │
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┌─────────────────────────┐
│  Community service care │
│  facility – Day clinic  │
│  Assessment and screening by care │
│  coordinator            │
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┌─────────────────────────┐        Up-skilled GPs,
│  Day clinic             │ ◄───   Specialists, Allied
│  Assessment and development of │   health
│  management plan; Specialists, Up- │
│  skilled GPs (GP clinical fellow) │
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┌─────────────────────────┐
│  Care provided within Day clinic │
│  until improvement achieved or │
│  after 12 months        │
│  Recommended actions implemented │
│  by GP clinical fellow  │
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│  Patient discharged from Day clinic │
│  -shared care plan developed with │
│  patient                │
│  -letter with patients management │
│  plan sent to the usual GP │
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│  Review patient as indicated in │
│  management plan.       │
│  **Discharge to usual GP** │
│  Link patient to appropriate │
│  community support programs │
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'Beacon' practice

Funding Details	Pilot studies have been funded by NHMRC via the Centre of research excellence in Quality and Safety in Integrated Primary-Secondary Care.
Participants	A total of 182 patients with complex type 2 diabetes enrolled in the ICDMS programme were compared to 145 receiving usual care. The catchment area for participants from Inala corresponded to a disadvantaged, multicultural, outer suburb, and average HbA1c at baseline was 70.4 and 62.4 mmol/mol for intervention and control cohorts respectively.
Interventions	See diagram above. Intervention is based on referral to a beacon practice where all care is coordinated by up-skilled GPs and allied health professionals in a day clinic environment for up to 12 months or until no further improvement is considered possible.
Outcomes measured	Diabetes-related PAHs (based on the AIHW definition as primary outcome, or an extended definition for secondary outcome where the diabetes diagnoses were secondary to any of a list of 15 pre-specified principal diagnoses), and further secondary outcomes of a number of non-diabetes-related hospitalisations and total number of hospital admissions.

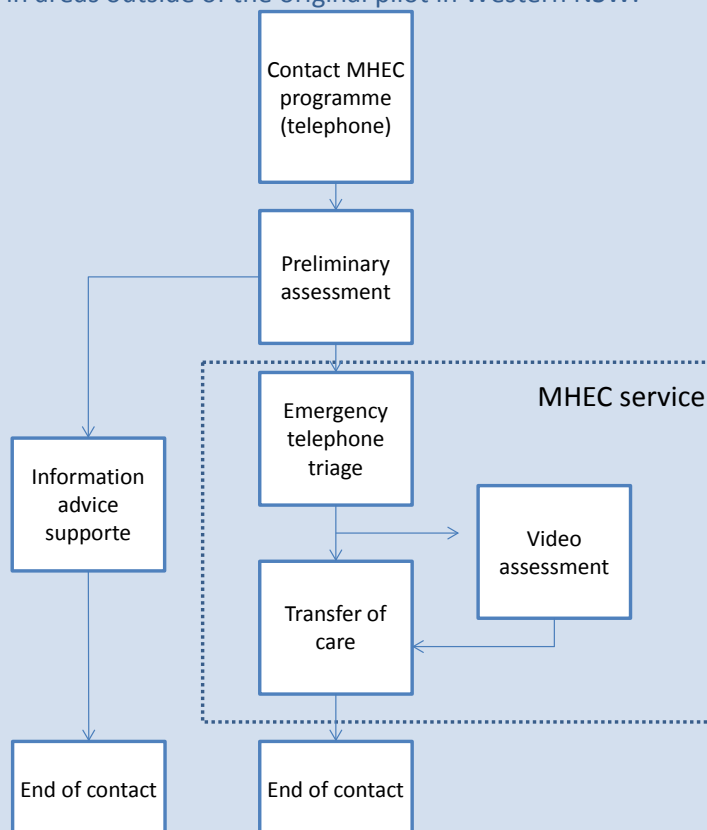|	
Results	Following 24 months participation, the intervention was associated with an incidence rate ratio of 0.53 (95% Cl 0.29-0.96) for PAH compared to controls. The most common reasons for hospital admission in the primary outcome analysis were specified ophthalmic complications and foot ulcer attributable to multiple causes. Following programme commencement there was no between group difference in length of hospital stay, but ICDMS participants were significantly more likely to be hospitalised for non-diabetes related events (incidence rate ratio 1.82, 95% Cl 1.2-2.8). In that case the most common reasons for hospitalisation were iron deficiency anaemia, atrial fibrillation and flutter, and rehabilitation procedures.
Key enablers and barriers	
Workforce and cost implications	The ICDMS integrated primary-secondary diabetes care service is based on a multidisciplinary team comprising a specialist (endocrinologist), advanced skilled GPs (clinical fellows), a credentialed diabetes educator and a podiatrist, with additional allied health on an individual needs basis.

