Evidence report: alternatives to acute hospital care for people over 65 years of age being considered for potentially avoidable admission

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CONTENT

1. Summaries

Lay Summary

When people become ill or are injured they are sometimes admitted to hospital. The number of hospital admissions is increasing steadily, and this puts a lot of demand on the healthcare system, as well as being expensive for the NHS. Five main types of alternative to acute hospital admission have been identified for people aged 65 years and over:

- Interventions initiated by paramedics and other 999 ambulance staff
- Alternatives delivered in hospital A&E (Emergency) Departments
- Admission to a local community hospital
- Hospital-type services delivered in the patient's own home "hospital at home"
- Hospital-type services delivered in a nursing or care home.

We identified, studied and summarised the highest quality research evidence published so far on these five types of alternative to acute hospital admission.

The majority of the research looks at "hospital at home" for a wide range of conditions; long-term heart and lung disease are the most commonly studied. The highest quality research (randomised controlled trials) of "hospital at home" show that overall this alternative approach is similar to acute hospital admission in terms of patient safety and recovery. The exception is "hospital at home" for stroke patients, where one large high quality research study showed that a stroke unit is better than treatment at home.

Cost information is reported rarely in "hospital at home" studies; however information from heart and lung patients showed some savings on initial care, but no differences in longer term follow-up.

Whilst research in the four other intervention types suggests that these alternatives are similar to acute hospital admission in terms of patient safety and recovery, this evidence is limited both in the number and quality of studies, and reporting of cost information.

This report also presents current UK guidance on admissions for a range of healthcare problems relevant to older people. This guidance is mostly based on expert opinion developed through a consensus process. Only guidance on dehydration and gastroenteritis, kidney infection, bleeding from the bowel, skin infection and complications of diabetes mention the older population specifically.

Executive summary

A systematic review was conducted to identify controlled studies that evaluate alternatives to acute hospital admission for the older population (≥65 years) with acute illness or exacerbation of chronic disease and being considered for a potentially avoidable admission. The review identified 19 primary studies published over 24 papers between 2000 and 2015, and eight relevant and recent systematic reviews published between 2010 and 2015. In addition, we have summarised relevant NICE guidance on decision making for acute hospital admission for acute and chronic conditions relevant to the ≥65 years population. The primary studies of the systematic review described the following:

Paramedic /Emergency care practitioner ECP

One randomised controlled trial (RCT) and two non-randomised controlled trials (nRCTs) of paramedic/ECP interventions versus usual care for the older population with acute medical problems all showed statistically significant reductions in ED attendance and acute hospital admissions. There were no cost data reported.

Community hospital

There were two high quality RCTs of community hospital versus acute hospital care for the older population with only one providing useful data. This RCT reports fewer readmissions and less community care needed following a community hospital intervention compared to acute hospital

care. The remaining RCT reported that 20% of the intervention group were sent to the community hospital. There were no cost data in either study.

Emergency department (ED) interventions

Individual studies investigating specific protocols in the ED for syncope (RCT) and hyperglycaemic patients (nRCT) compared to standard ED care showed they were less likely to be admitted/readmitted with cheaper costs. One nRCT comparing geriatric ED with conventional ED showed comparable outcomes for effectiveness and mortality.

Hospital at home

Hospital at home is the most researched and reviewed of admission avoidance interventions for the older population.

A sufficient number of high quality hospital at home RCTs have been conducted for the conditions of heart failure and COPD to allow meta-analysis of data, although data are lacking for some outcomes within these trials.

There is one recent trial of hospital at home published in the literature for each of the following conditions: pulmonary embolism, pneumonia, cellulitis, stroke, uncomplicated diverticulitis and the general older population.

Overall, with the exception of stroke patients, hospital at home appears to be at least comparable to care in an acute hospital in terms of effectiveness and patient safety.

Patient satisfaction appears comparable between hospital at home and care in an acute hospital although there is a limited amount of data

There is a lack of cost data and cost analysis for hospital at home interventions. Limited data from heart failure and COPD studies show savings on initial care but no differences in longer term follow-up.

Hospital at home compared to care in an acute hospital for heart failure patients significantly reduces time to next admission (2 RCTs) with comparable mortality rates between groups (3 RCTs).

Hospital at home for COPD patients compared to care in an acute hospital significantly reduces the number of subsequent admissions (8 RCTs) with comparable mortality rates between groups (7 RCTs).

Hospital at home compared to care in a stroke unit for patients is inferior for all effectiveness and safety outcomes (1 RCT).

Hospital in the nursing/care home

There were data from two nRCTs of hospital in nursing/care homes (HNCH) for the general older population; both showed a significantly reduced length of stay with HNCH compared to care in an acute hospital. There were no cost data.

Current UK guidance

There is specific guidance on admissions to a tertiary hospital for the majority of acute and chronic ambulatory care sensitive conditions. This guidance is mostly based on expert opinion developed through a consensus process. Only guidance on dehydration and gastroenteritis, pyelonephritis, upper GI haemorrhage, cellulitis and complications with diabetes specifically mention the older population.

2. General introduction

Reducing emergency bed days is one of the biggest challenges currently facing the National Health Service (NHS). There is considerable pressure to reduce hospital admissions amongst older people (D'Souza, 2013). It has been suggested that clinicians should: 'Choose to admit only those frail older people who have evidence of underlying life-threatening illness or need for surgery' (Philp, 2012). There has been a 65% increase in hospital admissions for those over 75 years of age in the last decade. The oldest old, those over 85 years of age, now account for 11% of emergency admissions and 25% of bed days (NHS England, 2013). Over the next 25 years the number of people aged over 85 years is predicted to double. Hospital stays for this group are longer and more disruptive than for younger people and their care does not always fit within usual ambulatory care pathways (NHS England, 2013).

