MELBOURNE HEALTH

CLINICAL EPIDEMIOLOGY & HEALTH SERVICE EVALUATION UNIT

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

Final report supplement

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CEHSEU

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Appendix 2: SIGN methodology checklists

SIGN	**Methodology Checklist 1: Systematic Reviews and Meta-analyses**

Study identification (*Include author, title, year of publication, journal title, pages*)

Guideline topic:	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY		
In a well conducted systematic review		In this study this criterion is:
1.1	The study addresses an appropriate and clearly focused question.	Well covered / Adequately addressed / Poorly addressed / Not addressed / Not reported / Not applicable
1.2	A description of the methodology used is included.	Well covered / Adequately addressed / Poorly addressed / Not addressed / Not reported / Not applicable
1.3	The literature search is sufficiently rigorous to identify all the relevant studies.	Well covered / Adequately addressed / Poorly addressed / Not addressed / Not reported / Not applicable
1.4	Study quality is assessed and taken into account.	Well covered / Adequately addressed / Poorly addressed / Not addressed / Not reported / Not applicable
1.5	There are enough similarities between the studies selected to make combining them reasonable.	Well covered / Adequately addressed / Poorly addressed / Not addressed / Not reported / Not applicable
SECTION 2: OVERALL ASSESSMENT OF THE STUDY		
2.1	How well was the study done to minimise bias? Code ++, +, or –	
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	

SECTION 3: DESCRIPTION OF THE STUDY PLEASE PRINT ANSWERS CLEARLY				
3.1	What types of study are included in the review? *(Highlight all that apply)*	RCT Case-control	CCT Other	Cohort
3.2	How does this review help to answer your key question? *Summarise the main conclusions of the review and how it relates to the relevant key question. Comment on any particular strengths or weaknesses of the review as a source of evidence for a guideline produced for the NHS in Scotland.*			

SIGN	**Methodology Checklist 2: Randomised Controlled Trials**

Study identification (*Include author, title, year of publication, journal title, pages*)

Guideline topic:	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY

In a well conducted RCT study		In this study this criterion is:
1.1	The study addresses an appropriate and clearly focused question.	Well covered / Adequately addressed / Poorly addressed / Not addressed / Not reported / Not applicable
1.2	The assignment of subjects to treatment groups is randomised	Well covered / Adequately addressed / Poorly addressed / Not addressed / Not reported / Not applicable
1.3	An adequate concealment method is used	Well covered / Adequately addressed / Poorly addressed / Not addressed / Not reported / Not applicable
1.4	Subjects and investigators are kept 'blind' about treatment allocation	Well covered / Adequately addressed / Poorly addressed / Not addressed / Not reported / Not applicable
1.5	The treatment and control groups are similar at the start of the trial	Well covered / Adequately addressed / Poorly addressed / Not addressed / Not reported / Not applicable
1.6	The only difference between groups is the treatment under investigation	Well covered / Adequately addressed / Poorly addressed / Not addressed / Not reported / Not applicable
1.7	All relevant outcomes are measured in a standard, valid and reliable way	Well covered / Adequately addressed / Poorly addressed / Not addressed / Not reported / Not applicable
1.8	What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?	
1.9	All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis)	Well covered / Adequately addressed / Poorly addressed / Not addressed / Not reported / Not applicable
1.10	Where the study is carried out at more than one site, results are comparable for all sites	Well covered / Adequately addressed / Poorly addressed / Not addressed / Not reported / Not applicable

SECTION 2: OVERALL ASSESSMENT OF THE STUDY		
2.1	How well was the study done to minimise bias? Code ++, +, or –	
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	
2.3	Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?	
2.4	Are the results of this study directly applicable to the patient group targeted by this guideline?	
SECTION 3: DESCRIPTION OF THE STUDY (The following information is required to complete evidence tables facilitating cross-study comparisons. Please complete all sections for which information is available).		
3.1	**How many patients are included in this study?** *Please indicate number in each arm of the study, at the time the study began.*	
3.2	**What are the main characteristics of the patient population?** *Include all relevant characteristics – e.g. age, sex, ethnic origin, co-morbidity, disease status, community/hospital based*	
3.3	**What intervention (treatment, procedure) is being investigated in this study?** *List all interventions covered by the study.*	
3.4	**What comparisons are made in the study?** *Are comparisons made between treatments, or between treatment and placebo / no treatment?*	
3.5	**How long are patients followed-up in the study?** *Length of time patients are followed-up from beginning participation in the study. Note specified end points used to decide end of follow-up (e.g. death, complete cure). Note if follow-up period is shorter than originally planned.*	
3.6	**What outcome measure(s) are used in the study?** List all outcomes that are used to assess effectiveness of the interventions used.	
3.7	**What size of effect is identified in the study?** *List all measures of effect in the units used in the study – e.g. absolute or relative risk, NNT, etc. Include p values and any confidence intervals that are provided.*	
3.8	**How was this study funded?** *List all sources of funding quoted in the article, whether Government, voluntary sector, or industry.*	
3.9	**Does this study help to answer your key question?** Summarise the main conclusions of the study and indicate how it relates to the key question.	

SIGN

Methodology Checklist 3: Cohort studies

Study identification (*Include author, title, year of publication, journal title, pages*)

Guideline topic: | Key Question No:

Checklist completed by:

Section 1: Internal validity

	In a well conducted cohort study:	In this study the criterion is:	
1.1	The study addresses an appropriate and clearly focused question.	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
SELECTION OF SUBJECTS			
1.2	The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation.	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.3	The study indicates how many of the people asked to take part did so, in each of the groups being studied.	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.4	The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis.	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.5	What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed.		
1.6	Comparison is made between full participants and those lost to follow up, by exposure status.	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
ASSESSMENT			
1.7	The outcomes are clearly defined.	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.8	The assessment of outcome is made blind to exposure status.	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.9	Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome.	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable

1.10	The measure of assessment of exposure is reliable.	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.11	Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable.	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.12	Exposure level or prognostic factor is assessed more than once.	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
CONFOUNDING			
1.13	The main potential confounders are identified and taken into account in the design and analysis.	Well covered Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
STATISTICAL ANALYSIS			
1.14	Have confidence intervals been provided?		
SECTION 2: OVERALL ASSESSMENT OF THE STUDY			
2.1	How well was the study done to minimise the risk of bias or confounding, and to establish a causal relationship between exposure and effect? *Code ++, +, or –*		
2.2	Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the exposure being investigated?		
2.3	Are the results of this study directly applicable to the patient group targeted in this guideline?		
SECTION 3: DESCRIPTION OF THE STUDY (			
3.1	***How many patients are included in this study?*** List the number in each group separately		
3.2	**What are the main characteristics of the study population?** *Include all relevant characteristics – e.g. age, sex, ethnic origin, comorbidity, disease status, community/hospital based*		
3.3	**What environmental or prognostic factor is being investigated in this study?**		
3.4	**What comparisons are made in the study?** Are comparisons made between presence or absence of an environmental / prognostic factor, or different levels of the factor?		
3.5	**For how long are patients followed-up in the study?.**		
3.6	**What outcome measure(s) are used in the study?** List all outcomes that are used to assess the impact of the chosen environmental or prognostic factor.		

3.7	**What size of effect is identified in the study?** *List all measures of effect in the units used in the study*	
3.8	**How was this study funded?** *List all sources of funding quoted in the article, whether Government, voluntary sector, or industry.*	
3.9	**Does this study help to answer your key question?** Summarise the main conclusions of the study and indicate how it relates to the key question?	

Appendix 3: Jurisdictional policy review survey

Jurisdictional policy review survey

This survey is part of a project being undertaken by the Clinical Epidemiology and Health Service Evaluation Unit (CEHSEU), Royal Melbourne Hospital on behalf the Australian Commission on Safety and Quality in Health Care (ACSQHC).

The purpose of this survey is to ascertain current initiatives being considered, developed or implemented to reduce the risk of **potentially preventable hospitalisation** (PPH) across Australia.

The focus is on three groups of conditions: (i) vaccination preventable conditions; (ii) chronic or complex disease management; and (iii) selected acute conditions.

For the purposes of this project the following definitions will be used:

> **Potentially preventable hospitalisations**, or hospitalisations that may be preventable with high quality primary and preventive care. These hospitalisations may be avoided if clinicians effectively diagnose, treat, and educate patients, and if patients actively participate in their care and adopt healthy lifestyle behaviors. *Agency for Healthcare Research and Quality*

We are interested in **policies, strategies or initiatives** that have been developed (or are in development) *to reduce the risk of PPH*. These are usually delivered in the primary care setting (GP or community health centre) but may be based from other settings such as from the hospital setting.

Please complete the survey and return it to Jo Tropea, Program manager, CEHSEU, Royal Melbourne Hospital via Joanne.Tropea@mh.org.au by **Friday 29 May 2009.**

We would appreciate your contact details in the event that we need to clarify responses. If you would like to discuss the survey further, please contact Jo Tropea (03) 9342 8772.

Name:

Position:

Department:

Phone number:

Please list policy initiatives to reduce potentially preventable hospitalisations for the following conditions:			
(ii) Chronic or complex medical conditions (eg COPD, diabetes, heart failure, mental health disorders, other)			
List policy(s) and weblink*: 1.	***Implementation status*** ☐ Main stream ☐ Pilot stage ☐ For future	***Description of intervention/program*** include information about organisation of care; funding model; workforce redesign; service delivery; settings	***Has the implementation been evaluated?*** ☐ Yes ☐ No If YES please provide weblink*, or publications
2.	☐ Main stream ☐ Pilot stage ☐ For future		☐ Yes ☐ No If YES please provide weblink*, or publications
3.	☐ Main stream ☐ Pilot stage ☐ For future		☐ Yes ☐ No If YES please provide weblink*, or publications

Please insert additional rows if required.

Please list policy initiatives to reduce potentially preventable hospitalisations for the following conditions:			
(iii) Acute conditions for which hospitalisations are commonly avoidable with antibiotics or other medical interventions available in primary care (eg gastroenteritis, ENT infections, urinary tract infections)			
List policy(s) and weblink*: 1.	***Implementation status*** ☐ Main stream ☐ Pilot stage ☐ For future	***Description of intervention/program*** include information about organisation of care; funding model; workforce redesign; service delivery; settings	***Has the implementation been evaluated?*** ☐ Yes ☐ No If YES please provide weblink*, or publications
2.	☐ Main stream ☐ Pilot stage ☐ For future		☐ Yes ☐ No If YES please provide weblink*, or publications
3.	☐ Main stream ☐ Pilot stage ☐ For future		☐ Yes ☐ No If YES please provide weblink*, or publications

Please insert additional rows if required.

Thank you for completing the survey.

Please save the completed survey and send to Joanne.Tropea@mh.org.au along with any relevant publications.

Appendix 4: Comparison of PPH sets used in Australia

National health performance framework (AIHW, 2008)	**Victorian ACSC study (2004)**	**PHIDU (2007)**
Vaccine-preventable conditions		
Influenza and pneumonia Other vaccine-preventable conditions	Influenza and pneumonia Other vaccine-preventable conditions	Influenza and pneumonia Other vaccine-preventable conditions
Chronic conditions		
Asthma Congestive cardiac failure Diabetes complications COPD Angina Iron deficiency anaemia Hypertension Nutritional deficiencies Rheumatic heart disease**	Asthma Congestive heart failure Diabetes complications COPD Angina Iron deficiency anaemia Hypertension Nutritional deficiencies	Asthma Congestive cardiac failure Diabetes complications COPD Angina Iron deficiency anaemia Hypertension Nutritional deficiencies
Acute medical conditions		
Dehydration and gastroenteritis Pyelonephritis Perforated/bleeding ulcer Cellulitis Pelvic inflammatory disease Ear, nose and throat infections Dental conditions Appendicitis with generalised peritonitis** Convulsions and epilepsy Gangrene	Dehydration and gastroenteritis Pyelonephritis Perforated/bleeding ulcer Cellulitis Pelvic inflammatory disease Ear, nose and throat infections Dental conditions Convulsions and epilepsy Gangrene	Dehydration and gastroenteritis Pyelonephritis Perforated/bleeding ulcer Cellulitis Pelvic inflammatory disease Ear, nose and throat infections Dental conditions Ruptured appendix** Convulsions and epilepsy Gangrene

** differences between the sets.
There are minor differences in ICD 10 codes between the sets. For example: Iron deficiency ICD 10 codes vary between VACSC (3 codes) and PHIDU (9 codes). Dental conditions – PHIDU includes ICD 10 code A69.0, VACSC does not include A69.0; Pyelonephritis AIHW and VACSC includes code N39.0 but PHIDU does not; Cellulitis PHIDU includes codes L08.8 L08.9

Appendix 5: ICD-10-AM codes used in national PPH indicator set

From Australian Hospital Statistics (AIHW, 2008) Table A1.9: ICD-10-AM codes for selected tables