Sources: (Zhang et al., 2015, Russell et al., 2013a, Hepworth et al., 2013, Jackson et al., 2010)

Mental Health Emergency Care – Rural Access Program (MHEC-RAP)

Description	The MHEC-RAP is a rural emergency telehealth programme providing 24/7 access to mental health specialists for health providers, and emergency telephone triage and mental health assessment via video for patients. It is currently being adopted in areas outside of the original pilot in Western NSW.

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        │ Contact MHEC │
        │  programme   │
        │ (telephone)  │
        └──────┬───────┘
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        │ Preliminary  │
   ┌────│  assessment  │
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   │      ┌────▼─────┐   MHEC service
   │    │ │Emergency │              │
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   │    │ │  triage  │              │
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Funding Details	Not provided
Participants	General public and their health care providers
Interventions	A free call line is answered by MHEC-RAP nurses who assess every presentation. Advice is given or the caller is formally triaged via telephone with or without video assessment. After triage/assessment, the MHEC-RAP coordinates transfer of care for each patient to be managed locally as an inpatient or outpatient or to be transported to a mental health inpatient unit (MHIPU).
Outcomes measured	Transfer of care to: outpatient, general hospital, MHIPU, or unknown destination.
Results	Over a 4-year period and for almost 10 000 calls: 71% outpatient, 8% general hospital, 20% MHIPU, 1% unknown. Admissions to hospital increased by 55% then decreased over a two-year period to a 28% reduction in admissions to MHIPU. Impact on PAH and ED not indicated but would be useful in the future.
Key enablers and barriers	Not indicated
Workforce and cost implications	Regionally-based team includes mental health nurses and psychiatrists. Support staff include nursing unit manager, clinical nurse consultant and an administration officer.

Source: (Saurman et al., 2014a, Saurman et al., 2014b)

My Health Guardian (MHG)

|	
Description	MHG is a free of charge health and wellbeing programme offered to members of The Hospitals Contribution Fund of Australia (HCF). Members with a chronic disease were invited to participate; those who declined formed the control group for the evaluation. The evaluation was based on private hospital data only and therefore presentations to public hospitals were not captured.
Funding Details	Funded by HCF, offered free of charge to members.
Participants	Programme is offered to all with chronic disease, but evaluation is for those with HF and/or diabetes.
Interventions	The core of MHG is an online programme offering health assessments, health action plans, personalised health support, education and health behaviour tracking. Registered nurses provide telephone support to assist self-management, and this is facilitated by the availability of patient data, assessments, individual action plans tailored to patient data and assessment responses. All new information is entered into the system to inform subsequent member interactions. Nurse-initiated calls are determined on the basis of disease severity, health status, wellbeing and self-management of individuals.
Outcomes measured	Occurrence and severity of hospitalisation, and hospital costs.
Results	For a cohort of almost 5 000 individuals, where 80% were aged 60 years and over, for the 4-year period odds ratio[20] for hospital admission and readmission were 0.73 (0.69-0.78) and 0.55 (0.48-0.63) respectively compared to the control group. This represented 27% and 45% decreased odds for each event respectively, with increasing benefit as time in the programme increased up to 4 years (end of evaluation period). Savings per member for the 4-year period were $3549 for intervention versus control. By end of evaluation 83% of enrolees were still enrolled. Note here that presentations to public hospitals have not been included and therefore this may be an overstatement of effect.
Key enablers and barriers	Not specifically addressed in the publication. Likely to include support and education of registered nurse staff advising members, and introduction of mobile phone Apps to increase accessibility (Aged care Insite, 2014).
Workforce and cost implications	Registered nurse support officers are the major workforce element of MHG, although maintenance of communication channels for data and guideline documents is also likely to require substantial input. As noted by the authors, the Australian state-based risk equalisation (RE) pools operating to ensure costs for high risk older members of private health insurance are shared across the industry may act as a disincentive for programmes like MHG. Given that people aged 75 and older accounted for 75% of costs and savings with MHG, after taking into consideration changes in RE fund allocation, HCF only retained 54% of the MHG generated savings.