Decisions to admit are often influenced by inadequate knowledge of the patient or condition, communication difficulties at the interface of primary and secondary care, perceived benefits of in-patient care and patient preferences (Hammond 2009). Within secondary care there is a fourfold variation in admission rates of people over 65 between hospital trusts and length of stay varies between consultants for the same population (NHS Interim Management and Support, 2014). While there has been an increase in emergency admissions over past 10 years, only 40 per cent of this increase is estimated to be due to ageing (Blunt, 2010). It has been suggested that the rate of hospital intervention is growing much faster than the rate of ageing. Hypotheses for this include improved medical technology and knowledge which produce a reduced threshold for admission; and there is a perceived increased risk aversion among doctors, compounded by less experienced junior doctors managing admissions. (NHS Interim Management and Support, 2014). The seniority of clinician who makes decisions about who should be admitted has been shown to impact on admission rates (White, 2010).

A recent review of urgent and emergency care highlighted the need to identify frail and elderly people in particular who need care but do not have a medical need requiring hospital admission (NHS England, 2013). There are some older patients for whom care in the community is safe, perhaps with the provision of additional services, and some for whom admission is required in order to deliver diagnostic or treatment techniques that are only available as an inpatient. However, for those patients who do not fall neatly into one of these categories, those 'at the decision margin', the best path of action may be unclear. The decision may be affected by non-clinical and clinical factors e.g. how much risk the patient or family are willing to accept, whether the patient has support at home or whether they have significant co-morbid conditions.

3. Methods

Overall aims

1) What admission alternatives are there for older patients and are they effective, safe and cost-effective?

2) What are the defining characteristics of those older patients for whom the decision to admit to hospital may be unclear?

Specific objectives:

a) To conduct a systematic review to identify studies of interventions aimed at reducing hospital admissions in older patients with acute medical problems potentially requiring unscheduled hospital admission that describe place of delivery of care (intervention), risk factors and outcomes of care

b) To review current guidance around emergency admittance decisions for people over 65 years of age

Systematic review

The protocol for a systematic review to identify and assess the effectiveness of hospital alternatives for people over the age of 65 who being considered for potentially avoidable hospital admission was registered at the PROSPERO register on 14/06/2015. Registration number is: CRD42015020371

Searches

Medline, Medline in process, Embase, Cinahl and CENTRAL were searched from 2005 to April 24th 2015. (Appendix 1) An update was run on the 4th May 2016 in Medline and Medline in process. The decision to focus on evidence from primary studies published in the previous 10 years was made since changes in NHS mean that older evidence would be less relevant to the current situation. We include any high quality systematic reviews published in the previous five years.

The Kings Fund and AHRQ websites were also searched. The reference lists of included studies were checked and forward referencing was conducted using Google Scholar. Authors of included studies were contacted regarding any queries on their studies and to check on any studies just about to be published.

PICOD

Participants/ population: People over 65 years of age of either sex living in OECD countries that are being considered for an unplanned admission - they will therefore not be admitted to hospital at time of recruitment but could be in community or ED (being assessed).

Intervention(s): Alternatives to admission including but not limited to: hospital at home, virtual ward, rapid response nursing, care at home, admission to a care home, usual care.

Comparator(s)/ control: The control is admission to hospital, using definitions developed for previous studies (Huntley, 2013)

Outcome(s) of included controlled studies

Effectiveness of intervention outcomes: length of stay, readmission and any related outcomes.

Patient related outcomes: patient satisfaction, quality of life and any related outcomes.

Safety outcomes: mortality rates, adverse effects of intervention and any related outcomes.

Cost outcomes: any cost data associated with an intervention and with its comparator.

Design: any randomised (RCT) or non-randomised controlled trials (nRCT).

Screening of studies

References were managed using End Note software. References were screening independently and in duplicate (AH, BD) using our inclusion/exclusion criteria. Abstracts were screened first and then full papers were obtained of potential studies of interest and were screened to produce the final inclusion list. Any disagreements in either stage were resolved using a third reviewer. (SP)

Data extraction and risk of bias (quality) assessment

Data were extracted into a custom-designed table with headings to capture all essential information required from the published trials: Study ID, study type, participants, ED or triage procedure,

intervention, control, outcomes, results. Particular care was taken to record the profile of the inclusion/exclusion criteria for participants, as well as actual recruited population including but not exclusively risk factors e.g. co-morbidities (mental & physical), age, gender, social circumstances ,disease severity, recent admission/discharge availability of other services. In addition recent relevant systematic reviews were identified that were published in the past five years (2010-2015). EPOC Cochrane risk of bias tool was used for randomised controlled trials and controlled trials. (EPOC) AMSTAR was used to assess the quality of the included systematic reviews. (Shea, 2007)

Structure of the report of the systematic review.

All the topic areas listed above are included in this report. We have used two levels of presentation.

- Systematic review with or without meta-analysis. This was used for topics that have either not been reviewed before or there has been many more studies since previous reviews.

- Summary of previous review(s) & brief description of new data. This was used for topics that have been reviewed recently and most likely contain all or most of the studies found in this review. We will use the terminology of **previous review** for previously published systematic reviews and **present review** for our searches and current systematic review of the evidence.