Codes used for identifying potentially preventable hospitalisations presented in Hospitals and a glance, and Tables 4.5, 4.6 and A5.1, A5.2 and A5.3

Category	ICD-10-AM codes
Vaccine-preventable	
Influenza and pneumonia	J10, J11, J13, J14, J15.3, J15.4, J15.7, J15.9, J16.8, J18.1, J18.8 in any diagnosis field, excludes cases with additional diagnosis of D57 (sickle-cell disorders) and people under 2 months
Other vaccine-preventable conditions	A35, A36, A37, A80, B05, B06, B16.1, B16.9, B18.0, B18.1, B26, G00.0, M01.4 in any diagnosis field
Chronic	
Asthma	J45, J46 as principal diagnosis only
Congestive cardiac failure	I50, I11.0, J81 as principal diagnosis only, exclude cases with the following procedure codes: 33172-00, 35304-00, 35305-00, 35310-02, 35310-00, 38281-11, 38281-07, 38278-01, 38278-00, 38281-02, 38281-01, 38281-00, 38256-00, 38278-03, 38284-00, 38284-02, 38521-09, 38270-01, 38456-19, 38456-15, 38456-12, 38456-11, 38456-10, 38456-07, 38456-01, 38470-00, 38475-00, 38480-02, 38480-01, 38480-00, 38488-06, 38488-04, 38489-04, 38488-02, 38489-03, 38487-00, 38489-02, 38488-00, 38489-00, 38490-00, 38493-00, 38497-04, 38497-03, 38497-02, 38497-01, 38497-00, 38500-00, 38503-00, 38505-00, 38521-04, 38606-00, 38612-00, 38615-00, 38653-00, 38700-02, 38700-00, 38739-00, 38742-02, 38742-00, 38745-00, 38751-02, 38751-00, 38757-02, 38757-01, 38757-00, 90204-00, 90205-00, 90219-00, 90224-00, 90214-00, 90214-02.
Diabetes complications	E10–E14.9 as principal diagnoses and E10–E14.9 as additional diagnoses where the principal diagnosis was: hypersmolarity (E87.0) acidosis (E87.2) transient ischaemic attack (G45) nerve disorders and neuropathies (G50–G64) cataracts and lens disorders (H25–H28) retinal disorders (H30–H36) glaucoma (H40–H42)

	myocardial infarction (I21–I22) other coronary heart diseases (I20, I23–I25) heart failure (I50) stroke and sequelae (I60–I64, I69.0–I69.4) peripheral vascular disease (I70–I74) gingivitis and periodontal disease (K05) kidney diseases (N00–N29) [including end-stage renal disease (N17–N19)] renal dialysis (Z49)
COPD	J20, J41, J42, J43, J44, J47 as principal diagnosis only, J20 only with additional diagnoses of J41, J42, J43,J44, J47
Angina	I20, I24.0, I24.8, I24.9 as principal diagnosis only, exclude cases with procedure codes not in blocks [1820] to [2016]
Iron deficiency anaemia	D50.1, D50.8, D50.9 as principal diagnosis only.
Hypertension	I10, I11.9 as principal diagnosis only, exclude cases with procedure codes according to the list of procedures excluded from the Congestive cardiac failure category above.
Nutritional deficiencies	E40, E41, E42, E43, E55.0, E64.3 as principal diagnosis only.
Rheumatic heart disease	I00 to I09 as principal diagnosis only. (Note: includes acute rheumatic fever)
Acute	
Dehydration and gastroenteritis	E86, K52.2, K52.8, K52.9 as principal diagnosis only.
Pyelonephritis	N10, N11, N12, N13.6, N39.0 as principal diagnosis only.
Perforated/bleeding ulcer	K25.0, K25.1, K25.2, K25.4, K25.5, K25.6, K26.0, K26.1, K26.2, K26.4, K26.5, K26.6, K27.0, K27.1, K27.2, K27.4, K27.5, K27.6, K28.0, K28.1, K28.2, K28.4, K28.5, K28.6 as principal diagnosis only.
Cellulitis	L03, L04, L08, L88, L98.0, L98.3 as principal diagnosis only, exclude cases with any procedure except those in blocks 1820 to 2016 or if procedure is 30216-02, 30676-00, 30223-02, 30064-00, 34527-01, 34527-00, 90661-00 and this is the only listed procedur
Pelvic inflammatory disease	N70, N73, N74 as principal diagnosis only.
Ear, nose and throat infections	H66, H67, J02, J03, J06, J31.2 as principal diagnosis only.
Dental conditions	K02, K03, K04, K05, K06, K08, K09.8, K09.9, K12, K13 as principal diagnosis only.
Appendicitis with generalised peritonitis	K35.0 in any diagnosis field
Convulsions and epilepsy	G40, G41, O15, R56 as principal diagnosis only
Gangrene	R02 in any diagnosis field

Appendix 6: Differences in PPH sets used in Australia

Differences in terminologies and definitions of PPH by national, state and territory departments

Title of indicator set / framework	Terminology	Definition
National sets		
National Health Performance Framework: Performance Indicators (AIHW [84])	Potentially preventable hospitalisations (PPH)	Rates of PPH measure the effectiveness, timeliness and adequacy of various types of care in preventing hospital admissions for particular conditions. Those types include population health, primary care, and outpatient services.
Indigenous Health Performance Framework [22]	Ambulatory care sensitive hospital admissions	The number of hospital admissions for ACSC for ATSI people expressed as a rate by age group, age-standardised rate and ratio
State and territory based sets		
NSW Health [85]	Ambulatory Care Sensitive (ACS) conditions	These are hospitalisations that could have been avoided through the use of preventive healthcare or early disease management given in an ambulatory setting, such as by a general practitioner or community health centre. The categories used for the ambulatory care-sensitive conditions are based on those used by the Victorian Department of Human Services (2004).
Northern Territory [21]	Avoidable hospitalisation rates	Based on PHIDU sub-set of PPH conditions.
Queensland Health	Potentially preventable hospitalisations (PPH)	Conditions where hospitalisation is believed to be avoidable through provision of timely and adequate non-hospital care
SA Health [86]	Potentially preventable hospitalisations	There are a number of conditions for which hospital separations are seen to be potentially preventable if timely and adequate non-hospital care is provided. The conditions are those collected by the AIHW.
Victorian Ambulatory Care Sensitive Conditions Study [87]	Ambulatory Care Sensitive Conditions (ACSC)	Conditions for which hospitalisation is thought to be avoidable if preventive care and early disease management are applied, usually in an ambulatory setting. Use Victorian ACSC set.
WA health [88]	Ambulatory Care Sensitive Conditions (ACSC)	Conditions that are thought to be avoidable if timely and adequate non-hospital care is provided. These conditions are collectively called ambulatory care sensitive conditions (ACSC). Collect information on conditions as defined in the Victorian ACSC study.

Appendix 7: Summary tables of included studies

1. Vaccine-preventable conditions

Study (year); Country	Study design	Participants	Intervention	Relevant outcomes	Main findings	SIGN* & NHMRC rating**
Berg[54] (2008) **USA**	RCT	People ≥ 65 years enrolled in 5 USA states Blue Cross and Blue Shield Government-wide Service Benefit Plan N = 134,791	2 interventions: (a) mail outs to promote receiving influenza vaccination; and (b) mail outs to promote the use of a telephonic nurse advice service regarding influenza vaccine	Hospital admissions Inpatient bed days for: influenza, pneumonia, heart failure, and other respiratory conditions ED visits Other Physician evaluation and management visits; other outpatient visits; and costs	Compared to the control group: • Intervention (a) experienced 2.87% (p=0.033) fewer condition-related inpatient bed days; and 7.25% (p=0.101) fewer condition-related ED visits. • Intervention (b) experienced 7.65% (p<0.001) fewer condition-related inpatient bed days; and 6.75% (p=0.125) fewer condition-related ED visits. • Per dollar spent, the return on investment was estimated to be US$ 2.51 for the influenza mailing intervention and US$24.24 for the nurse advice mailing intervention.	SIGN: + Level II
Berg[53] (2004) **USA**	RCT	Enrolled members of Blue Cross Blue Shield Association's Government Wide Service Benefit Program N=339,220	Two reminders sent via mail to encourage receipt of influenza and pneumococcal vaccinations	Hospital admissions Influenza or pneumonia inpatient admissions ED visits Other Rates of vaccine uptake Costs	• Intervention group had 9.67% (p=0.136) lower rate of influenza/pneumonia inpatient admissions; and 22.64% (p=0.002) lower rate of influenza/pneumonia ED visits compared to the control group. • The intervention group experienced a 2.62% (p=0.010) higher rate of influenza vaccinations; 4.61% (p_0.080) higher rate of pneumonia vaccinations; • The benefit-cost ratio (return on investment) from this intervention was estimated to be US$ 2.21 per dollar spent.	SIGN: + Level II

2. Chronic conditions

Study (year); country	Study design	Participants	Intervention	Relevant outcomes	Main findings	SIGN* & NHMRC rating**
Adams[68] (2007) **USA**	SR/MA of 32 studies 20 RCT 5 CCT 7 CBA	COPD patients	Intervention(s) containing at least one CCM component	<u>Hospital admissions</u> Health care use eg, emergency/unscheduled visits Hospitalisations Length of stay (LOS) <u>Other</u> Knowledge, dyspnoea, quality of life (QoL), lung function, performance-based tests, clinical end point (eg mortality or number of AE), and cost	• Pooled analysis of 3 RCTs (level I) among COPD patients receiving multiple CCM components showed significantly lower rates of: – emergency/unscheduled visits RR 0.58, 95% CI 0.42-0.79; – hospitalisations RR 0.78 (0.66-0.94). • There were no significant differences for those receiving only 1 CCM component. • WMD for hospital stay was −2.51 (95% CI −3.40 to −1.61) days shorter for the group that received 2 or more components. • Symptoms, QoL, lung function, and functional status were not significantly different between the intervention and control groups.	SIGN: 2+ Level III-1
Barnett[81] (2006) **USA**	Retrospective matched cohort study	Older veterans with type 2 DM at high risk for multiple Veterans Affairs (VA) inpatient and outpatient visits. N=800; (400 in each group	Coordination Home Telehealth program (CHT)	<u>Hospital admissions</u> Hospitalisations <u>Other healthcare utilisation</u> LOS and outpatient visits by type	• There was reduction in hospitalisation by 25% which was attributed to the intervention. • There was a significant difference between the treatment and comparison groups in the likelihood of all-cause hospitalisations, decreasing in the treatment group from 38.8% to 30.0% (p =0.01) and increasing in the comparison group from 31.2% to 33.1% (p=0.61). • The treatment group had a significant reduction in DM-related hospitalisations during 24 months from 35.3% to 26.9% (p=0.02). • The treatment group experienced a significant reduction in care coordinator–initiated primary care clinic visits, decreasing from 59.0% to 22.6% (p<0.001).	SIGN: + Level III-2

Study (year); country	Study design	Participants	Intervention	Relevant outcomes	Main findings	SIGN* & NHMRC rating**
Dennis[69] (2008) & Zwar [68] (2006) **Australia**	SR of 141 studies & 23 SR 116 RCT 24 CCT 4 Cohort studies 1 ITS	Adults (≥18 years) with one or more of the following chronic conditions: HT, type 2 diabetes, lipid disorders, asthma, IHD, COPD, arthritis and osteoperosis	Chronic disease management interventions	<u>Hospital admissions</u> Health service utilisation: Hospital admissions ED visits Readmissions (respiratory) <u>Other</u> Other health service utilisation measures GP visits; Health care professional adherence to guidelines; Patient outcomes: physiological measures of disease, adherence to treatment, QoL, risk behaviour, satisfaction, health status, and functional status.	• Self-management interventions are effective in improving both processes of care and patient outcomes; including significantly reducing hospital admissions among COPD and asthma patients. • Delivery-system design (DSD) interventions have a positive effect on both provider behaviour and some patient outcomes, particularly for diabetes, HT and lipid disorders. There were mixed results regarding the effect of DSD interventions on hospitalisation rates. • Evidence-based guidelines and educational meetings for health professionals improved adherence to guidelines and some patient outcomes. Education of health professionals, on its own, did not improve patient health outcomes. • There was limited evidence for the effective use of community resources and health care organisation to support chronic disease management in primary care.	SIGN: 2+ Level III-2
Dorr[76] (2008) **USA**	CCT	Older patients (≥ 65 years); 7 intervention & 6 control clinics from Intermountain Health Care, Utah N=3432	Care Management Plus (CMP) program	<u>Hospital admissions</u> Hospitalisation rates <u>Other</u> Mortality	• Hospitalisations were lower for the majority of intervention patients, but did not reach statistical significance (at 1 year: CMP 22.2% vs. control 23.3%, OR = 0.94, p=0.55; at 2 years: CMP 31.8% vs. control 34.7%, OR = 0.88, p=0.23). • Following multivariate analysis of patients with DM, those receiving CMP had significantly lower rates of hospitalisations at 1 year (Adj OR 0.65, p<0.001); and at 2 years (Adj OR 0.0.56, p<0.001). • The intervention resulted in significantly lower mortality at 1 year (6.2%, vs. 10.6% for controls) and at 2 years (12.9% vs. 18.2%) in patients with DM. Survival analyses showed lower mortality and slightly more emergency department visits for care managed patients than for controls.	SIGN: NA Poor quality due to study design Level III-1