Source: (Hamar et al., 2015)

[20] Adjusted for gender, age group, Coarsended Exact Marching weights, base admit count and disease status for coronary artery disease, heat failure, diabetes, COPD, asthma depression, chronic kidney disease, end stage renal disease, and cancer

Silver Chain Group

Description	A not-for-profit provider of a range of health care services primarily aimed at assisting people in need of care to remain in their own homes and out of hospital, Silver Chain group currently operates in WA, SA, NSW, and QLD. The core services of the Silver Chain Hospital in the Home (HITH) service are: Hospital At The Home (HATH), Post Acute Care (PAC), Priority Response Assessment (PRA) and Community Nursing (CN). HITH is a true hospital substitution, PRA is a hospital avoidance programme, PAC is a post-discharge care in the home, and CN is also a hospitalisation alternative for sub-acute interventions. COPD with severe complication or comorbidity is the fourth most common Diagnosis Related Groups treated by Silver Chain HATH, but respiratory infections, kidney conditions and HF also feature prominently in the list of 10 most common other conditions (McGowan et al., 2013). The PRA service response team attends those not requiring an emergency response but who are in need of timely clinical assessment and/or care intervention within 4 hours. In WA, an agreement with St Johns Ambulance to refer to Silver Chain when appropriate has reduced ED presentations (no figures reported).
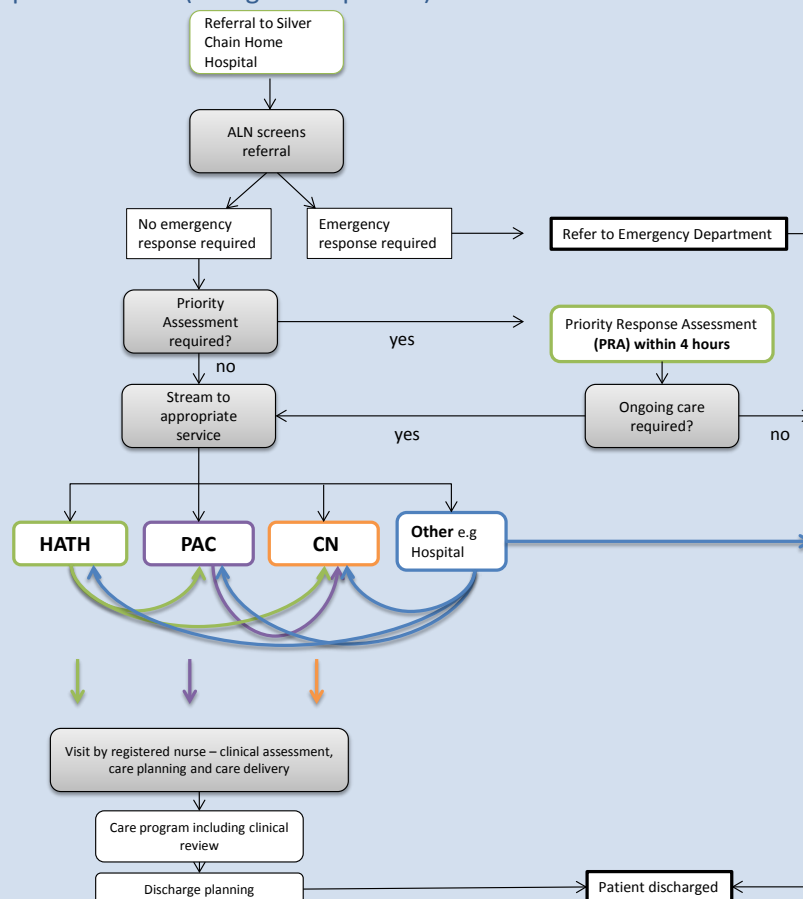
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Funding Details	Approximately 40% of funding for 2013/14 was from home and community care grants, 33% from Department of Health grants, and 12% from Commonwealth grants and subsidies.
Participants	All people aged 18 years and over are assessed for eligibility and need. Entry is generally based on referral by their GP, specialist or Silver Chain Home Hospital medical officer and most participants tend to be elderly.