Searching for current UK guidance on admissions

Admission criteria for Ambulatory Care Sensitive Conditions were searched for within all the relevant NICE guidelines. Relevant guidelines were identified using the Directory of Ambulatory Emergency Care for Adults ICD – 10 codes and also referring to the newly updated codes from the Health and Social Care Information Centre. (HSCI) For the conditions which did not have admission criteria in the NICE guidelines other national guidance, such as the Scottish Intercollegiate Guidelines Network (SIGN) were searched. Conditions were divided into acute and chronic and the guidance was reported in tables. If admission criteria were present within a guideline, the evidence base for these admission criteria was searched and the standard of evidence noted.

4. What admission alternatives are there for older patients and are they effective, safe and cost-effective?

The present systematic review identified 19 studies over 24 papers (appendix 2):

Paramedic/emergency care practitioner (n=3). Three studies were identified involving an older population with acute medical problems: a cluster randomised controlled trial and two nRCTs.

Community hospital (n=2). Two RCTs involving an older population with acute medical problems were identified.

ED interventions focussing on specific procedure/protocol (n=3). Three studies were identified: a RCT (syncope) and two nRCTs (hyperglycaemic crisis, general older).

Hospital at home -community dwelling participants (n=9). Three RCTs on heart failure and one RCT for each of COPD, pulmonary embolism, pneumonia, stroke, uncomplicated diverticulitis and an older population with acute medical problems .

Hospital at care home-care/nursing home residents (n=2). Two nRCT studies involving an older population with acute medical problems were identified.

Fifteen of the studies were conducted in western European countries of which four were in the UK. Two studies were conducted in Australia and two studies in the USA.

The present review also identified eight relevant and recent systematic reviews published between 2010 and 2015. (appendix 2) All of these reviews were concerned with Hospital at Home interventions. The previous reviews include older studies than our present review which searched between 2005 and 2015 only, and so the previous reviews provide historical as well as recent evidence for HaH. Six previous reviews cover heart failure, COPD, pulmonary embolism, pneumonia and cellulitis. (Quaddoura, 2015, Jeppensen, 2012, Lasschuit, 2014, Vinson, 2012, Chalmers, 2011). The remaining three previous reviews cover RCTs of HaH across all patient groups. (Caplan, 2012, Varney, 2014, Mas, 2015)

Paramedic/emergency care practitioner (ECP)

Paramedics/ECPs can be trained to assess and treat or refer patients with a range of conditions to provide pre-hospital care. The ECP role was created in order to contribute a more appropriate response to patients needs in emergency and urgent care settings. Under certain conditions, ECPs can administer and supply medication. In cases where further investigation or treatment is required, ECPs can refer patients to other health and social care where appropriate. The main role of ECPs is to improve the patient experience and pathway of care in these settings, particularly by discharging patients at the scene or by referring to the most appropriate care practitioner reducing unnecessary ED attendance and avoidable admissions.

Our present searches identified three relevant studies: a cluster randomised controlled trial of paramedic practitioners with additional training compared with standard practitioners attending 999 calls from elderly persons in the community. (Mason, 2007) and two more recent controlled studies investigating the role of ECPs in avoiding admissions in specific patient populations including distinct elderly groups (separate data available). (Gray, 2008, Mason, 2012) (Tables 1&2). There was limited detail on how the care provided with interventions differed from that of standard paramedic care in all three studies. No relevant reviews were found.

Risk of bias was low for the cluster randomised trial conducted by Mason in 2007 but the subsequent studies were not RCTs and were at high risk for the randomisation domains but generally low risk for most of the other domains. (Mason, 2007)

In the cluster RCT, the randomisation was by individual service (unit) (n=56) over a large urban area in England and worked such that the intervention services (n=1469 participants) provided the paramedic practitioner service whilst the control services (n=1549 participants) did not. Patients aged 60 years old or more were recruited between 8am and 8pm if they had a presenting complaint that fell within the scope of practice of the paramedic service. There were no differences in baseline

characteristics between the two groups. Primary outcomes included ED attendance, readmissions within 28 days and patient satisfaction. Secondary outcomes were subsequent unplanned contact with secondary care and mortality at 28 days. All primary outcomes were significantly improved with the paramedic service compared with the control service: ED attendance within 28 days (RR (relative risk) 0.72 (0.68, 0.75) hospital admissions within 28 days (RR 0.87 (0.81, 0.94)), very satisfied with care (RR 1.16 (1.09, 1.23)), Mean total episode time (-42.2 (-59.5,-25.0)) ($p<0.001$ for all). Mortality was comparable between the groups, but patients in the intervention group had greater number of subsequent unplanned contacts with secondary care (330(21.3%) vs. 259(17.6%) $p<0.01$. There were no cost data. (Mason, 2007)

In the controlled study by Gray, an ECP intervention (Jan- April 2006 n=233) was compared to a historical control group (Jan- April 2005 n=772) before the intervention was implemented. Patients were included if they had breathing problems (any age) or were 65 years or more with a fall. The latter only is reported here. Outcomes of interest were care completed at home, ED or admitted at time zero (index call), 72hrs and 28 days. The avoidable admission rate of the intervention group versus the control group at 28 days was 56% (17% better) $p<0.05$. No cost data were given.

In a controlled study by Mason in 2012, participants were either allocated an ECP intervention for acute care or the usual emergency care provision. This was a large study (May 2006-August 2007) which included various patient groups of which one a cohort of care home residents (n=457). Baseline data for this cohort was brief but mean age (84 years) and gender (33% female) were comparable but groups appeared to differ on clinical complaints: (intervention vs. control) adult medical 30 vs. 41%, adult trauma 46 vs. 13%, falls 23 vs. 46%. Primary outcomes were percentage of patients needing a) no further care b) urgent referral to ED /admission to hospital and c) non-urgent referral to GP/community care. All three outcomes appeared significantly improved in terms of reducing urgent care in the ECP group compared to the control group (49 vs. 12.4%, 22.7% vs 88% and 28 vs. 0% respectively but no statistical analysis were performed. There were no cost data.