Study (year); country	Study design	Participants	Intervention	Relevant outcomes	Main findings	SIGN* & NHMRC rating**
Effing[78] (2007) **Cochrane review**	SR/MA of 14 studies 13 RCT 1 CCT	COPD patients	Self-management education programs	<u>Hospital admissions</u> Hospital admission rates ED visits <u>Other</u> Health-related QoL (eg St George's Respiratory Questionnaire, SGRQ), symptom scores, number and severity of exacerbations, courses of oral steroids or antibiotics, use of rescue medication, use of other health care facilities, days lost from work, lung function, and exercise capacity	• The studies showed a significant reduction in the probability of at least one hospital admission among patients receiving self management education compared to those receiving usual care (OR 0.64; 95%CI 0.47 to 0.89). • The results translated into a one year NNT ranging from 10 (6 to 35) for patients with a 51% risk of exacerbation, to an NNT of 24 (16 to 80) for patients with a 13% risk of exacerbation. • On the disease specific SGRQ, differences reached statistical significance at the 5% level on the total score (WMD -2.58; 95% CI -5.14 to -0.02) and impact domain (WMD -2.83; 95% CI -5.65 to -0.02), but these difference did not reach the clinically relevant improvement of 4 points. • A small but significant reduction was detected in dyspnoea measured with the BORG-scale (WMD -0.53; 95% CI (-0.96 to -0.10). • No significant effects were found either in number of exacerbations, ED visits, lung function, exercise capacity, and days lost from work. • Inconclusive results were observed in doctor and nurse visits, on symptoms other than dyspnoea, the use of courses of oral corticosteroids and antibiotics, and the use of rescue medication.	SIGN: 2+ Level III-1

Study (year); country	Study design	Participants	Intervention	Relevant outcomes	Main findings	SIGN* & NHMRC rating**
Gibson[77] (2002) **Cochrane Review**	SR/MA of 36 RCT	Asthma patients (> 16 years old)	Self-management education programs	Hospital admissions Asthma hospital admission rates ED visits Other Doctor visits, days lost from work or school, lung function (FEV1), peak expiratory flow (PEF), use of rescue beta agonists, courses of oral corticosteroids, symptom scores, QoL scores, costs	• Self management education significantly reduced: – hospitalisations (RR 0.64, 95% CI 0.50 to 0.82); – ED visits (RR 0.82, 95% CI 0.73 to 0.94); – unscheduled visits to the doctor (RR 0.68, 95% CI 0.56 to 0.81); – days off work or school (RR 0.79, 95% CI 0.67 to 0.93); – nocturnal asthma (RR 0.67, 95% CI 0.0.56 to 0.79); and – QoL (standard mean difference 0.29, 95% CI 0.11 to 0.47). • Measures of lung function were little changed.	SIGN: 2+ Level I
Gruen[80] (2003) **Cochrane review**	SR of 9 studies 5 RCT 2 CBA 2 ITS	Patients eligible to receive specialist outreach service	Specialist outreach clinics	Hospital admissions Use of hospital services Other Access; quality of care; health outcomes; patient and provider satisfaction; use of primary care services; costs	• Studies measuring hospitalisations found reductions in hospital attendances, however, they were not statistically significant • Simple 'shifted outpatients' styles of specialist outreach were shown to improve access, but there was no evidence of impact on health outcomes. • Specialist outreach as part of more complex multifaceted interventions involving collaboration with primary care, education or other services was associated with improved health outcomes, more efficient and guideline-consistent care, and less use of inpatient services. • Two included studies examined numbers of primary care physician visits in 1 year and found that outreach led to an increase visits that was not statistically significant. • There was a reduction in use of other non-hospital services reported, such as mental health worker service, and physiotherapy.	SIGN: 2+ Level III-2

Study (year); country	Study design	Participants	Intervention	Relevant outcomes	Main findings	SIGN* & NHMRC rating**
Holland[74] (2005) **UK**	SR/MA of 30 RCTs	CHF patients	Multidisciplinary interventions including provision of home visits; home physiological monitoring or televideo link; telephone follow up but no home visits; and hospital or clinic interventions alone. Pharmaceutical and exercise based interventions were excluded	<u>Hospital admissions</u> Proportion of patients with one or more hospital admission (all cause), heart failure hospital admission. <u>Other</u> All cause mortality and mean inpatient days.	All cause hospitalisation: • MD interventions showed a significant reduction in all cause admission compared to the usual care (RR 0.87, 95% CI 0.79 to 0.95, p = 0.002). However, there was a significant heterogeneity (p = 0.002). • Home visit interventions showed significant reduction in all cause admission to hospital (RR 0.80, 95% CI 0.71 to 0.89, p=0.0001). • Telephone-type interventions reduced admission but this finding was not significant (RR 0.86, 95% CI 0.73 to 1.02, p = 0.09) Heart failure admissions: • MD interventions (n= 16) showed a significant reduction in heart failure admissions compared to usual care (RR 0.70, 95% CI 0.61 to 0.81, p < 0.0001). This benefit was notable and similar for home and telephone-type interventions, with RRs of 0.62 (95% CI 0.51 to 0.74, p < 0.001) and 0.70 (95% CI 0.57 to 0.85, p < 0.001), respectively. • There was no significant effect (n = 2 trials) of hospital or community based intervention (RR 0.94, 95% CI 0.78 to 1.13, p = 0.51). Mortality • MA showed (26 RCTs) a significant decrease in all cause mortality (RR 0.79, 95% CI 0.69 to 0.92, p = 0.002).	SIGN: + Level I

Study (year); country	Study design	Participants	Intervention	Relevant outcomes	Main findings	SIGN* & NHMRC rating**
Lavery[75] (2005) **USA**	BA study with historical control	Community based services, N= 2738	Lower extremity disease management program	<u>Hospital admissions</u> Hospitalisations: foot related LOS <u>Other</u> Amputation incidence	After implementation of the disease management program: • The number of foot-related hospital admissions decreased by 37.8%, from 22.86 per 1000 members per year to 14.23 (37.8%). • The average inpatient LOS was reduced by 21.7%, from 4.75 to 3.72 days ($p<0.05$). • Incidence of amputations decreased by 47.4%, from 12.89 per 1000 diabetics per year to 6.18 ($p<0.05$). • There was a 69.8% reduction in the number of skilled nursing facility admissions per 1000 members per year and a 38.2% reduction in the average SNF LOS from 8.72 to 6.52 days ($p < 0.05$).	SIGN: NA Poor quality due to study design Level III-3
Lemmens[71] (2009) **Netherlands**	SR/MA of 36 studies 30 RCT 6 CBA	Patients with asthma or COPD	Disease management interventions; and their components	<u>Hospital admissions</u> Health care utilisation: Hospitalisations ED visits LOS <u>Other</u> Clinical outcomes, QoL, and/or patient satisfaction.	*Multiple interventions including case management vs usual care* • Pooled analysis of nine of these studies reporting hospitalisations in COPD-care showed a significant reduction in the probability of at least one hospital admission (OR=0.58; 95% CI 0.40-0.83, p=0.003). • MA of 4 studies did not show significant differences in rates of ED visits • MA of 3 double interventions and 3 triple interventions demonstrated significant improvements on the SGRQ total and impact scores (mean difference -2.52, 95% CI -5.00,-0.05). • No significant differences between intervention and control groups were found on clinical outcomes (lung function and symptoms). *Patient education and revision of professional role (and professional education) vs usual care* • MA of studies that included a pharmacist demonstrated a significant improvement in Asthma QoL Questionnaire (AQLQ).	SIGN: + Level III-2

Study (year); country	Study design	Participants	Intervention	Relevant outcomes	Main findings	SIGN* & NHMRC rating**
McAlister[72] (2001) **Canada**	SR/MA of 12 RCT	Patients with IHD	MD disease management programs	Hospital admissions Hospital admission rates Other Mortality, myocardial re-infarction rates, hospital length of stay (LOS)	• There was a significant reduction in hospital admissions in those receiving MD intervention compared to controls (RR= 0.84, 95% CI 0.76 to 0.94). • Of the four trials that evaluated LOS, two showed shorter LOS in the intervention group • Patients in disease management programs were more likely to be prescribed efficacious drugs RR = 2.14, 95% CI 1.92 to 2.38 for lipid lowering drugs; RR = 1.19, 95% CI 1.07 to 1.32 for beta blockers; and RR = 1.07, 95% CI 1.03 to 1.11 for antiplatelet agents. • Among the intervention group, reductions in risk of all cause mortality RR 0.91 (95% CI 0.79 to 1.04); and recurrent myocardial infarction RR =0.94, 95% CI 0.80 to 1.10 were found. • Five of the eight trials evaluating QoL or functional status reported better outcomes in the intervention arms. Only three of these trials reported the costs of the intervention—the interventions were cost saving in two cases	SIGN: + Level I

Study (year); country	Study design	Participants	Intervention	Relevant outcomes	Main findings	SIGN* & NHMRC rating**
Peikes[79] (2009) **USA**	RCT	18 309 fee-for-service Medicare patients with CHF, coronary artery disease, and DM n = 178 to 2657 per program	15 care coordination programs	Hospital admissions Hospitalisation rates Other Monthly Medicare expenditures, patient-reported and care process indicators	• Thirteen of the 15 programs showed no significant ($p<0.05$) differences in hospitalisations;1 program had 0.17 fewer hospitalisations per person per year (90% CI, -0.28 to -0.05; 17% less than the control group mean, $p=0.02$); another program (Georgetown) reduced annual hospitalisations by 0.49 per person per year (24% of the control group mean, $p=0.07$) • However, one another program (Charlestown) had 0.118 more hospitalisations per person per year (90% CI, 0.025-0.210; 19% more than the control group mean, $P=0.04$). • None of the 15 programs generated net savings. • Treatment group members in 3 programs had monthly Medicare expenditures less than the control group by 9% to 14%	SIGN: + Level II

3. Acute medical conditions

Study (year) country	Study design	Participants	Interventions	Relevant outcomes	Main findings	SIGN* & NHMRC rating**
Brazil[90] (1998) **Canada**	Descriptive case-series	Patients from 3 acute care hospitals and one home care program N=123	Rapid access home-based service	<u>Hospital admissions</u> Hospital admissions	• Elderly women with multiple health problems who lived alone were the most frequent users. • 66% of the patients (47 out of 77 patients) admitted to service was averted from the hospital admissions. • The service was found to be cost effective. • 95% of the survey respondents reported that the service met their needs	SIGN: NA Poor quality due to study design Level IV
Coulthard [86] (2003) **UK**	Cluster RCT	Children with UTI from 88 general practices N=107 000	Nurse led education & direct access service	<u>Hospital admissions</u> Hospital visits <u>Other</u> Rate and quality of diagnosis of UTI, use of prophylactic antibiotics, convenience for families, and the number of infants with vesico-ureteric reflux in whom renal scarring may have been prevented.	• Families in the intervention group visited hospital half as much as the control families (mean 1.3 times vs. 2.6 times). • Intervention practices diagnosed twice as many UTI as the control practices (RR=1.86, 95% CI 1.42 to 2.44); 3.84 times more in infants < 1 year old (RR=3.84, 95% CI 1.94 to 9.32, p<0.001); and 6.10 times more in children without specific symptoms (RR=6.10, 95% CI 3.47 to 11.76, p<0.001). • Overall, 294 of 312 (94%) children aged under 4 years were prescribed antibiotic prophylaxis by study doctors compared with 61 of 147 (41%) by control doctors (p< 0.001).	SIGN: - Level II