Interventions	**HATH:** Silver Chain Group oversees clinical governance for patients and is totally responsible for care 24/7 including medication, equipment and additional support from a personal care worker to assist the patient remain at home, if required. **PRA:** Hospital avoidance programme offering 24/7 access to clinical assessment and intervention within 4 hours of a referral being received in either the client's home or Residential Aged Care Facility (RACF). **Telehealth monitoring of people with COPD:** monitoring for predominantly elderly people in their own home for 6 or 12 months **Telehealth Education for Indigenous people with diabetes:** Silver Chain, Wirraka Maya Health Service Aboriginal Corporation. PAH rates not a specific outcome. Currently in recruitment phase, final report December 2015
Outcomes measured	Variable, no formal evaluation of entire group reported, but an evaluation by Deloitte on behalf of the WA Department of Health is referred to in McGowan et al. (2013). A RCT comparison of Silver Chain government-funded HACC service and a Silver Chain HIP service measured ED presentation and hospital admissions (Lewin et al., 2014).
Results	Based on an evaluation of the WA Silver Chain group HACC (McGowan et al., 2013, p 10): • Potentially avoidable separations decreased by 29% (significance not indicated). The average LOS of potentially avoidable separations decreased from 3 to 2 days. • Average number of beds available in public hospitals increased by 4.5%. • Referrals from a GP with a letter decreased by 11% for potentially avoidable conditions (compared to a decrease of 4% for all conditions) Based on comparison between HACC and HIP (Lewin et al., 2014): • HIP (a short-term individualised service to promote independence and minimise need for ongoing support, e.g., improving functionality, health literacy, nutrition) was 30% less costly than HACC over the 2-year period • Odds ratio for ED presentation with HIP was 0.81 (0.6-1.1, ns) versus HACC • Odds ratio for hospital admission was 0.85 (0.62-1.17, ns) versus HACC. Based on Telemonitoring for elderly with COPD (Smith et al., 2011). • Provision of telehealth remote monitoring for 6 months reduced health service use over winter and summer • Benefits were sustained after removal of equipment • Cost savings for winter versus summer were a maximum of $1448 per person • PAH for non-COPD conditions also decreased
Key enablers and barriers	Not indicated
Workforce and cost implications	Silver chain services depend on a multidisciplinary team and communication between team members and the patient is facilitated through use of an in-house information system (ComCare). Access to ComCare is via stationary and mobile devices, and the service lists patient information and alerts, referrals, diagnosis, and care actions, as well as fees and billing, appointment schedules, and guidelines.

Source: (McGowan et al., 2013, Lewin et al., 2014, Smith et al., 2011).

Western Sydney Care Navigation (CN)

Description

The CN model is based on the framework established following a review of Western Sydney's health services for older people and those with chronic conditions. Based within the hospital environment the model of care relies on 3 differentiated nursing roles that identify patients in need of care management, coordinate within-hospital care, and coordinate safe and appropriate discharge into the community. Patient identification employs an ED algorithm based on 3 or more unplanned admissions within a 12-month period, and aged 70 years or more for non-Indigenous, and 45 years and older for Indigenous patients.
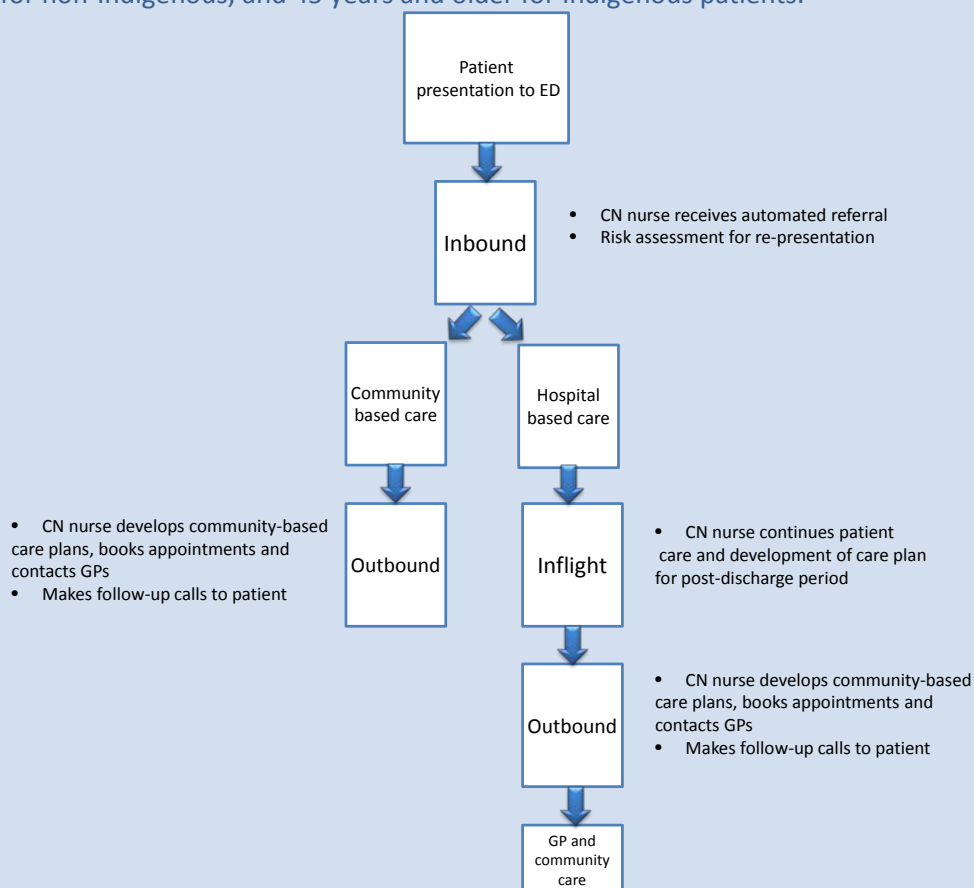
Funding Details