Community hospital

The role of community hospitals varies between country and health systems but essentially their main role is in non-urgent care; routine or rehabilitation care. However community hospitals can be extended to provide an alternative to acute hospital admission in some cases.

Our present searches identified two relevant studies: two RCT of care provided by a community hospital compared to acute hospital care. (Garasen, 2007; Garasen, 2008ab; Vicente, 2014) (Tables 1 &2) No relevant reviews were found.

Both RCTs were at low risk of bias overall. In the RCT by Garasen patients who were aged 60 years old or more who were had an acute illness or an acute exacerbation of an known chronic disease and needed ward care for 3-4 days were randomised to either to community hospital care (n=72) or acute hospital care (n=70). This decision was made in the acute hospital within 24 hours. Baseline characteristics were comparable between the groups. Outcomes were readmissions, need for community care, need for nursing home, number of days of care after randomisation, no need for any this care support, and number of deaths at 26 weeks plus some data at 12 months. At 26 weeks all outcomes were comparable except there were less readmissions in the community hospital group compared with acute hospital group (19% vs. 36% p=0.02) and more people receiving no care in the community hospital versus acute hospital group (25% vs. 10% p=0.01). At 12 months follow up there were less deaths in the community hospital group compared to the acute hospital group (18% vs. 31% p=0.03) and the total observation period was greater in the community hospital compared to acute hospital group (335.7 days vs. 292.8 days p=0.01) possibly as a result of this. There were no cost data.

In the RCT by Vicente and colleagues, older adults were randomized when they called the emergency services to either go to a community hospital (n=410) or to the ED department of an acute hospital (n=396). There was no specific information on targeted population but the authors stated that 14% of the population served was people aged 65 years old or more. Mean age (81

years) and gender (57% female) were similar between groups and whilst priority levels of patients differed between the two groups when the ambulance was sent out (p=0.001) by the time the patients had been assessed in the ambulance and arrived at their place of care they were all comparable. The primary outcome was the number of people being delivered to the community hospital and any subsequent transfer between from the community hospital to the ED within 24 hours. After exclusion and crossover, the acute hospital group consisted of 217 and the community hospital group 449. The nurse sent 20% of the intervention group (90/449) to the community hospital and 6 of those individuals were transferred from the community hospital to the ED. No cost data were presented.

Emergency Department (ED) interventions

In this section interventions are included which involve initial assessment in the ED, followed by an extended stay for tests and observation. This extended stay is in a bed closely associated with the ED, if not part of it.

Our present searches identified three relevant studies: One RCT of an observation syncope protocol in an ED [Sun, 2014), one controlled study of 'day hospital' for elderly patients with a hyperglycaemic crisis (Benaiges, 2014) and one study comparing a geriatric ED with a conventional ED.(Salvi, 2008) (Tables 1& 2) No relevant reviews were found.

Syncope observation protocol

Sun and colleagues conducted a RCT in which patients admitted to ED with syncope were randomised to either a syncope observation protocol lasting 24 hours or less (n=62) or normal inpatient admission (n=62). The targeted population was patients aged 50 years or more diagnosed with intermediate syncope using standard criteria. The mean age of included patients for both groups was 65 years and all baseline characteristics were comparable between the two groups.

The primary outcomes were admission rates and length of stay at index visit. Secondary outcomes were serious events at 30 days and 6 months, patient satisfaction and costs. Syncope patients

randomised to the intervention spent less time in hospital at index visit (29 vs. 47 hours p<0.001) and were significantly less likely to be admitted to hospital (relative rate 0.16(95% CI 0.09, 0.29) p<0.001). There were no differences in serious events, patient quality of life or satisfaction with care between the groups. A reduction in costs was reported with no statistical analysis (Index visit $1400 vs. 2,420, 30 days $1,800 vs.2, 520).

Day hospital for hyperglycaemic crisis

One controlled trial described a 'day hospital' of eight hours followed by scheduled follow up visits at 24, 72hrs and 7 days to adjust treatment. (Benaiges, 2014). One hundred diabetic patients aged 74 years or older consecutively admitted to a tertiary teaching hospital in Spain for hyperglycaemic crisis (>300 mg/dL] for at least 3 days with or without ketosis and were followed for 6 months after discharge. The primary objective of the study was to compare the costs of this intervention for hyperglycaemic crisis in elderly diabetic patients with hospital admission. Secondary objectives included number of emergency and outpatient visits and readmission. This study reported that the average cost per patient was 1,345.1±793.6 € in the day hospital group and 2,212.4±982.5 € in the hospitalisation group (*P*>0.001). Readmissions for hyperglycaemic crisis were significantly higher in the hospitalisation group 1 (1.6%) vs. 5 (13.9%) p=0.04). There were no effectiveness, patient-related or safety outcomes reported.

Geriatric ED

Salvi and colleagues performed a secondary analysis on data from a controlled cohort which compared patients aged 65 years or more attending ED who either were treated in a geriatric ED (observation unit of 6 beds) (n=100) or a conventional ED (n=100). There were significant differences in the baseline characteristics between the groups in terms of age, gender, marital status, mental status and activities of daily living. In brief the intervention group were younger (78 vs. 83yrs), 47% female, more likely to be married and were more able mentally and physically (P<0.001). Outcomes of interest were number of admissions, length of stay, number of subsequent ED visits and readmissions at 6months, activities of daily living at 6 months and mortality at 30 days

and 6 months. There was no difference in any of the outcomes at any time point. There were no cost data.