Study (year) country	Study design	Participants	Interventions	Relevant outcomes	Main findings	SIGN* & NHMRC rating**
Gray[88] (2008) **UK**	Historically controlled study	Adult patients with breathing difficulties or elderly (≥ 65 years) patients with a fall who dialled the emergency number Breathing difficulties n=1130 control; n=186 intervention; Falls n=772 control; n=233 intervention	ECP ambulance service	<u>Hospital admissions</u> Attendance or admissions to ED within 72 hours and 28 days from initial service contact	• 119 of the 186 patients with breathing difficulties were treated at home and referred on for primary care review where appropriate, which translated to 64% initial avoided ED attendance rate, compared to only 24% in the control group. • The avoided admission rate was 46.7% when those admitted or attending with related problems within 28 days were taken into account, suggesting the reduction of admissions by 30% at 28 days relative to the ED ''initial contact'' figure (from 76% to 53.3%, n=1307, p <0.001). • Amongst the patient having fallen the ECP service avoided attendance rate by 73%, compared to 48% in the control group and reduced admissions by 17% at 28 days relative to the ED ''initial contact'' figure (from 52% to 44%, n=1005, p<0.05).	SIGN:NA Poor quality due to study design Level III-3
Mason[91] (2007) **UK**	Cluster RCT	People aged over 60 who called the emergency services in a large urban area in England N=3018 (n=1549 intervention, n=1469 control)	Paramedic practitioner service	<u>Hospital admissions</u> Hospital admissions and ED attendance between 0 and 28 days <u>Other</u> Interval from time of call to time of discharge; patients' satisfaction with the service received; investigations and treatments prescribed, and health status and mortality at 28 days.	• Compared to the control group, patients in the intervention group were less likely to have attended an ED either during the initial episode (day 0) or 28 days post (62.6% v 87.5%, p<0.001); and were also less likely to have required a hospital admission during the same time period (40.4% v 46.5%, p<0.001). • Patients in the intervention group were more likely to report being "very satisfied" with the service than those in the control group (85.5% v 73.8%, P<0.001) • Patients in the intervention group experienced a shorter total episode time by around 42 minutes compared to control group (235 v 278 minutes, p<0.001). • 95% chance of being cost effective at £20000 per QALY	SIGN: - Level II

Study (year) country	Study design	Participants	Interventions	Relevant outcomes	Main findings	SIGN* & NHMRC rating**
Zolotor[87] (2007) **USA**	CBA	Children <5 years old. 20 primary practices in Medicaid managed care network (3 higher intensity and 17 low intensity)	Practice-based, multimodal quality improvement intervention	Hospital admissions Annual rate of hospitalisations for gastroenteritis per 1000 Medicaid children < 5 years old	• Gastroenteritis admission rates declined 45% in high-intensity practices (from 6.6 to 3.6 per 1000); and 44% in low-intensity practices (from 3.2 to 1.8 per 1000) during the study compared with 11% in the control practices (from 12.2 to 10.9 per 1000).	SIGN: NA Poor quality due to study design Level III-2

4. Studies evaluating interventions to reduce the risk of PPH from adverse events

Study (year) country	Study design	Participants	Interventions	Relevant outcomes	Main findings	SIGN* & NHMRC rating**
Royal[93] (2006) **UK**	SR/MA of 38 studies RCT=29 CBA=8 ITS=1	Community based family medical services – all patients	Interventions in primary care which aim to improve patient safety by reducing AEs resulting from medication overuse or misuse	Hospital admissions Hospital admissions Other Drug-related morbidity, and death	• The studies included 17 pharmacist-led interventions (of which 15 reported hospital admissions as an outcome); eight interventions led by other primary healthcare professionals that reported preventable drug related morbidity as an outcome; and 13 complex interventions that included a component of medication review • MA found that pharmacist-led interventions are effective at reducing hospital admissions (OR 0.64, 95% CI 0.43 to 0.96) level III-2, but restricting analysis only to the RCTs failed to demonstrate significant benefit (OR 0.92, 95% CI 0.81 to 1.05), Level I. • MA of studies investigating interventions led by other primary healthcare professionals (n = 8) did not found any significant effect (OR 1.05, 95% CI 0.57 to 1.94). • Non-significant result were demonstrated from studies (n = 9) which described medication review undertaken by a primary healthcare professional as an interventions component that resulted in any reduction in drug related morbidity such as falls (OR 0.91, 95% CI 0.68 to 1.21).	SIGN: 2+ Level III-2
Holland[94] (2008) **UK**	SR/MA analysis. RCT = 32	Older people across all care settings	Pharmacist-led medication review	Hospital admissions Emergency hospital admission (all cause). Other Mortality and numbers of drugs prescribed	• There was no significant effect of the pharmacist-led medication review interventions on all-cause admission from MA of 17 trials (RR of 0.99, 95% CI 0.87, 1.14, p= 0.920). • MA of mortality data from 22 trials also found no significant benefit of the intervention on mortality (RR of mortality of 0.96, 95% CI 0.82, 1.13, P = 0.62).	SIGN: 2+ Level: I

Appendix 8: Critical Appraisals of the included studies

1. Systematic reviews / meta-analyses

SIGN	Methodology Checklist 1: Systematic Reviews and Meta-analyses

Study identification: **Adams SG, Smith PK, Allan PF, et al., Systematic review of the chronic care model in chronic obstructive pulmonary disease prevention and management. Archives of Internal Medicine, 2007. 167(6): p. 551-61.**

Guideline topic: **PPH- Chronic diseases**	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY			
In a well conducted systematic review		***In this study this criterion is:***	
1.1	The study addresses an appropriate and clearly focused question.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.2	A description of the methodology used is included.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.3	*The literature search is sufficiently rigorous to identify all the relevant studies.*	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.4	Study quality is assessed and taken into account.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.5	There are enough similarities between the studies selected to make combining them reasonable.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
SECTION 2: OVERALL ASSESSMENT OF THE STUDY			
2.1	How well was the study done to minimise bias? Code ++, +, or –	**++**	
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	NA	

SECTION 3: DESCRIPTION OF THE STUDY		
3.1	What types of study are included in the review?	**RCTs = 32** **CCT = 5** **BA studies = 7**
3.2	How does this review help to answer your key question?	**Objectives:** To conduct a systematic review and meta-analysis of the literature to determine which chronic care model (CCM) components have been implemented in patients with COPD and what combination of CCM components is associated with improved outcomes. **Methods:** The Medline, CINHAL and Cochrane Library databases were searched. Search was limited to publications to August 2005, which contained intervention(s) with at least 1 CCM component. Articles designed to evaluate the impact of specific therapeutic measures, such as oral or inhaled bronchodilator therapy, pulmonary rehabilitation, and supplement oxygen therapy, were excluded because these therapies are considered to be "standard of care". **Outcomes investigated:** Health care use (e.g., emergency/unscheduled visits, hospitalizations, or LOS), knowledge, dyspnoea, QoL, lung function, performance-based test (e.g., 6-minute walk test), clinical end point (e.g., mortality or number of Adverse Events), or cost. **Main findings:** • Pooled RRs (95% CI) for emergency/unscheduled visits and hospitalisations for the group that received at least 2 CCM components were 0.58 (0.42-0.79) and 0.78 (0.66-0.94), respectively. • WMD for hospital stay was −2.51 (95% CI, −3.40 to −1.61) days shorter for the group that received 2 or more components. • Symptoms, QoL, lung function, and functional status were not significantly different between the intervention and control groups in the follow up visits. • There were no significant differences for those receiving only 1 CCM component. **Authors' conclusion:** Limited published data exist evaluating the efficacy of CCM components in COPD

		management. However, pooled data demonstrated that patients with COPD who received interventions with 2 or more CCM components had lower rates of hospitalisations and emergency/unscheduled visits and a shorter LOS compared with control groups. Most of the successful programs were the presence of self-management, individualised action plans, and knowledgeable health care providers, and the incorporation of evidence-based treatments. **Other comments:** Findings from this systematic review and the success of similar programs in other chronic diseases highlight the need for well designed trials implementing multiple components of the CCM to prevent complications and improve outcomes in patients with COPD. **Limitation:** ▪ Detailed critical appraisals of the included studies were not provided. ▪ Inclusion of studies with varied methodology and short-term interventions (<12 months) ▪ Calculation of pooled estimates was based on the selected trials. ▪ Funding source was not reported

SIGN	Methodology Checklist 1: Systematic Reviews and Meta-analyses

Study identification: **Effing T, Monninkhof EM, van der Valk PD, et al., *Self-management education for patients with chronic obstructive pulmonary disease.* Cochrane Database of Systematic Reviews, 2007(4): p. CD002990.**

Guideline topic: **PPH-Chronic diseases**	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY			
In a well conducted systematic review		***In this study this criterion is:***	
1.1	The study addresses an appropriate and clearly focused question.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.2	A description of the methodology used is included.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.3	The literature search is sufficiently rigorous to identify all the relevant studies.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.4	Study quality is assessed and taken into account.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.5	There are enough similarities between the studies selected to make combining them reasonable.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable

SECTION 2: OVERALL ASSESSMENT OF THE STUDY		
2.1	How well was the study done to minimise bias? Code ++, +, or –	**++**
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	

SECTION 3: DESCRIPTION OF THE STUDY		
3.1	What types of study are included in the review?	**RCTs = 13; CCT = 1**
3.2	How does this review help to answer your key question?	**Objectives:** To assess the settings, methods and efficacy of COPD self-management education programmes on health outcomes and use of health care services. **Methods:** • Comprehensive search of the Cochrane Airways Group trial register, MEDLINE (January 1985 to January 2006), reference lists, and abstracts of medical conferences for the controlled trials (randomised and non-randomised) of self-management education in patients with COPD. • Studies focusing mainly on pulmonary rehabilitation and studies without usual care as a control group were excluded. **Interventions investigated:** Self-management education programs in COPD **Outcomes investigated:** Hospital admissions, emergency room visits, health-related QoL, symptom scores, number and severity of exacerbations, courses of oral steroids or antibiotics, use of rescue medication, use of other health care facilities, days lost from work, lung function, and exercise capacity. **Main findings:** • The studies showed a significant reduction in the probability of at least one hospital admission among patients receiving self management education compared to those receiving usual care (OR 0.64; 95%CI (0.47 to 0.89)). • A one year number needed to treat (NNT) ranged from 10 (6 to 35) for patients with a 51% risk of exacerbation, to an NNT of 24 (16 to 80) for patients with a 13% risk of exacerbation. • No significant effects were found either in number of exacerbations, emergency department visits, lung function, exercise capacity, and days lost from work. • On the disease specific St. George's Respiratory Questionnaire (SGRQ), total and domain scores in the intervention group were all lower (indicating better Health related QoL) or were similar to the scores in the usual group. The differences on SGRQ reached statistical significance at the 5% level on the

		total score (WMD -2.58; 95% CI -5.14 to -0.02) and impact domain (WMD -2.83; 95% CI -5.65 to -0.02), but these difference did not reach the clinically relevant improvement of 4 points. • A small but significant reduction was detected in dyspnoea measured (WMD -0.53; 95% CI (-0.96 to -0.10). • Inconclusive results were observed in doctor and nurse visits, on symptoms other than dyspnoea, the use of courses of oral corticosteroids and antibiotics, and the use of rescue medication. **Authors' conclusion:** Self-management education was associated with improvement in QoL (as measured by the SGRQ) and a reduction in hospital admissions with no indications of detrimental effects in other outcome parameters. **Other comments:** The currently available data were still insufficient to formulate clear recommendations regarding the form and contents of self-management education programs in COPD. **Limitation:** ▪ Heterogeneity amongst the included studies in terms of a broad-spectrum of interventions and health outcomes with different follow-up times, and participant inclusion criteria. ▪ Meta-analyses was not performed for all outcome variables due to above mentioned reasons.

SIGN	Methodology Checklist 1: Systematic Reviews and Meta-analyses

Study identification: **Gibson PG, Powell H, Wilson A, Abramson MJ, Haywood P, Bauman A, Hensley MJ, Walters EH, Roberts JJL. Self-management education and regular practitioner review for adults with asthma. Cochrane Database of Systematic Reviews 2002, Issue 3.**

Guideline topic: **PPH-Chronic diseases**	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY

In a well conducted systematic review		***In this study this criterion is:***	
1.1	The study addresses an appropriate and clearly focused question.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.2	A description of the methodology used is included.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.3	The literature search is sufficiently rigorous to identify all the relevant studies.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.4	Study quality is assessed and taken into account.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.5	There are enough similarities between the studies selected to make combining them reasonable.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable

SECTION 2: OVERALL ASSESSMENT OF THE STUDY

2.1	How well was the study done to minimise bias? Code ++, +, or –	**++**
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	

SECTION 3: DESCRIPTION OF THE STUDY

3.1	What types of study are included in the review?	**RCT = 36**

3.2	How does this review help to answer your key question?	**Objectives of the study:** To assess the effects of asthma self-management programmes, when coupled with regular health practitioner review, on health outcomes in adults with asthma. **Methods:** • A comprehensive search of the Cochrane Airways Group trials register and reference lists of articles. • RCTs exploring asthma self-management programs in adults over 16 years of age with asthma which included: education, self-monitoring of peak expiratory flow or symptoms, regular medical review and a written action plan, were included for the review. • Two reviewers assessed trial quality and extracted data independently. • Study authors were contacted for confirmation. **Interventions investigated:** Asthma self-management programs **Outcomes investigated:** Hospital admissions, emergency room visits, doctor visits, days lost from work or school, lung function (FEV1), peak expiratory flow (PEF), use of rescue beta agonists, courses of oral corticosteroids, symptom scores, quality of life scores, and costs. **Main findings:** Self-management education led to reduction in: • hospitalisations (RR 0.64, 95% CI 0.50 to 0.82); • emergency room visits (RR 0.82, 95% CI 0.73 to 0.94); • unscheduled visits to the doctor (RR 0.68, 95% CI 0.56 to 0.81); • days off work or school (RR 0.79, 95% CI 0.67 to 0.93); • nocturnal asthma (RR 0.67, 95% CI 0.0.56 to 0.79); and There was a significant improvement in the QoL scores (SMD 0.29, 95% CI 0.11 to 0.47). Measures of lung function were little changed in the intervention group compared to the controls: FEV1 (SMD 0.1, 95% CI -0.22 to o.22); and PEF (SMD 0.18, 95% CI 0.07, 0.29) There was no difference in rescue mediations used between the groups (RR 1.01, 95% CI 0.95 to 1.07).