Model implementation was performed as a RCT funded by the NHMRC.

Participants

Patients presenting to ED and having record of 3 or more unplanned admissions within a 12-month period, and aged 70 years or more for non-Indigenous, and 45 years and older for Indigenous, and at least one admission for a respiratory or cardiology-related condition. A total of 500 patients within a 'real world' hospital setting were randomised to intervention and control groups, with 98% of participants in each group included in the final intention-to-treat analysis.

Interventions

Three nursing roles formed the intervention; Inbound, Inflight, and Outbound. Inbound CN nurse receives an automated referral and then assesses patient's likelihood for re-presentation and confers with ED medical officers about the need for hospitalisation. The Inflight CN nurse takes over patient care within the hospital and oversees nursing and development of care plan for post-discharge management. The Outbound CN nurse is responsible for care coordination and/or case management, ensuring adequate preparation and provision for discharge, booking of appointments and contact with GP to advise of patient status and to

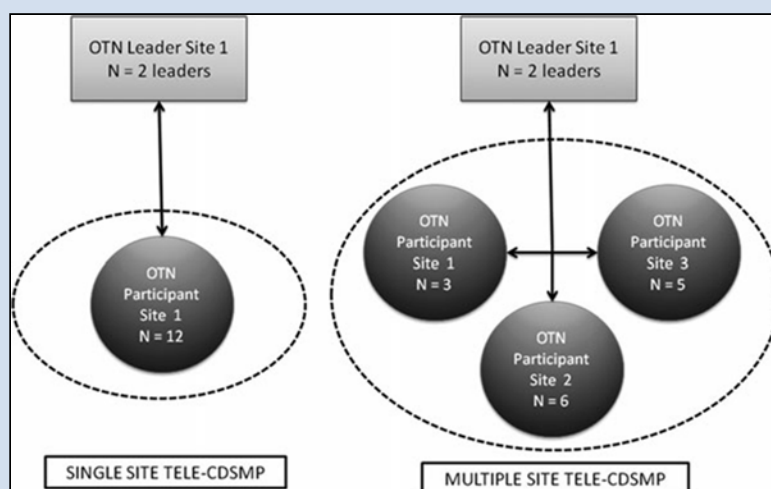|	provide copy of care plans. For those patients not admitted, the Outbound CN nurse also performs this function.
Outcomes measured	Primary outcomes: rate of re-presentations to ED, rate of hospital readmissions, quality of life. Secondary outcomes: LOS, mortality rates, time to first hospital readmission, time to first ED re-presentation, hospital key performance indicators, patient satisfaction, adherence to prescribed medication.
Results	After 2 years, no significant change in any primary outcome. No significant impact on secondary outcomes despite an improvement in number of people receiving medication reviews, and increased rates of community health service use. However, non-significant reductions were reported in rate of re-presentations to ED, and rate of hospital readmissions by 17% and 15% respectively. Analysis of results at 12 months (and for the period when CN nurses were available) showed no significant impact of intervention on outcomes.
Key enablers and barriers	Nursing personnel was reduced from 2 to 1 midway through the study, and the remaining CN nurse left before study completion severely impacting on intervention delivery.
Workforce and cost implications	Ideally 3 nurse roles to provide assessment and referral, in hospital care management, and discharge planning.