Hospital at Home (HaH)-community dwelling participants

'Hospital at home' provides acute or subacute treatment in a patient's residence for a condition that would normally require admission to hospital. It is also known as 'hospital in the home' and 'home hospitalisation'. (Shepperd, 1996) A 2008 Cochrane review of the role of HaH in avoiding admission to hospital is currently being updated. (Shepperd, 2008)

Heart failure

This review identified three RCTs on HaH for heart failure published in four papers. (Mendoza, 2009; Garcia-Soleto, 2013; Tibaldi, 2009; Patel, 2008)

The previous review by Qaddoura in 2015 included the same 3 RCTs (n=203) identified in our search cited above and an additional three observational studies. (Bechich, 2000; de Zuazu, 2003; Roig, 2006) The authors used Cochrane risk of bias and described the overall quality of studies as modest. (Table 3) From the RCT data that was available, the previous review reported:

Effectiveness outcomes

HaH increased time to first readmission (Mean difference (MD) 14.13 [95% CI 10.36, 17.91] p=0.015 using data from two of the RCTs (n=132) (Patel , 2008; Tibaldi, 2009). HaH had no effect on readmissions (RR 0.68 [0.42, 1.09]) using data from two of the RCTs (n=172)

Patient-related outcomes

An improvement was reported in HRQoL at 6 and 12 months in favour of HaH but the statistical analysis is not robust.

Safety outcomes

HaH was comparable to acute hospital care on all-cause mortality (RR 0.94 (0.67, 1.32) using data from all three RCTs.

Cost outcomes

All three studies showed a statistically significant reduction in costs for the index treatment period ($p<0.001$ for both). Mendoza and Patel also reported a non-statistically significant difference ($p=0.83$) and a borderline statistically significant difference ($P=0.05$) in favour of HaH compared to acute hospital care at 12 months.

COPD

This review identified 1 RCT. (Ricauda, 2008)

The recent previous review by Jeppensen in 2012 included eight RCTs (n=870 participants), which included the RCT in our present search (Ricauda, 2008), one described HaH in an early discharge setting (Nissen, 2007) and six were pre 2005. (Cotton, 2000; Davies, 2000; Hernandez; 2003, Nicolson 2001; Ojoo, 2002; Swwarska, 2000) (Table 3) From the RCT data that were available, the previous review reported:

Effectiveness outcomes:

HaH showed a reduction in readmission rates compared with acute hospital care of acute exacerbations of COPD (RR 0.76; [95% CI 0.59, 0.99] p=0.04) using data from all 8 RCTs (n=870).

Patient-related outcomes

Patient satisfaction (no. of people stating to be very satisfied with treatment 0 to 2 weeks after discharge) was comparable between HaH and acute hospital care. RR 1.06 (0.96, 1.17) from 2 RCTs (n=158)

Carer satisfaction (no. of carers stating to be very satisfied with treatment (2 weeks after discharge) was comparable between HaH and acute hospital care RR 0.97 (0.79, 1.19) from one RCT (n=34)

For health-related quality of life, the quality of the available evidence is in general too weak to make firm conclusions. There were 3 RCTs (n=332) of which two had data that was not suitable to combine.

Safety outcomes

Mortality was lower in the HaH arm, but the confidence interval was wide and included no effect. (RR 0.65, [95% CI 0.40, 1.04] p= 0.07) with data from 7 RCTs (n= 845).

Cost outcomes

The Cochrane review by Jeppensen in 2012 reported that three of the eight included RCTs (n=339) reported mean cost analysis (Hernandez, 2003; Nicholson, 2001; Ricauda, 2008). The three studies report direct costs associated with supplying the care and do not account for possible saving related to prevention of exacerbations, reduction in absence from work and improved patient outcomes. Two studies conducted in Spain and Australia reported a significant reduction in direct costs for hospital at home (Nicholson, 2001; Hernandez, 2003). The last study showed a trend towards lower cost for hospital at home compared with acute hospital care, but the difference did not reach statistical significance (P = 0.38). The direction of effect in the three studies favoured reduction for hospital at home, however it is likely that the true effect size will vary substantially between different countries and various conditions. The Cochrane authors concluded that and the existing evidence for costs to be of very low quality and not suitable for meta-analysis.

Pulmonary embolism

This review identified 1 RCT. (Rodriguez-Cerrillo, 2009)

The previous review by Vinson 2012 included eight studies (n=777 participants), which included the RCT (Vinson, 2012) we identified in our present searches plus seven observational studies. (Agterof, 2010; Aujesky, 2011; Beer, 2003; Kovacs, 2000; Siragusa, 2005; Wells, 2005; Zondag, 2011) The aim of the review was to answer the question as to whether patients with newly diagnosed pulmonary embolism can be safely treated without hospitalisation. (Table 3)

The previous systematic review included 7 prospective observational studies and one RCT. Four of seven studies were located in the ED department, three in an outpatient thrombosis unit and in one study location was unclear. Only two of the seven studies, including the RCT had a population aged 65 years or more. The higher quality RCT and systematic review reported:

Safety outcomes

There was no major bleeding, thrombosis or death in either group at 90 days in the RCT. The home treatment was successfully completed in 100% of the patients. Three patients in the acute hospital group had hospital acquired infections.

In the seven studies (one RCT and six observational studies) which had 90 day data, the overall incidence of venous thromboembolic-related and haemorrhage-related mortality was very low (0/741).

There were no effectiveness, patient-related or cost outcomes reported.