		Authors' conclusion: Education in asthma self-management which involves self-monitoring by either peak expiratory flow or symptoms, coupled with regular medical review and a written action plan improves health outcomes for adults with asthma. **Other comments:** The authors concluded that training programs that enable people to adjust their medication using a written action plan appear to be more effective than other forms of asthma self-management, however, data linked to this statement were not provided. **Limitations:** ▪ There was variable contamination of control group with some aspects of self-management education in some included studies. ▪ Outcomes reported in the included studies varied.

SIGN	Methodology Checklist 1: Systematic Reviews and Meta-analyses

Study identification: **Gruen RL, Weeramanthri TS, Knight SS, Bailie RS. Specialist outreach clinics in primary care and rural hospital settings. Cochrane Database of Systematic Reviews 2003.**

Guideline topic: PPH- Chronic diseases	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY

	In a well conducted systematic review	***In this study this criterion is:***	
1.1	The study addresses an appropriate and clearly focused question.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.2	A description of the methodology used is included.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.3	The literature search is sufficiently rigorous to identify all the relevant studies.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.4	Study quality is assessed and taken into account.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.5	There are enough similarities between the studies selected to make combining them reasonable.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable

SECTION 2: OVERALL ASSESSMENT OF THE STUDY

2.1	How well was the study done to minimise bias? Code ++, +, or –	**++**
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	

SECTION 3: DESCRIPTION OF THE STUDY		
3.1	What types of study are included in the review?	**N = 9** **RCTs = 5; CBA = 2; ITS = 2**
3.2	How does this review help to answer your key question?	**Objectives:** To undertake a descriptive overview of studies of specialist outreach clinics and to assess the effectiveness of specialist outreach clinics on access, quality, health outcomes, patient satisfaction, use of services, and costs **Methods:** • Comprehensive search of the literature for studies and analyses of visiting specialist outreach clinics in primary care or rural hospital settings, either providing simple consultations or as part of complex multifaceted interventions. • Reference list of the all retrieved articles were scrutinized for the relevant studies. • Cochrane Effective Practice and organisation of Care (EPOC) checklist was used for the data extraction. • Study quality was assessed using standardised checklist. • The participants were patients, specialists, and primary care providers. **Interventions investigated:** Specialist outreach clinics: defined as planned and regular visits by specialist-trained medical practitioners from a usual practice location (hospital or specialist centre) to primary care or rural hospital settings. **Outcomes investigated:** Use of hospital and primary care services, access; quality of care; other health outcomes; patient and provider satisfaction; and costs. **Main findings:** • Studies evaluating the hospital visits found the reduction in hospital attendances, particularly hospital outpatient clinics. MA was not performed. • Two included RCTs examined numbers of primary care physician visits in 1 year and found that outreach led to an increase the visits that was not statistically significant (combined SMD in number of visits of 0.14 (95% CI - 0.05-0.32, P=0.15). • There was a reduction in use of other non-hospital services reported, such as mental health worker service, and physiotherapy.

		• Simple 'shifted outpatients' styles of specialist outreach were shown to improve access, but there was no evidence of impact on health outcomes. • Specialist outreach as part of more complex multifaceted interventions involving collaboration with primary care, education or other services was associated with improved health outcomes, more efficient and guideline-consistent care, and less use of inpatient services. **Authors' conclusion:** This review supports the hypothesis that specialist outreach can improve access, outcomes and service use, especially when delivered as part of a multifaceted intervention. **Other comments:** The benefits of simple outreach models in urban non-disadvantaged settings seem to be small. There is a need for good comparative studies of outreach in rural and disadvantaged settings where outreach may confer most benefit to access and health outcomes **Limitation:** ▪ Limited number of studies was included. ▪ Studies with varied methodology and short-term interventions were included ▪ Calculation of pooled estimates was based on the selected trials only.

SIGN	Methodology Checklist 1: Systematic Reviews and Meta-analyses

Study identification: **Holland R, Battersby J, Harvey I, et al., *Systematic review of multidisciplinary interventions in heart failure.* Heart, 2005. 91(7): p. 899-906.**

Guideline topic: **PPH- Chronic diseases**	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY			
In a well conducted systematic review		***In this study this criterion is:***	
1.1	The study addresses an appropriate and clearly focused question.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.2	A description of the methodology used is included.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.3	*The literature search is sufficiently rigorous to identify all the relevant studies.*	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.4	Study quality is assessed and taken into account.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.5	There are enough similarities between the studies selected to make combining them reasonable.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
SECTION 2: OVERALL ASSESSMENT OF THE STUDY			
2.1	How well was the study done to minimise bias? Code ++, +, or –	**+**	
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	NA	

SECTION 3: DESCRIPTION OF THE STUDY		
3.1	What types of study are included in the review?	**RCTs = 30**
3.2	How does this review help to answer your key question?	**Objectives:** To determine the impact of multidisciplinary interventions on hospital admission and mortality in heart failure. **Methods:** Comprehensive search of 13 databases including Medline, Embase. CINHAL, Cochrane Library databases were conducted and reference lists from included trials and related reviews were checked. Trial authors were contacted if further information was required Trails conducted with a defined subgroup of patients with a diagnosis of heart failure, in both hospital and community settings were included. **Outcomes investigated:** *Primary outcome*: proportion of patients with one or more hospital admission (all cause). *Secondary outcomes*: all cause mortality, heart failure hospital admission, and mean inpatient days. **Main findings:** All cause hospitalisation: • Multidisciplinary interventions showed a significant reduction in all cause admission compared to the usual care (RR 0.87, 95% CI 0.79 to 0.95, p = 0.002). However, there was a significant heterogeneity (p = 0.002). • Home visit interventions showed significant reduction in all cause admission to hospital (RR 0.80, 95% CI 0.71 to 0.89, p , 0.0001). • Telephone-type interventions reduced admission but this finding was of borderline significance (RR 0.86, 95% CI 0.73 to 1.02, p = 0.09) • Hospital based interventions were found to have no effect on admission (RR 0.99, 95% CI 0.90 to 1.10, p = 0.56). Heart failure admission • multidisciplinary interventions (n= 16RCTs) showed a significant reduction in heart failure admission compared to usual care (RR 0.70, 95% CI 0.61 to 0.81, p < 0.0001). • This benefit was notable and similar for home and telephone-type interventions, with RRs of 0.62 (95% CI 0.51 to 0.74, p < 0.001) and 0.70 (95% CI 0.57 to

		0.85, p < 0.001), respectively. • There was no significant effect (n = 2 trials) of hospital or community based intervention (RR 0.94, 95% CI 0.78 to 1.13, p = 0.51). Mortality • Meta-analysis showed (26 RCTs) a significant decrease in all cause mortality (RR 0.79, 95% CI 0.69 to 0.92, p = 0.002). • Subgroup analysis showed significant reductions in mortality for both telemonitoring (RR 0.49, 95% CI 0.33 to 0.73, p < 0.001) and telephone follow up (RR 0.70, 95% CI 0.53 to 0.94, p = 0.02). • Reductions in mortality were non-significant in the home (RR 0.87, 95% CI 0.72 to 1.06, p = 0.44) and clinic subgroups (RR 1.00, 95% CI 0.84 to 1.20, p = 0.98). **Authors' conclusion:** Multidisciplinary interventions for heart failure reduce both hospital admission and all cause mortality. The most effective interventions were delivered at least partly in the home. **Other comments:** Majority of the interventions were post-discharge interventions delivering patient education and symptom self management. **Limitation:** ▪ Detailed critical appraisals of the included studies were not provided. ▪ Grey literature search was not performed. ▪ Study inclusion criteria were broad. ▪ Diverse range of interventions were included limiting the generalaisability of the results to the patient groups from specific settings such as primary care or other community settings. ▪ Study populations in the included trials were heterogeneous, which is likely to have contributed to heterogeneity in the results. ▪ Funding source was not reported

SIGN	Methodology Checklist 1: Systematic Reviews and Meta-analyses

Study identification: **Holland R, Desborough J, Goodyer L, et al., *Does pharmacist-led medication review help to reduce hospital admissions and deaths in older people? A systematic review and meta-analysis.* British Journal of Clinical Pharmacology, 2008. 65(3): p. 303-16.**

Guideline topic: **PPH-adverse events**	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY

	In a well conducted systematic review	***In this study this criterion is:***	
1.1	The study addresses an appropriate and clearly focused question.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.2	A description of the methodology used is included.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.3	The literature search is sufficiently rigorous to identify all the relevant studies.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.4	Study quality is assessed and taken into account.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.5	There are enough similarities between the studies selected to make combining them reasonable.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable

SECTION 2: OVERALL ASSESSMENT OF THE STUDY

2.1	How well was the study done to minimise bias? Code ++, +, or –	**++**
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	

SECTION 3: DESCRIPTION OF THE STUDY		
3.1	What types of study are included in the review?	**RCT = 32**
3.2	How does this review help to answer your key question?	**Objectives:** To evaluate and quantify the effects of medication review by pharmacists on hospital admissions and mortality for older people across all care settings. **Methods:** • Comprehensive search of the academic literature databases to 1 September 2005 was performed. • Reference lists of the included articles and relevant review articles were searched. • Strict selection criteria were applied for the study selection and assed by 2 authors independently. • Comprehensive study validity assessment was adopted. **Interventions investigated:** Pharmacist-led medication review **Outcomes investigated:** Primary: emergency hospital admission (all cause). Secondary: mortality and numbers of drugs prescribed. **Main findings:** • There was no significant effect of the pharmacist-led medication review interventions on all-cause admission from meta-analysis of 17 trials (RR of 0.99, 95% CI 0.87 to 1.14, P = 0.92). • Meta-analysis of mortality data from 22 trials also found no significant benefit of the intervention on mortality (RR of 0.96, 95% CI 0.82 to 1.13, P = 0.62). • Meta-analysis of 15 trials suggested that pharmacists led interventions may slightly reduced numbers of drug prescribed (WMD = -0.48; 95% CI -0.89 to -0.07), however there was a significant heterogeneity amongst the included studies. **Authors' conclusion:** Pharmacist-led medication review interventions did not have any effect on or hospital admission reducing mortality in older people, and could not be assumed to provide substantial clinical benefit.

		Other comments: Pharmacist led interventions may improve drug knowledge and adherence, but there are insufficient data to know whether quality of life was improved. **Limitation:** ▪ Only RCTs were included, however, due to the nature of the interventions other non-RCTs may have provided additional information. ▪ Grey literature search was not performed ▪ Publication bias cannot be ruled out as authors not contacted and unpublished and negative studies were not sought. ▪ There was heterogeneity in the results of the included studies, suggesting the existing differences between the studies included in the analysis.