Source: (Plant et al., 2013, Plant et al., 2015)

**Other programmes
(Jaglal et al., 2013)**

Ontario Telehealth chronic disease self-management programme (tele-CDSMP)	
Description	The tele-CDSMP is based on delivery of a 6 session self-management programme to rural and remote participants via telehealth linkage by trained coordinators (leaders). To accommodate remote community limitations single and multiple site sessions are conducted where self-management groups are formed either within a single community or by connecting participants from different communities respectively. In each case the self-management group is connected to the leader via telehealth. The programme made use of pre-existing Ontario Tele-medicine Network. For leader teams, at least 2 had one of the chronic diseases targeted and the other person was a health care professional or other professional (e.g., teacher). Participant group is limited to 10-15 participants.
Funding Details	Not provided
Participants	People with a self-reported physician diagnosis of chronic lung disease, heart disease, stroke, or chronic arthritis.
Interventions	The course format is a guided workshop, with constant interaction between participants and leaders, using both video and audio connection. Subjects covered included healthy behaviours, emotional issues, medication use, treatment decisions and working with patient's healthcare professional. Each session involves preparation of an action plan
Outcomes measured	Initially self-efficacy, health behaviour, and health status were monitored. In a subsequent study linkage of patient data with administrative databases for ED presentations, hospitalisations, and physician visits supplemented this list of outcomes.
Results	Based on 13 rural and remote communities in the province of Ontario (N=104), and comparing 6, 12, and18 months before with equivalent periods after tele-CDSMP the following was noted: Significant improvements in self-efficacy, health behaviours and health status. For participants ≤66 years of age 34% increase in physician visits, and no significant difference in EDP For participants >66 years of age there was no impact on physician visits, but a trend reduction by 41% in ED visits (p=0.08) Pre-study hospitalisation rates were low at 0.2-0.3 in the previous 18 months, and

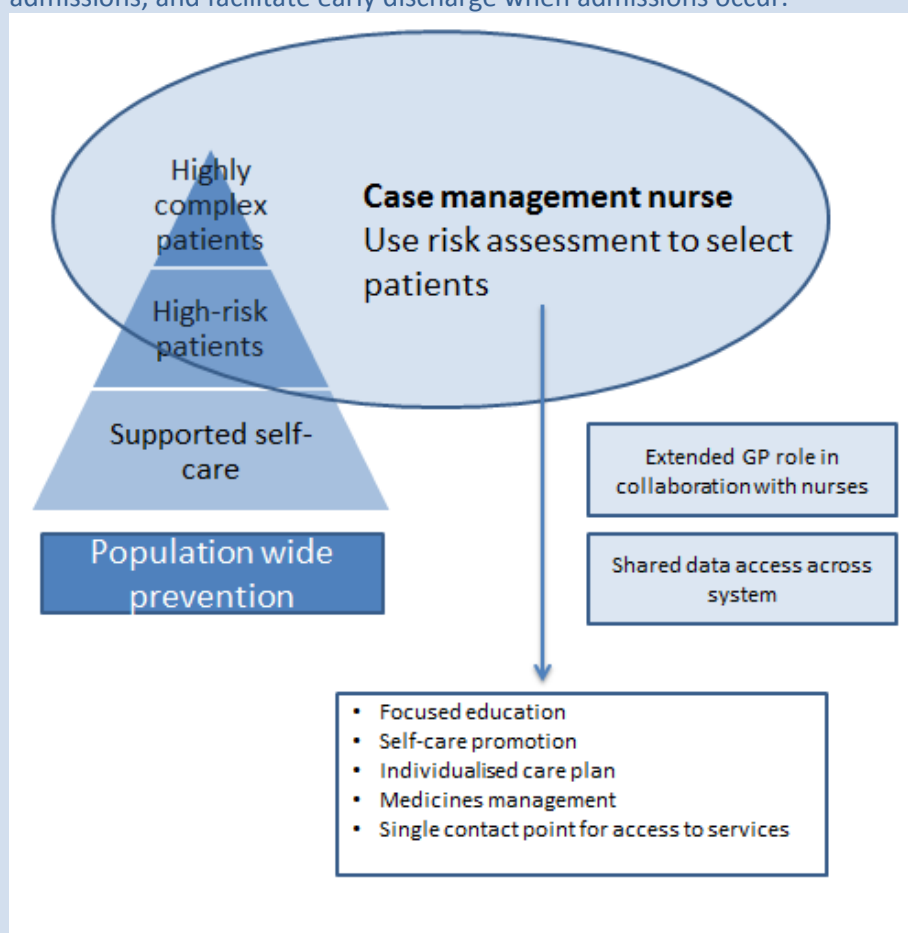|	
	ED visits were also low at 3.1-3.2 in the previous 18 months.
Key enablers and barriers	Although recruitment targeted people interested in online learning only 31.5% of participants attended all sessions. Barriers and facilitators have not been identified at this stage.
Workforce and cost implications	Apart from the need to recruit and train Leaders, there is a need for reliable telehealth linkages to enable programme delivery. The cost of establishing this was not addressed because a pre-existing service was utilised for this programme, but it needs to be considered where no such service exists.