Pneumonia

This review identified 1 RCT. (Carratala, 2005)

The recent previous review by Chalmers included six studies (n=946 participants), which included the RCT we identified in our present searches.(Chalmers, 2011) The aim of the review was to investigate the strategies to increase the proportion of low risk patients with community acquired pneumonia treated in the community. (Table 3)

In addition to Carratala 2005, the previous systematic review included two prospective observational studies, two nRCTs and one RCT. (Atlas, 1998; Dean, 2000; Marrie, 2000; Renaud, 2007; Yealy 2005) The aim of the review was to broadly investigate strategies to increase the proportion of low-risk patients with community-acquired pneumonia treated in the community as opposed to specifically HaH approaches.

Five of the six studies were located in the ED department and one was conducted in walk in medical centres. This previous review does not give the mean ages of the participants in the individual studies but we know that the RCT had a population aged 65 years or more. The primary outcome of interest in the previous review was the proportion of patients treated in the community but they also assessed safety outcomes: mortality, readmission to hospital in community treated patients, and patient related outcomes: satisfaction with care, health related quality of life and return to

work/normal activities. The previous review, concluded that overall significantly larger numbers of patients were treated in the community with these interventions (OR 2.31 (95% CI 2.03, 2.63) n=5 studies). The previous review reported:

Effectiveness outcomes

Hospital readmissions were comparable between the HAH interventions and acute hospital care (OR 1.08 (95% CI 0.82, 1.42) n=6 studies)

Patient related outcomes

Patient satisfaction with care was comparable between the HAH interventions and acute hospital care (OR 1.21 (95% CI 0.97, 1.49) n= 3 studies). There were insufficient data regarding quality of life or return to usual activities.

Safety outcomes

Mortality was comparable between the HAH interventions and acute hospital care (OR 0.83 (95% CI 0.59, 1.17) n=5 studies)

Cost outcomes

None.

Cellulitis

The present search found no controlled studies within the search dates. One systematic review was identified with nine RCTs (n=797 participants) and thirty other relevant articles. (Lasschuit, 2014) (Table 3)

Eight of the nine RCTs recruited participants with a mean age of less than 65 years. (Bergkvist, 1997; Caplan, 2005; Caplan, 2006; Corwin, 2005; Grayson, 2002; Hepburn, 2004; Richards, 1998; Wolter, 2004) The remaining RCT published in 1999 recruited participants with a median age of 76 years (range 17-111). (Caplan, 1999).

This previous review aimed to evaluate the efficacy of hospital at home for the treatment of cellulitis by looking broadly across the literature and included studies on HaH for rehabilitation. The results were presented narratively without combining data and concluded:

Effective and cost outcomes:

Compared with acute hospital care, the mean duration of treatment in hospital in the home is comparable but it is delivered at half of the cost.

Patient related outcomes:

Patient and carer satisfaction with home based care is high. Hospital in the home may be preferable in older patients due to lower incidence of geriatric complications such as delirium.' The conclusion around older people comes from one controlled study which recruited a mixed population and is described below. (Leff, 2005) There were no safety outcomes reported.

Stroke

This search found one RCT on HaH for stroke patients. (Kalra, 2005) This trial was included in a previous more system-wide systematic review. (Caplan, 2013) (Table 3)

The single-blind RCT by Kalra compared care for stroke patients with an average age of 76 years by a) hospital at home, b) stroke unit and C) general wards with stroke team support. Patients were included within 72 hours of stroke onset. The research team was notified by GPs for patients at home, and by staff at ED. HaH involved management at home under supervision of a GP and stroke specialist with support from specialist team and community services for a maximum of 3 months. 457 patients were randomised with 153 patients randomised to HaH .The groups were well matched for baseline characteristics. Fifty-one (34%) patients in the HaH were admitted to hospital after randomisation. This RCT reported:

Safety outcomes:

Mortality and institutionalisation at 1 year were lower on stroke unit compared with the stroke team (14% vs. 30%, $p < 0.001$) or HaH (14% vs. 24%, $p = 0.03$). Significantly fewer patients on the stroke unit died compared with those managed by the stroke team (9% vs. 23%, $p = 0.001$). The proportion of patients alive without severe disability at 1 year was also significantly higher on the stroke unit compared with the stroke team (85% vs. 66%, $p < 0.001$] or HaH (85% vs. 71%), $p = 0.002$). These differences were present at 3 and 6 months after stroke.

Patient related outcomes:

Stroke survivors managed on the stroke unit showed greater improvement on basic activities of daily living compared with other strategies (change in Barthel Index 10 vs. 7, $p < 0.002$). Achievement of higher levels of function was not influenced by strategy of care. Quality of life at 3 months was significantly better in stroke unit and HaH patients (data presented stratified by initial disability). There was greater dissatisfaction with care on general wards compared with stroke unit or domiciliary care.

Costs outcomes:

The total costs of stroke per patient over the 12-month period were £11,450 for stroke unit, £9527 for stroke team and £6840 for HaH. However, the mean costs per day alive for the stroke unit were significantly less than those for the specialist stroke team patients, (£37.98 vs. £50.90, $p = 0.046$) but no different from HaH patients. Costs for the HaH group were significantly less than for those managed by the specialist stroke team on general wards. No subsequent emergency care resource outcomes were reported.

Uncomplicated diverticulitis

This search found one controlled trial comparing the outcomes of elderly patients with uncomplicated diverticulitis who were treated at home versus acute hospital care. (Rodriguez-Cerillo, 2013) This controlled trial was included in a recent integrative review on admission-avoidance HaH services. (Varney, 2014) (Table 3)

The trial included patients over 70 years of age. All patients were given intravenous antibiotics. Patients (n=34) were transferred to HaH stayed for 24 hours in the observation ward within the emergency department prior to discharge and 18 patients were treated in the acute hospital. Baseline patient characteristics were similar between the two groups. All patients had a good clinical evolution. None of the patients treated at home was transferred to acute hospital. No statistical detail was given on any of the data presented. This one controlled trial reported:

Effectiveness outcomes:

Mean stay was 9 days in HaH and 10 days in an acute hospital. (no further detail)

Cost outcomes:

HaH treatment was associated with a cost reduction of 1368 euros per patient. (no further detail)

There were no other outcomes reported relating to effectiveness nor were there any patient related outcomes or safety outcomes.