SIGN	Methodology Checklist 1: Systematic Reviews and Meta-analyses

Study identification: **Lemmens KMM, Nieboer AP, and Huijsman R, *A systematic review of integrated use of disease-management interventions in asthma and COPD.* Respiratory Medicine, 2009.**

Guideline topic: **PPH-Chronic diseases**	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY			
In a well conducted systematic review		***In this study this criterion is:***	
1.1	The study addresses an appropriate and clearly focused question.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.2	A description of the methodology used is included.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.3	The literature search is sufficiently rigorous to identify all the relevant studies. *MEDLINE and Cochrane Library only*	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.4	Study quality is assessed and taken into account. *Used the HTA-DM instrument for methodological quality assessment*	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.5	There are enough similarities between the studies selected to make combining them reasonable.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable

SECTION 2: OVERALL ASSESSMENT OF THE STUDY		
2.1	How well was the study done to minimise bias? Code ++, +, or –	**+**
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	Overestimate the effect

SECTION 3: DESCRIPTION OF THE STUDY		
3.1	What types of study are included in the review? *Control group=usual care or single intervention*	**RCT = 29** **CBA = 7**
3.2	How does this review help to answer your key	**Objectives of the study:** To understand the effectiveness of multiple

	question?	disease management interventions (combined disease management components) in improving care and cost-effectiveness for patients with asthma or COPD. **Methods:** • MEDLINE and the Cochrane Library (1995 – May, 2008) were searched for controlled trials. • Two reviewers independently extracted data and assessed study quality. • Meta-analyses were performed on quality of life and health care utilisation data. • Effects of multiple interventions versus single interventions and usual care were assessed qualitatively. **Intervention investigated:** Interventions classified (using EPOC criteria) as 'Patient-related'; 'Professional-directed'; or 'Organisational' and needed to include a combination of these approaches to be defined as a multiple intervention. Pulmonary rehab programs were excluded. Control group=usual care or single intervention. **Outcomes investigated:** Any objective measure of outcomes reflecting the primary goals of disease management i.e. to promote maintain and enhance the health of the study population, which included: clinical outcomes, QoL, health care utilisation and/or patient satisfaction. **Main findings:** 36 studies met the study inclusion criteria. 17 used both patient-related and organisational interventions (double interventions); 19 used patient-related' professional-directed and organisational interventions (triple interventions). ***Multiple interventions including case management vs. usual care*** 9 studies examined patient education in combination with case management; 11 studies examined patient education and case management in combination with professional education. • Pooled analysis of 5 studies (COPD care) showed a significant reduction of the probability of at least one hospital admission (OR=0.58, 0.40-0.83). • MA (N = 4 studies) of ED visits per person did not show a statistically significant effect in favour of treatment (mean difference = -

		0.08, 95% CI -0.18 to 0.03, p = 0.14. • MA of 3 double interventions and 3 triple interventions demonstrated statistically significant improvements on the SGRQ total and impact scores (mean difference -2.52 95% CI -5.00,-0.05). • Pooled data from 3 triple interventions also showed statistically significant improvement in SGRQ the activity score (mean difference -5.20 95% CI -9.76 to -0.64). • No significant differences between intervention and control groups were found on clinical outcomes (lung function and symptoms); or ED visits. ***Patient education and revision of professional role (and professional education) vs. usual care*** 6 studies focussed on patient education in combination with revision of professional roles. • MA of studies that included a pharmacist demonstrated a significant improvement in Asthma Quality of Life Questionnaire. **Authors' conclusion:** Multiple interventions show improvements in QoL. Triple interventions had reduced probability of at least one hospital admission compared with usual care. Qualitative analyses revealed positive trends on process improvements and satisfaction. **Other comments:** Pulmonary rehab programs were excluded as it was defined as a single intervention that is already part of the organisational structure of care. Data on QoL could not be included in a meta analysis due to heterogeneity of instruments. **Limitations:** ▪ Included studies with a wide range in (combinations of) interventions used, process and outcome variables and patient populations. ▪ Not all studies could be pooled for meta analysis due to above issues. ▪ Selection bias cannot be ruled out as only Medline and Cochrane databases were searched and grey literature search, and other unpublished or negative stiudies were not sought not performed.

SIGN	Methodology Checklist 1: Systematic Reviews and Meta-analyses

Study identification: **McAlister F, Lawson FE, Teo K, et al., Randomised trials of secondary prevention programmes in coronary heart disease: systematic review. BMJ, 2001. 323(7319): p. 957-962.**

Guideline topic: **PPH- Chronic diseases**	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY			
In a well conducted systematic review		***In this study this criterion is:***	
1.1	The study addresses an appropriate and clearly focused question.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.2	A description of the methodology used is included.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.3	*The literature search is sufficiently rigorous to identify all the relevant studies.*	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.4	Study quality is assessed and taken into account.	Well covered Adequately addressed **Poorly addressed**	Not addressed Not reported Not applicable
1.5	There are enough similarities between the studies selected to make combining them reasonable.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
SECTION 2: OVERALL ASSESSMENT OF THE STUDY			
2.1	How well was the study done to minimise bias? Code ++, +, or –	**+**	
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	Over estimates the effect size.	

SECTION 3: DESCRIPTION OF THE STUDY		
3.1	What types of study are included in the review?	**RCTs = 12**
3.2	How does this review help to answer your key question?	**Objectives:** To determine whether multidisciplinary disease management programmes for patients with coronary heart disease improve processes of care and reduce morbidity and mortality. **Methods:** A comprehensive search of major electronic databases including Medline, CINHAL, Embase, SIGLE and Cochrane Library databases were performed. **Outcomes investigated:** Hospital admissions, Hospital admission rates Other: Mortality, myocardial re-infarction rates, hospital length of stay (LOS) **Main findings:** • There was a significant reduction in hospital admissions (n = 2 trials) in those receiving the disease management programs compared to controls (RR= 0.84, 95% CI 0.76 to 0.94). • Of the four trials that evaluated LOS, two showed shorter LOS in the intervention group • Patients in disease management programs were more likely to be prescribed efficacious drugs RR = 2.14, 95% CI 1.92 to 2.38 for lipid lowering drugs; RR = 1.19, 95% CI 1.07 to 1.32 for β blockers; and RR = 1.07, 95% CI 1.03 to 1.11 for antiplatelet agents. • Among the intervention group, reductions in risk of all cause mortality (RR 0.91, 95% CI 0.79 to 1.04); and recurrent myocardial infarction (RR =0.94, 95% CI 0.80 to 1.10) were found. • Five of the eight trials evaluating QoL or functional status reported better outcomes in the intervention arms. Only three of these trials reported the costs of the intervention—the interventions were cost saving in two cases. **Authors' conclusion:** Disease management programs improve processes of care, reduce admissions to hospital, and enhance quality of life or functional status in patients with coronary heart disease. The programs' impact on survival and recurrent infarctions, their cost effectiveness, and the optimal mix of components remain uncertain. **Other comments:** The optimal mix of components and the cost effectiveness of the disease management programs is still uncertain.

		Limitations: ▪ Grey literature search not performed. ▪ Detailed critical appraisals of the included studies were not provided. ▪ Conclusion of findings such as hospital admissions were based only on small numbers of studies. ▪ Inclusion of only RCTs and studies with other methodology were excluded. However, due to the nature of the intervention investigated, exploring other studies with other design could have elaborated the findings. ▪ Interventions that were offered in the disease management programs varied substantially. ▪ Included studies often enrolled highly selected populations

SIGN	Methodology Checklist 1: Systematic Reviews and Meta-analyses

Study identification: **Royal S, Smeaton L, Avery AJ, et al., Interventions in primary care to reduce medication related adverse events and hospital admissions: Systematic review and meta-analysis. Quality and Safety in Health Care, 2006. 15(1): p. 23-31.**

Guideline topic: **PPH-adverse events**	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY

	In a well conducted systematic review	***In this study this criterion is***:	
1.1	The study addresses an appropriate and clearly focused question.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.2	A description of the methodology used is included.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.3	The literature search is sufficiently rigorous to identify all the relevant studies.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.4	Study quality is assessed and taken into account.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.5	There are enough similarities between the studies selected to make combining them reasonable.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable

SECTION 2: OVERALL ASSESSMENT OF THE STUDY

2.1	How well was the study done to minimise bias? Code ++, +, or –	**++**
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	

SECTION 3: DESCRIPTION OF THE STUDY		
3.1	What types of study are included in the review?	**N = 38** **RCT = 29, CBA = 8; ITS = 1**
3.2	How does this review help to answer your key question?	**Objectives:** To identify and evaluate studies of interventions in primary care aimed at reducing medication related adverse events that result in morbidity, hospital admission, and/or mortality **Methods:** • Comprehensive search of the literature was performed. • Grey literature search was performed and bibliographies of key articles were scrutinised for relevant articles • Cochrane EPOC inclusion criteria were used for study selection and study validity assessment. **Interventions investigated:** All interventions applied in primary care settings which aimed to improve patient safety by reducing AEs resulting from medication. **Outcomes investigated:** Hospitalisation, drug-related morbidity, mortality. **Main findings:** • The studies included 17 pharmacist-led interventions (of which 15 reported hospital admissions as an outcome); eight interventions led by other primary healthcare professionals (that reported preventable drug related morbidity as an outcome); and 13 complex interventions (that included a component of medication review). • MA found that pharmacist-led interventions are effective at reducing hospital admissions (OR 0.64, 95% CI 0.43 to 0.96), but restricting analysis only to the RCTs failed to demonstrate significant benefit (OR 0.92, 95% CI 0.81 to 1.05). • MA of studies investigating interventions led by other primary healthcare professionals (n = 8) did not found any significant effect of the intervention (OR 1.05, 95% CI 0.57 to 1.94). • Similar non-significant result were demonstrated from the studies (n = 9) which described medication review undertaken by a primary healthcare professional as an intervention component, that resulted in any reduction in drug related morbidity such as

		falls (OR 0.91, 95% CI 0.68 to 1.21). **Authors' conclusion:** There was relatively weak evidence to indicate that pharmacist-led medication reviews were effective in reducing hospital admissions. There was currently no evidence for the effectiveness of other interventions which aim at reducing admissions or preventable drug related morbidity. **Other comments:** The setting for this review was primary care and findings are unlikely to be applicable to all healthcare systems. **Limitation:** ▪ Studies with varied methodology were included. ▪ Calculation of pooled estimates was based on the selected trials. ▪ Publication bias cannot be ruled out as authors were not contacted.

SIGN	Methodology Checklist 1: Systematic Reviews and Meta-analyses

Study identification: **Zwar N, Harris M, Griffiths R, et al., A systematic review of chronic disease management. 2006: Canberra**

Guideline topic: **PPH- Chronic diseases**	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY			
In a well conducted systematic review		***In this study this criterion is:***	
1.1	The study addresses an appropriate and clearly focused question.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.2	A description of the methodology used is included.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.3	*The literature search is sufficiently rigorous to identify all the relevant studies.*	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.4	Study quality is assessed and taken into account.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.5	There are enough similarities between the studies selected to make combining them reasonable.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
SECTION 2: OVERALL ASSESSMENT OF THE STUDY			
2.1	How well was the study done to minimise bias? Code ++, +, or –	**++**	
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?		

SECTION 3: DESCRIPTION OF THE STUDY		
3.1	What types of study are included in the review?	**RCT= 116** **CCT= 24** **Cohort= 4** **Other: systematic review= 23.** **Interrupted time series= 1**
3.2	How does this review help to answer your key question?	**Objectives:** To undertake a systematic review of literature with qualitative synthesis of data to focus on the evidence for the effect of interventions on the management of chronic disease most commonly seen in primary care (PC) from countries comparable to Australia. **Methods:** • Comprehensive literature search with qualitative data synthesis, using CCM as a frame work for analysis between January 1990 and February 2006 was performed. • Interventions were classified according to CCM elements addressed: community resources, health care organisation, self-management support, delivery system design, decision support and/or clinical information systems. • Interventions were described using the Cochrane EPOC taxonomy. • Quality assessment of all included studies wee performed • Major findings were discussed with policymakers and key stakeholders in relation to current and emerging health policy in Australia **Interventions investigated:** Studies of organisational, professional or financial interventions for chronic disease, as described by the EPOC taxonomy of interventions and delivered by non-hospital health professionals. Patient-mediated interventions, such as distribution of educational materials, education sessions, motivational counselling, brief intervention, community programs, self-management and call-back reminder notices, were also considered **Outcomes investigated:** Health care professional adherence to guidelines. Patient outcomes: health service use,

		physiological measures of disease, adherence to treatment, QoL, risk behaviour, satisfaction, health status, and functional status. **Main findings:** • Self-management interventions were effective in improving both processes of care, patient outcomes and patient service use. There was most evidence for self-management support for diabetes and hypertension, with some evidence for arthritis • Delivery-system design interventions such as multidisciplinary team care have been shown to have positive effects on both provider behaviour and some patient outcomes, particularly for diabetes, hypertension and lipid disorders and patient service use. • Evidence-based guidelines and educational meetings for health professionals improved health professional adherence to guidelines and some patient outcomes. Education of health professionals, on its own, did not improve patient health outcomes. • There was limited evidence for the effective use of community resources and health care organisation to support chronic disease management in PC. **Authors' conclusion:** The interventions most likely to be effective in the context of Australian PC were: • engaging primary care in self-management support through education and training for general practitioners and practice nurses, • including self-management support in care plans linked to multidisciplinary team support. **Other comments:** The current Practice Incentives Payment and Service Incentives Payment programs could be improved and simplified to encourage guideline-based chronic disease management, integrating incentives so that individual patients are not managed as if they had a series of separate chronic diseases. The use of chronic disease registers should be extended across a range of chronic illnesses and used to facilitate audit for quality improvement. Training should focus on clear roles and responsibilities of the team members **Limitation:** ▪ The results were summarised narratively only

		and meta-analysis was not performed ▪ Detail critical appraisals of the included studies were not provided. ▪ Publican bias cannot be ruled out as inclusion of studies restricted to English language and those conducted only in particular western countries.