Source: (Jaglal et al., 2014, Jaglal et al., 2013)

Evercare (UK)	
Description	This programme was originally developed in the US and is based on the top tiers of the Kaiser Triangle of chronic care. Implemented in the UK in 2005, United Healthcare's Evercare model targets people at highest risk using Advanced Primary Care Nurses as case managers. These case managers assist with integrating social and healthcare to meet an individual's needs. Using risk prediction tools to identify older people at high risk Advanced Primary Care Nurses are then able to assess their care needs and coordinate their journey along a care pathway with the aim to maintain health, detect changes and prevent unnecessary admissions, and facilitate early discharge when admissions occur.
Funding Details	The evaluation was funded by a Department of Health grant to the National Primary Care Research and Development Centre. Following this evaluation, the NHS introduced case management using the Evercare approach as a key feature of case management policy in the NHS in England.
Participants	Interviews with 46 nurses, 10 GPs, 72 patients, 52 carers and 46 managers/others.
Interventions	Nine primary care trusts worked with United Healthcare to implement the Evercare programme. The programme aimed to avoid hospital admissions for older people by providing an integrated primary care service with Advanced Primary Nurses working collaboratively with GPs.

Outcomes measured	Rates of emergency admission, emergency bed days, and mortality from April 2001 to March 2005 in 62 Evercare practices and 6960-7695 control practices in England
Results	National evaluation of Evercare implementation in the UK found that this model effectively identified vulnerable older people enabling provision of preventive health care, and organisation of care around people's needs. However, the intervention had no significant effect on rates of emergency admission (increase 16.5%, 95% confidence interval −5.7% to 38.7%), emergency bed days (increase 19.0%, −5.3% to 43.2%), and mortality (increase 34.4%, −1.7% to 70.3%) for a high risk population aged >65 with a history of 2 or more emergency admissions in the preceding 13 months. A significant number of people enrolled into Evercare programmes in the UK were not frequent healthcare service users. The evaluators concluded that Evercare and other case management initiatives may identify unmet needs and increase demand on health services.
Key enablers and barriers	Case management by Advanced Primary Nurses (referred to as Community Matrons) as a component of integrated health & social care
Workforce and cost implications	Access to case management added a frequency of contact, regular monitoring and knowledge of a range of management options that had not recently been provided by GPs or anyone else. The Advanced Primary Nurse role was central to this programme. Favourable reports from health professionals, patients and carers were included in the evaluation, including patient quality of life and reduced GP workload. Nurses, patients and carers described individual examples of hospital admissions that had been avoided. There was no evidence of systematic redesign of care. There remained poor liaison between primary and secondary care, varied and at times poor access to services in the community, and out-of-hours services did not focus on keeping patients out of hospital.

Source: (Singh and Ham, 2005, Gravelle et al., 2007, Boaden et al., 2005, Boaden et al., 2006, Singh, 2005)

Triage and Rapid Elderly Assessment Team (TREAT), UK	
Description	UK-based programme designed to reduce LOS and hospital admission rates among patients aged 70 or over. Programme is based on recommendations of the King's Fund for proven interventions: • Early senior doctor review in ED • Specialist input for geriatrics (comprehensive geriatric assessment, CGA) • Timely access to therapist assessment • Alignment of primary, community and acute care
Funding Details	Not indicated
Participants	ED data for over 10 000 admissions over 2 years for pre and post TREAT analysis
Interventions	Rapid response to all admissions of people aged 70 and over with a medically stable but complex condition or social needs. CGA performed by specialist geriatrician determined eligibility with patients either directed to TREAT or inpatient management or to ED for discharge. Hours of operation 9-5 on weekdays and 9-1pm on weekends.
Outcomes measured	Same-day discharge rate as a percentage of admissions (taken as inverse measure of admission rate), LOS.
Results	TREAT reduced LOS by 18.6% and increased same-day discharge by approximately 4% for a targeted geriatric population (compared to matched controls) and 11.65% for all ED geriatric admissions (including unmatched individuals); but had no impact on overall likelihood of same-day discharge (admission avoidance); although from case-matched analysis, intervention was associated with an increase. Study conclusions are in need of further investigation.
Key enablers and barriers	Not indicated
Workforce and cost implications	Consultant geriatrician selects ED patients for TREAT based on a CGA, A multidisciplinary team within ED supported this role (Specialist registrar, nurse practitioner, occupational therapist, administrator). Community-based care delivered by nurse practitioner.

Source: (Wright et al., 2013).