Older population with acute medical problems

This review identified one controlled trial which recruited acutely ill older persons. (Leff, 2005) This trial was not included in any the previous reviews as it is an nRCT.

The aim of the trial was to assess the clinical feasibility and efficacy of providing HaH to a population of community-dwelling elderly patients who required acute care for community-acquired pneumonia, exacerbation of chronic heart failure, exacerbation of chronic obstructive pulmonary disease, or cellulitis. The 455 participants were recruited in two consecutive 11 month phases over 3 different sites (2 Medicare-managed, one veteran administrated). The 'control' group (acute hospitalisation) were identified and followed through their acute hospital care from Nov 1990-Sep 2001. The intervention group were identified at time of potential admission and offered HaH as an alternative from Nov 2001 –Sep 2002.

Overall participants were elderly, white and had a high burden of functional impairments and comorbid illnesses but the HaH group were more likely to live in poverty, live alone, take more prescription medication on a daily basis and have a lower illness acuity score. In 2 Medicare sites, 69% of patients who were offered HaH chose it over acute hospital care. In the Veteran administration site, 29% of patients chose HaH. The authors report that HaH care met quality standards at rates similar to those of acute hospital care. The outcomes of this study was reported over three publications: (Leff , 2005; Frick, 2009; Leff 2009)

Effectiveness outcomes:

Data were analysed on an intention-to-treat basis. Patients treated with HaH had a shorter length of stay compared with acute hospital care (3.2 vs. 4.9 days) (P =0.004)

Patient-related outcomes:

Functional outcomes measured by activities of daily living (ADL, IADL) were statistically similar but patients in the HaH group experienced modest improvements whilst those in the acute hospital care declined (0.04 vs. 0.09 p=0.711 and -0.07 vs. 0.14 p=0.28 respectively). (Leff, 2009)

Satisfaction as measured by a modified Picker Hospital Survey of both patients (p<0.001) and carers (p<0.001) was greater for the HaH group than with acute hospital care.

Safety outcomes:

There was some evidence that the HaH group had fewer complications. The rate of incident delirium was 9% (HaH) vs. 24% (acute hospital care). However, data were not available for 42% of study participants and patients in the HaH group were less likely to have a sedative medication prescribed. Whilst small numbers prevented analysis, there was a reduction in the use of chemical restraints, a trend towards a reduction in physical restraints, fewer critical complications and a lower death rate.

Cost outcomes

The mean cost was lower for HaH care than for acute hospital care ($5081 vs. $7480) (P < 0.001)). [Frick 2009] Eight weeks after admission, there were no differences in the use of health services between HaH and acute hospital care patients in terms of ED visits, readmissions, admissions to skilled nursing facilities or number of home health visits.

Hospital in Nursing/Care Home (HNCH)

HNCH has been used as a model of admission avoidance to treat patients living in residential (care) or nursing homes working on the same principles as hospital at home for community dwelling residents. (Montalto, 2001)

Our searches identified two HNCH studies both conducted in Australia. (Tables 1 &2) One is a quasi-experimental study investigating nursing home admission avoidance. (Crilly, 2010) The other study is case series with historical controls investigating hospital treatment in residential care facilities. (Lau, 2013) No relevant reviews were found. Both studies were non-conventional controlled studies and so were at high risk of bias for population selection.

The Crilly study recruited 62 elderly patients (mean age 85 years) who resided in an acute care facility and had been recruited by a GP into the HNCH scheme. HNCH was targeted at the 65 years plus population presenting with a medical condition that that requires hospital services but not necessarily admission. Acute care facility residents who presented at the ED were assessed in short term stay unit for their current eligibility to the scheme. The control group consisted of 115 patients who presented to the ED at the same time but were admitted. Baseline characteristics were not statistically different between groups. Outcomes of interest were length of stay in ED, length of stay in care (HNCH/acute hospital), total time of episode of care and readmissions within 28 days. HNCH participants experienced longer time in ED than those admitted into the acute hospital (9.94 vs. 7.01hrs p=0.005) but less time in the care intervention (HNCH vs. hospital) (2.19 vs. 6.2 days p<0.001) but overall episode of care in days between were not statistically different between groups due to wide variation between patients (p=0.14). Readmissions with 28 days were not statistically different between the two groups, and there were no mortality or cost data

The Lau study assessed residents of a care home (mean age 83 years) presenting in the ED department in an acute hospital to determine whether they were suitable for treatment -in the care home in which they reside. Recruitment was at care home level and with prior patient consent to participation in the scheme. 95 residents were recruited to the HNCH intervention and their outcomes were compared to patients (not from care homes) treated in the aged care unit within the same acute hospital in the preceding year prior to the setup of the HNCH (n=167). Baseline

characteristics were similar between the same groups with the exception of a greater proportion of dementia patients being present in the population recruited into resident care ($p<0.001$). The clinical diagnosis of participants deemed appropriate to the HNCH intervention were dehydration, pneumonia, urinary tract infection, gastroenteritis , deep venous thrombosis and terminal care support. The outcomes were palliative care, mortality, and index length of stay and readmissions at 6 months. There were significantly more patients receiving palliative care under the HNCH intervention compared with acute hospital care group (36% vs. 8%, $p<0.001$) and length of stay in treatment was also significantly less in the HNCH intervention (2 vs. 11 days $p<0.001$). Mortality and readmissions at 6 months were comparable between groups. There were no cost data.