2. Randomised Controlled Trials

SIGN	Methodology Checklist 2: Randomised Controlled Trials

Study identification: **Berg GD, Silverstein S, Thomas E, et al., Cost and utilization avoidance with mail prompts: a randomized controlled trial. American Journal of Managed Care, 2008. 14(11): p. 748-54.**

Guideline topic: **PPH-Vaccine preventable conditions**	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY

	In a well conducted RCT study…..	***In this study this criterion is:***
1.1	The study addresses an appropriate and clearly focused question.	Well covered **Adequately addressed** Poorly addressed Not addressed Not reported Not applicable
1.2	The assignment of subjects to treatment groups is randomised.	Well covered **Adequately addressed** Poorly addressed Not addressed Not reported Not applicable
1.3	An adequate concealment method is used.	Well covered Adequately addressed **Poorly addressed** Not addressed Not reported Not applicable
1.4	Subjects and investigators are kept 'blind' about treatment allocation. *Study was not blinded.*	Well covered Adequately addressed **Poorly addressed** Not addressed Not reported Not applicable
1.5	The treatment and control groups are similar at the start of the trial	**Well covered** Adequately addressed Poorly addressed Not addressed Not reported Not applicable
1.6	The only difference between groups is the treatment under investigation.	Well covered **Adequately addressed** Poorly addressed Not addressed Not reported Not applicable
1.7	All relevant outcomes are measured in a standard, valid and reliable way.	Well covered **Adequately addressed** Poorly addressed Not addressed Not reported Not applicable
1.8	What percentage of the individuals or clusters recruited into each treatment arm of the study	Not applicable (administrative data analysis of the participating groups).

	dropped out before the study was completed?	
1.9	All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).	**Well covered** Adequately addressed Poorly addressed Not addressed Not reported Not applicable
1.10	Where the study is carried out at more than one site, results are comparable for all sites.	Well covered **Adequately addressed** Poorly addressed Not addressed Not reported Not applicable
SECTION 2: OVERALL ASSESSMENT OF THE STUDY		
2.1	How well was the study done to minimise bias? Code ++, +, or –	**+**
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	**Unlikely to have caused bias**
2.3	Taking into account clinical considerations, your evaluations of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?	**Yes**
2.4	Are the results of this study directly applicable to the patient group targeted by this guideline?	**Yes**
SECTION 3: DESCRIPTION OF THE STUDY		
3.1	How many patients are included in this study?	Randomisation of 134,791 individuals, of whom 26,474 in the intervention group were sent the influenza mailing, and 26,864 in the intervention group were sent the nurse advice mailing; 81,453 were in the control group
3.2	What are the main characteristics of the patient population?	All individuals over the age of 65 years
3.3	What intervention (treatment, procedure) is being investigated in this study?	2 mailed interventions: 1 of the mailings was to promote receiving influenza vaccination (influenza mailing group) and other mailing was to promote the use of a telephonic nurse advice service (nurse advice service mailing group).
3.4	What comparisons are made in the study?	2 mailed interventions vs. no prompts
3.5	How long are patients followed-up in the study?	5 months
3.6	What outcome measure(s) are used in the study?	Influenza, pneumonia, heart failure, and other respiratory inpatient bed days, ED visits, physician evaluation and management visits, and other outpatient visits and costs
3.7	What size of effect is identified in the study?	• The influenza mailing intervention group experienced 2.87% (P = 0.033) fewer condition related inpatient bed days and 7.25% (P = 0.101) fewer condition-related ED visits. • The nurse advice service mailing intervention

		group experienced 7.65% (P <.001) fewer condition-related inpatient bed days and 6.75% (P = 0.125) fewer condition-related ED visits. • Per dollar spent, the return on investment was estimated to be US$2.51 for the influenza mailing intervention and US$24.24 for the nurse advice mailing intervention.
3.8	How was this study funded?	No industry sponsors and the study was funded by the Blue Cross and Blue Shield Government-wide Service Benefit Plan
3.9	Does this study help to answer your key question?	Yes, this large RCT provided convincing evidence that a relatively simple mail-delivered prompt to encourage flu vaccination or to encourage the use of a nurse advice line can have measurable effects on health services utilization rates and generate cost savings. Mailing information to their members is a cost-effective way for health plans to affect condition-related medical service utilisation with a positive return on investment. **Limitations:** • Study was not blinded. • Allocation concealment method not described. • The authors relied only on administrative claimed data for the analysis. • Study period was one flu season (5 months), hence result may be dependent upon particular flu strain in a given period.

SIGN	Methodology Checklist 2: Randomised Controlled Trials

Study identification: **Berg GD, Thomas E, Silverstein S, et al., Reducing medical service utilization by encouraging vaccines: randomized controlled trial. American Journal of Preventive Medicine, 2004. 27(4): p. 284-8.**

Guideline topic: **PPH - vaccine preventable conditions**	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY

	In a well conducted RCT study…..	***In this study this criterion is:***	
1.1	The study addresses an appropriate and clearly focused question.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.2	The assignment of subjects to treatment groups is randomised.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.3	An adequate concealment method is used.	Well covered Adequately addressed **Poorly addressed**	Not addressed Not reported Not applicable
1.4	Subjects and investigators are kept ‘blind’ about treatment allocation.	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.5	The treatment and control groups are similar at the start of the trial	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.6	The only difference between groups is the treatment under investigation.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.7	All relevant outcomes are measured in a standard, valid and reliable way.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.8	What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?	Not applicable, (administrative data analysis of the participating groups).	

1.9	All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.10	Where the study is carried out at more than one site, results are comparable for all sites.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
SECTION 2: OVERALL ASSESSMENT OF THE STUDY			
2.1	How well was the study done to minimise bias? Code ++, +, or –	**+**	
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	**Unlikely to have caused bias**	
2.3	Taking into account clinical considerations, your evaluations of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?	**Yes**	
2.4	Are the results of this study directly applicable to the patient group targeted by this guideline?	**Yes**	
SECTION 3: DESCRIPTION OF THE STUDY			
3.1	How many patients are included in this study?	Randomisation of 339,220 individuals, of whom 82,364 were allocated to the intervention group and the remaining 256,856 allocated to the control group.	
3.2	What are the main characteristics of the patient population?	The average age was 50.2 (+/- 25.0) years in the intervention group and 50.0 (+/- 25.0) years in the control group. The proportions of males in the two groups were 46% (intervention) and 46.1% (control), respectively.	
3.3	What intervention (treatment, procedure) is being investigated in this study?	Two identical influenza/pneumonia direct mail marketing pieces that encouraged individuals to receive influenza and pneumococcal vaccinations	
3.4	What comparisons are made in the study?	Mailed interventions vs. no prompts	
3.5	How long are patients followed-up in the study?	5 months	
3.6	What outcome measure(s) are used in the study?	Influenza/pneumonia inpatient admissions and ED visits.	
3.7	What size of effect is identified in the study?	• Intervention group had 9.67% (p=0.136) lower rate of influenza/pneumonia inpatient admissions; and 22.64% (p=0.002) lower rate of influenza/pneumonia ED visits compared to the control group. • The intervention group experienced a 2.62% (p=0.010) higher rate of influenza	

		vaccinations; 4.61% (p=0.080) higher rate of pneumonia vaccinations; • The benefit-cost ratio (return on investment) from this intervention was estimated to be US$ 2.21 per dollar spent.
3.8	How was this study funded?	No industry sponsors. Funded by the Blue Cross and Blue Shield Government-wide Service Benefit Plan
3.9	Does this study help to answer your key question?	Yes, this large RCT provided convincing evidence that that a mass mailing reminder system encouraging individuals to receive an influenza vaccination to be cost saving in a population of both healthy and at risk individuals. Vaccination against influenza was associated with reductions in hospitalizations for heart disease, cerebrovascular disease, pneumonia, or influenza, and the risk of death from all causes during the influenza season. **Limitations:** • The authors did not provided any justification for the determination of the sample size of the study by the budget. • Allocation concealment method not described. • The authors relied only on administrative claimed data for the analysis. • Study period was one flu season (5 months), hence result may be dependent upon particular flu strain in a given period.

SIGN	Methodology Checklist 2: Randomised Controlled Trials

Study identification**: Coulthard MG, Vernon SJ, Lambert HJ, et al., A nurse led education and direct access service for the management of urinary tract infections in children: prospective controlled trial. BMJ, 2003. 327(7416): p. 656.**

Guideline topic: **PPH-acute conditions**	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY

	In a well conducted RCT study…..	***In this study this criterion is:***	
1.1	The study addresses an appropriate and clearly focused question.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.2	The assignment of subjects to treatment groups is randomised. **Randomisation by strata**	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.3	An adequate concealment method is used.	Well covered Adequately addressed **Poorly addressed**	Not addressed Not reported Not applicable
1.4	Subjects and investigators are kept ‘blind’ about treatment allocation.	Well covered Adequately addressed Poorly addressed	Not addressed **Not reported** Not applicable
1.5	The treatment and control groups are similar at the start of the trial	Well covered Adequately addressed **Poorly addressed**	Not addressed Not reported Not applicable
1.6	The only difference between groups is the treatment under investigation.	Well covered Adequately addressed Poorly addressed	**Not addressed** Not reported Not applicable
1.7	All relevant outcomes are measured in a standard, valid and reliable way.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.8	What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?	Out of 104 GP practices, 16 decline to participate.	
1.9	All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable

1.10	Where the study is carried out at more than one site, results are comparable for all sites.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
SECTION 2: OVERALL ASSESSMENT OF THE STUDY			
2.1	How well was the study done to minimise bias? Code ++, +, or –	**-**	
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	**Over estimate the effect size.**	
2.3	Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?	**Yes, for the other outcomes. However, not sure for the healthcare utilisation outcomes.**	
2.4	Are the results of this study directly applicable to the patient group targeted by this guideline?	**Yes**	
SECTION 3: DESCRIPTION OF THE STUDY			
3.1	How many patients are included in this study?	Randomisation according to the strata of the 88 GP practices (346 GPs, 107,000 children) Study practices: 44 Control practices: 44	
3.2	What are the main characteristics of the patient population?	Not provided	
3.3	What intervention (treatment, procedure) is being investigated in this study?	Multi component strategy: Nurse led education and direct access service, GP education, clinical practice guideline implementation.	
3.4	What comparisons are made in the study?	Practices where multi-component intervention has been implemented vs. usual care	
3.5	How long are patients followed-up in the study?	4 months	
3.6	What outcome measure(s) are used in the study?	Rate and quality of diagnosis of UTI, use of prophylactic antibiotics, convenience for families, hospital visit and the number of infants with vesico-ureteric reflux in whom renal scarring may have been prevented	
3.7	What size of effect is identified in the study?	• Study families visited hospital half as much as the control families (mean 1.3 times vs. 2.6 times). • Practices with interventions diagnosed twice as many UTI as the control practices (6.42 vs. 3.45/1000 children/year; RR 1.86, 95% CI 1.42 to 2.44); • Nearly four times more diagnosis was made in infants (age < 1 year) and six times more in children without specific symptoms.	

		• Diagnoses were made more robustly by study practices than by control practices; 99% vs. 89% of referred patients had their urine cultured and 79% vs. 60% had bacteriologically proved UTIs (P < 0.001 for both). • Overall, 294 of 312 (94%) children aged under 4 years were prescribed antibiotic prophylaxis by study doctors compared with 61 of 147 (41%) by control doctors (P < 0.001). • Twice as many renal scars were identified in patients attending the study practices. Twelve study infants but no control infants had reflux without scarring.
3.8	How was this study funded?	No industry sponsors. The study was funded by various Trust and Research bodies.
3.9	Does this study help to answer your key question?	Not sure, this large, multisite effectiveness trial failed to provide enough details on healthcare utilisation data. However, the results demonstrated that a nurse led direct access service improved the management of children with urinary tract infections, was preferred by general practices and families alike, and saved time for paediatric clinics and reduced hospital visits. **Limitations:** • Study was not blinded • Allocation concealment method was not reported. • Costs implications was not considered • Study participants were not compared before the study • Patient characteristic was not provided

SIGN	Methodology Checklist 2: Randomised Controlled Trials

Study identification: **Mason S, Knowles E, Colwell B, et al., *Effectiveness of paramedic practitioners in attending 999 calls from elderly people in the community: cluster randomised controlled trial.* BMJ, 2007. 335(7626): p. 919.**

Guideline topic: **PPH- acute conditions**	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY

	In a well conducted RCT study…..	***In this study this criterion is:***	
1.1	The study addresses an appropriate and clearly focused question.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.2	The assignment of subjects to treatment groups is randomised. *Cluster randomisation by weeks when Paramedic practitioner service being active (intervention) vs. inactive (control)*	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.3	An adequate concealment method is used.	Well covered Adequately addressed Poorly addressed	Not addressed **Not reported** Not applicable
1.4	Subjects and investigators are kept 'blind' about treatment allocation. *Not blinded*	Well covered Adequately addressed Poorly addressed	Not addressed Not reported **Not applicable**
1.5	The treatment and control groups are similar at the start of the trial	Well covered Adequately addressed **Poorly addressed**	Not addressed Not reported Not applicable
1.6	The only difference between groups is the treatment under investigation.	Well covered Adequately addressed **Poorly addressed**	Not addressed Not reported Not applicable
1.7	All relevant outcomes are measured in a standard, valid and reliable way.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.8	What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?	Intervention group: 74.2% of patients consented and included in the analysis; Control group: 77/0% gave consented and included in the analysis.	