Glossary

Propensity scoring	This score summarises as a single figure those characteristics that reflect the likelihood that a given person received the intervention. A control cohort is then determined by selecting people with similar propensity scores to those in the intervention cohort (George Institute for Global Health et al., 2014).
Separation	Separation refers to an episode of admitted patient care, which can be either a patient's total stay in hospital, or part of a patient's stay in hospital, that results in a change to the type of care (e.g., from acute care to rehabilitation). Hospital separations are more widely known as 'admissions', but can also be referred to as 'hospitalisations' (AIHW, 2015a).
Regression to the mean	Observational evidence that those people who are extreme one year are rarely extreme in the next. Therefore, when individuals identified as 'outliers' because they represent high-risk individuals are invited to participate in an intervention intended to reduce their level of risk, regression to the mean results in their risk being less than in the previous year, effectively biasing outcomes.
Australian Triage Scale classification (ATS)	Classification of patients presenting to the ED according to treatment acuity (assessed maximum time for which the patient should wait for medical assessment and treatment) (AIHW, 2014d, p 5). **Table:** ATS1 — Resuscitation — Immediate ATS2 — Emergency — 10 minutes ATS3 — Urgent — 30 minutes ATS4 — Semi-urgent — 60 minutes ATS5 — Non-urgent — 120 minutes
Hazard ratios	A measure of effect produced by a **survival analysis**. This represents the increased **risk** with which one group is likely to experience the **outcome** of interest. For example, if the hazard ratio for death for a treatment is 0.5, then we can say that treated patients are likely to die at half the rate of untreated patients. (from *http://community.cochrane.org/glossary/*)
Incident Rate Ratios (IRR)	Incidence rate ratio is a time-dependent relative risk comparing the rates of an event over time between groups. From *http://www.australianprescriber.com/magazine/31/1/12/6*

For the Australian Triage Scale classification row, the embedded table is:

ATS category		Treatment acuity
ATS1	Resuscitation	Immediate
ATS2	Emergency	10 minutes
ATS3	Urgent	30 minutes
ATS4	Semi-urgent	60 minutes
ATS5	Non-urgent	120 minutes

CASP checklist assessment for systematic reviews included in the current rapid review

Predictor variable/study	1. Did the review address a clearly focused question?	2. Did the authors look for the right type of papers?	3. Do you think all the important, relevant studies were included?	4. Did the review's authors do enough to assess the quality of the included studies?	5. If the results of the review have been combined, was it reasonable to do so?	8. Can the results be applied to the local population?	9. Were all important outcomes considered?	10. Are the benefits worth the harms and costs?	Score out of 8
(Benbassat and Taragin, 2013)	Y	Y	Y	Y	Y	?	Y	?	6
(Fan et al., 2014)	Y	Y	Y	Y	Y	?	Y	?	6
(Flores-Mateo et al., 2012)	Y	Y	Y	Y	?	?	Y	Y	6
(Gibson et al., 2013)	Y	Y	N	N	Y	?	Y	?	4
(Henson et al., 2015)	Y	Y	Y	Y	Y	N	Y	?	6
(Hickam et al., 2013)	Y	Y	Y	Y	?	?	Y	?	5
(Huntley et al., 2014)	Y	Y	Y	Y	Y	N	Y	?	6
(Kansagara et al., 2011)	Y	Y	Y	Y	Y	Y	Y	N	7
(Leppin et al., 2014)	Y	Y	?	Y	Y	N	Y	Y	6
(Muenchberger and Kendall, 2010)	N	Y	Y	N	N	N	Y	?	3
(Rosano et al., 2013)	Y	Y	Y	?	Y	N	Y	?	5
(Ross et al., 2008)	Y	Y	Y	?	Y	Y	Y	N	6
(Soril et al., 2015)	Y	Y	Y	Y	N	N	Y	Y	6
(Stokes et al., 2015)	Y	Y	Y	Y	Y	Y	Y	?	
(Takeda et al., 2012)	Y	Y	Y	Y	Y	Y	Y	Y	8
(Thomas et al.,	Y	Y	Y	Y	N	Y	Y	?	6

2013)									
(van Loenen et al., 2014)	Y	Y	Y	Y	Y	N	Y	?	6
(van Tiel et al., 2015)	Y	Y	N	?	Y	Y	Y	?	5
(Wallace et al., 2014)	Y	Y	Y	Y	Y	Y	Y	?	7

Y=Yes; N=No; ?= Unable to decide; Note questions 6 & 7 relate to description of results and as such were not quality judgements. Source: (CASP UK, 2013)