		For the measurement of patients' satisfaction by questionnaire: of the 3996 patients randomised to the trial, only 2293 agreed to receive a questionnaire, out of which only 1482 (64.6%) responded, which is less than the required sample size (n=2200) calculated.	
1.9	All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.10	Where the study is carried out at more than one site, results are comparable for all sites.	Well covered Adequately addressed Poorly addressed	Not addressed Not reported **Not applicable**
SECTION 2: OVERALL ASSESSMENT OF THE STUDY			
2.1	How well was the study done to minimise bias? Code ++, +, or –	**-**	
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	**Over estimate the effect size.**	
2.3	Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?	**Yes**	
2.4	Are the results of this study directly applicable to the patient group targeted by this guideline?	**Yes**	
SECTION 3: DESCRIPTION OF THE STUDY			
3.1	How many patients are included in this study?	3018 patients (n=1549 intervention, n=1469 control)	
3.2	What are the main characteristics of the patient population?	All patients 60 years and above who called the emergency services originated from the designated postcode and time	
3.3	What intervention (treatment, procedure) is being investigated in this study?	Paramedic practitioner service	
3.4	What comparisons are made in the study?	Paramedic practitioner service being activate (intervention) vs. inactive (control)	
3.5	How long are patients followed-up in the study?	Total patients recruitment period was for 56 weeks, and patients were followed up for 28 days	
3.6	What outcome measure(s) are used in the study?	Primary: Emergency department attendance or hospital admission between 0 and 28 days; interval from time of call to time of discharge; patients' satisfaction with the service received. Secondary: investigations and treatments prescribed, subsequent use of health services within 28 days, and health status and mortality	

		at 28 days.
3.7	What size of effect is identified in the study?	• Compared to the control group, patients in the intervention group were less likely to have attended an ED either during the initial episode (day 0) or in the next 28 days (62.6% v 87.5%, P<0.001) and were also less likely to have required a hospital admission during the same time period (40.4% v 46.5%, P<0.001). • Patients in the intervention group were more likely to report being "very satisfied" with the service than those in the control group (85.5% v 73.8%, P<0.001) • Patients in the intervention group experienced a shorter total episode time by around 42 minutes compared to control group (235 v 278 minutes, P<0.001). • The total costs in the intervention group were £140 lower when routine data were considered, though this was not statistically significant (p=0.63). • When the costs and QALY were considered simultaneously, the authors estimated that paramedic practitioner service had a greater than 95% chance of being cost effective at £20000 per QALY
3.8	How was this study funded?	Funded by Health Foundation, UK, and there was no industry sponsors.
3.9	Does this study help to answer your key question?	Yes, this large pragmatic trial demonstrates that paramedic practitioners with extended skills could provide a clinically effective alternative to standard ambulance transfer and treatment in an ED for elderly patients with acute minor conditions. **Limitations:** • Study participants and assessors were not able to be blinded. • Allocation concealment method not described. • Large drop outs in both groups. • Possibility of the spiling over between the groups cannot be ruled out particularly in the intervention weeks when Paramedic practitioner service was active, as the other eligible patients were treated within a control groups' protocol, when the paramedic practitioners were busy attending to another case at the same time. • Randomisation was done by the weeks • Study was carried out in large urban area in the UK, hence, generalisability of the results to other context should be taken cautiously.

SIGN	Methodology Checklist 2: Randomised Controlled Trials

Study identification: Peikes D, Chen A, Schore J, et al., Effects of care coordination on hospitalization, quality of care, and health care expenditures among Medicare beneficiaries: 15 randomized trials. JAMA, 2009. 301(6): p. 603-18.

Guideline topic: **PPH- Chronic diseases**	Key Question No:

Checklist completed by:

SECTION 1: INTERNAL VALIDITY

	In a well conducted RCT study…..	**In this study this criterion is:**	
1.1	The study addresses an appropriate and clearly focused question.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.2	The assignment of subjects to treatment groups is randomised.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.3	An adequate concealment method is used.	Well covered Adequately addressed Poorly addressed	Not addressed **Not reported** Not applicable
1.4	Subjects and investigators are kept 'blind' about treatment allocation. **Not blinded**	Well covered Adequately addressed Poorly addressed	Not addressed Not reported **Not applicable**
1.5	The treatment and control groups are similar at the start of the trial	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.6	The only difference between groups is the treatment under investigation.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.7	All relevant outcomes are measured in a standard, valid and reliable way.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.8	What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?	Details not provided, however all patients were followed up.	

1.9	All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).	**Well covered** Adequately addressed Poorly addressed	Not addressed Not reported Not applicable
1.10	Where the study is carried out at more than one site, results are comparable for all sites.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
SECTION 2: OVERALL ASSESSMENT OF THE STUDY			
2.1	How well was the study done to minimise bias? Code ++, +, or –	**+**	
2.2	If coded as +, or – what is the likely direction in which bias might affect the study results?	**Unlikely to have caused bias**	
2.3	Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?	**Yes**	
2.4	Are the results of this study directly applicable to the patient group targeted by this guideline?	**Yes**	
SECTION 3: DESCRIPTION OF THE STUDY			
3.1	How many patients are included in this study?	Care coordination group from 15 program (18,309 fee-for-service Medicare patients, n = 178 to 2657 per program) compared with the controls from the same programs in 1:1 ratio	
3.2	What are the main characteristics of the patient population?	Fee-for-service Medicare patients (primarily with congestive heart failure, coronary artery disease, and diabetes) in 15 care coordination programs (each received a negotiated monthly fee per patient from Medicare)	
3.3	What intervention (treatment, procedure) is being investigated in this study?	Care coordination programs in which nurses provided patient education and monitoring (mostly via telephone) to improve adherence and ability to communicate with physicians. Patients were contacted twice per month on average; frequency varied widely amongst the programs.	
3.4	What comparisons are made in the study?	Care coordination programs vs. usual care	
3.5	How long are patients followed-up in the study?	On average 30 months, with maximum of 51 months	
3.6	What outcome measure(s) are used in the study?	Hospitalisations, monthly Medicare expenditures, patient-reported and care process indicators	
3.7	What size of effect is identified in the study?	• Thirteen of the 15 programs showed no significant (P<.05) differences in hospitalisations;1 Programs (Mercy medical	

		service) had statistically significant 0.17 fewer hospitalisations per person per year (90% CI, -0.28 to -0.05; 17% less than the control group mean, P=0.02); another program (Georgetown) reduced annual hospitalisations by 0.494 per person per year but was not statistically significant (24% of the control group mean, P=0.07) • One another program (Charlestown) had 0.118 more hospitalisations per person per year (90% CI, 0.025-0.210; 19% more than the control group mean, P=.04). • None of the 15 programs generated net savings. • Treatment group members in 3 programs had monthly Medicare expenditures less than the control group by 9% to 14%
3.8	How was this study funded?	No industry sponsors. Data collection and original analysis were funded by grant from Centres for Medicare & Medicaid Services.
3.9	Does this study help to answer your key question?	Not sure, this large, multisite effectiveness trial evaluated 15 care coordination programs with varied study population size and different program components. Out of 15 programs evaluated only 1 program showed significant benefit in regards to the health care utilisation. This study demonstrated that viable care coordination programs without a strong transitional care component are unlikely to yield net Medicare savings. Programs with substantial in-person contact that target moderate to severe patients can be cost-neutral and improve some aspects of care. **Limitations:** • Study participants and assessors were not able to be blinded. • Allocation concealment method not described. • Care coordination interventions of the 15 programs assessed in the study differed widely. • Wide variation in the number of participants in each program (ranging from 178 to 2687 patients).

3. Cohort studies

SIGN	Methodology Checklist 3: Cohort studies

Study identification: **Barnett TE, Chumbler NR, Vogel WB, et al., The effectiveness of a care coordination home telehealth program for veterans with diabetes mellitus: a 2-year follow-up. American Journal of Managed Care, 2006. 12(8): p. 467-74.**

Guideline topic: **PPH- Chronic diseases** | Key Question No:

Checklist completed by:

Section 1: Internal validity

In a well conducted cohort study:		***In this study the criterion is*:**	
1.1	The study addresses an appropriate and clearly focused question.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
SELECTION OF SUBJECTS			
1.2	The two groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.3	The study indicates how many of the people asked to take part did so, in each of the groups being studied.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.4	The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.5	What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed?	There was no loss to follow up.	
1.6	Comparison is made between full participants and those lost to follow up, by exposure status.	Well covered Adequately addressed Poorly addressed	Not addressed Not reported **Not applicable**
ASSESSMENT			
1.7	The outcomes are clearly defined.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable

1.8	The assessment of outcome is made blind to exposure status.	Well covered Adequately addressed **Poorly addressed**	Not addressed Not reported Not applicable
1.9	Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome.	Well covered Adequately addressed **Poorly addressed**	Not addressed Not reported Not applicable
1.10	The measure of assessment of exposure is reliable.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.11	Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
1.12	Exposure level or prognostic factor is assessed more than once.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
CONFOUNDING			
1.13	The main potential confounders are identified and taken into account in the design and analysis.	Well covered **Adequately addressed** Poorly addressed	Not addressed Not reported Not applicable
STATISTICAL ANALYSIS			
1.14	Have confidence intervals been provided?	No CI were provided, and only P values were provided	
SECTION 2: OVERALL ASSESSMENT OF THE STUDY			
2.1	How well was the study done to minimise the risk of bias or confounding, and to establish a causal relationship between exposure and effect? *Code ++, +, or –*	+	
2.2	Taking into account clinical considerations, your evaluations of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the exposure being investigated?	Yes, based on the result of this study Care Coordination Home Telehealth program reduces the healthcare services utilisation for DM (such as hospitalisations) and reduced care coordinator–initiated primary care clinic visits.	
2.3	Are the results of this study directly applicable to the patient group targeted in this guideline?	The study population in this study were older veterans with type 2 DM from 4 Veterans Affairs medical centres, who were at high risk for multiple inpatient and outpatient visits. Hence, this might not be applicable to overall general population.	
SECTION 3: DESCRIPTION OF THE STUDY			

3.1	**How many patients are included in this study?**	400 patients in the intervention and 400 in the comparison group
3.2	**What are the main characteristics of the study population?**	Older veterans mean age 68.1 years (intervention group) and 67.4 (control group) years with type 2 DM who were at high risk of health care utilisations (2 or more in past 12 months). The participants were predominantly white and Hispanic.
3.3	**What environmental or prognostic factor is being investigated in this study?**	Coordination Home Telehealth program
3.4	**What comparisons are made in the study?**	Coordination Home Telehealth program vs. usual care
3.5	**For how long are patients followed-up in the study?.**	24 months
3.6	**What outcome measure(s) are used in the study?**	Healthcare utilisation (hospitalisations, length of stay, and outpatient visits by type)
3.7	**What size of effect is identified in the study?**	• There was reduction in hospitalisation by 25% which was attributed to the intervention. • There was a significant difference between the treatment and comparison groups in the likelihood of all-cause hospitalisations, decreasing in the treatment group from 38.8% to 30.0% (P = 0.01) and increasing in the comparison group from 31.2% to 33.1% (P = 0.61). • The treatment group had a significant reduction in DM-related hospitalisations during in 24 months from 35.3% to 26.9% (P = 0.02). • The treatment group experienced a significant reduction in care coordinator–initiated primary care clinic visits, decreasing from 59.0% to 22.6% (p <0.001).
3.8	**How was this study funded?**	Funded by Veterans Affairs Community Care Coordination Service, USA
3.9	**Does this study help to answer your key question?**	Yes, though some limitation in the study, the care coordination program delivered via tele health program seems to provide additional support and reduce the healthcare burden, associated with this sub-group of patients. **Limitations:** • Patients were not comparable with

		respect to comorbidities at baseline. • The treatment group tended to be selected based on hospitalisation criteria, while the comparison group was chosen largely based on ED visit criteria. However, the authors have adjusted these in the analysis. • There was limited socio-demographic information of the patients; presence and level of social support and private health insurance status was not reported, which may have played the confounding factors and may have affected findings. • Cost analysis was not performed.