5. What are the defining characteristics of those older patients for whom the decision to admit to hospital may be unclear?

Patient population details from the RCTs and nRCTs include in the systematic review suggested that the defining characteristics of older patients for whom the decision to admit to hospital may be unclear were likely to be : an age of greater than 75 years old, the presence of the chronic conditions heart failure, COPD or diabetes and the acute conditions dehydration, pulmonary embolism, stroke, syncope, deep venous thrombosis, gastroenteritis, uncomplicated diverticulitis, pneumonia, cellulitis, urinary tract infection, terminal care support or falls.

Current UK guidance

Most guidance is based on expert opinion and group consensus with some evidence from studies low in the evidence pyramid.

Acute ambulatory care sensitive conditions

There is current NICE guidance on admissions for stroke, dehydration and gastroenteritis, pyelonephritis, perforated bleeding/upper gastrointestinal bleeding, pelvic inflammatory disease, cellulitis, ears, nose and throat conditions and dental conditions. Other guidance was found on cellulitis (CREST), upper gastrointestinal haemorrhage (SIGN) and epilepsy (The College of Emergency Medicine). (Table 4)

NICE guidance recommends that all people with suspected stroke should be admitted directly to a specialist acute stroke unit following initial assessment, either from the community or from the A&E department. (NICE, 2008)

All guidance on these acute conditions gave detailed and/or very clear criteria on admission with the exception of the epilepsy guidance. Guidance was generally not tailored to older population although the guidance for dehydration and gastroenteritis, pyelonephritis, upper GI haemorrhage and cellulitis specifically mentioned older people in risk criteria.

Chronic ambulatory care sensitive conditions

There is current NICE guidance on admissions for complications with diabetes, COPD, angina, iron deficit anaemia and hypertension. Other guidance was found on asthma (BTS and SIGN), and diabetes complications (BDS). Guidance was sought from outside the UK for congestive heart failure and nutritional deficiencies as there was no NICE guidance. Guidance on congestive heart failure was found (ACC/AHA and Heart Failure Society of America). WHO guidance on nutritional deficiency did not include guidance on admissions. (Table 5)

All guidance gave very clear criteria on admission with the exception of nutritional deficiencies. Many of these chronic conditions are more prevalent in the older population, but only the diabetes guidance specifically mentions older patients in risk criteria.

Both data from the systematic review and the UK guidance suggest that the home or care/nursing situation, family or social support, an individual ability to cope and severity of dementia were also important considerations in terms of deciding to admit.

6. Conclusions

The findings of this report show that alternative care to hospital at the point of potential acute admission for the population over 65 years is broadly safe with comparable mortality and clinical outcomes for a range of acute and chronic conditions. However there are still many issues to consider in future research which include: the wide range of interventions delivered, the wide range of conditions to treat, cost data and cost-comparison with acute hospital admission, patient and family/carer acceptability, health professional acceptability, and resources and commissioning of services.

The majority of evidence is based on hospital at home services but within this evidence base there is a wide range of conditions treated. Hospital at home for a patient with an exacerbation of COPD is likely to much more intensive in resources and staffing and therefore more expensive than a patient treated at home with antibiotics for pneumonia who is checked on by phone and brief visits. The exception to the evidence of benefit of hospital at home is the treatment of stroke patients who fare much worse with hospital at home compared to a stroke unit. The authors of this study suggest that the differences are due to the expertise of the stroke unit as opposed to care from a generic hospital/home staff advised by specialised stroke health professionals. It is likely therefore that in line with current NHS practice for stroke best care needs to be provided in specialist units.

The majority of the studies in the review provide little or no cost data and make it difficult to compare these alternatives to acute hospital admission and care. Cost data from studies of hospital at home for heart failure and COPD patients provide the best evidence and suggest that initial resource savings with hospital at home compared to acute hospital admission evens out over the subsequent months of patient care.

This review did not include qualitative studies of either patient or health professional views of alternatives to acute hospital admissions. This is an important omission in the evidence and should

be the next step in this research. It is essential that that we know more about the acceptability and patients'/carers' experiences and expectations of care.

Whilst there is evidence that patients don't want to go into hospital and prefer to be at home, conversely there is evidence that patients and carers expect an admission to hospital if they are very ill or have a sudden deterioration in their health.

In terms of health professionals, making a decision to admit an older patient can be difficult. This is illustrated by the study populations and the clinical guidelines, which reflect professional experience and are influenced by broader factors such as living conditions and individual/family/carer coping. If alternatives to acute admission are available for health professionals to refer to they have be confident in these alternative pathways for their patients. (Walsh, 2015)

Finally, many of the interventions in this review, e.g. day hospitals and hospital in care/nursing homes, may be viable alternatives to acute care but may not exist in some healthcare communities or geographical regions. Commissioners of health and care services need to have the comprehensive evidence of effectiveness and cost effectiveness as well as the resources to commission. If alternatives to acute admission require a radical change in current care provision both structural and cost barriers need to be addressed.

7. References

Aujesky D, Roy PM, Verschuren F, *et al*. Outpatient versus inpatient treatment for patients with acute pulmonary embolism: an international, open-label, randomised, non-inferiority trial. *Lancet* 2011; 378:41-48. **STUDY**

Beer JH, Burger M, Gretener S, *et al.* Outpatient treatment of pulmonary embolism is feasible and safe in a substantial proportion of patients. *J Thromb Haemost* 2003; 1:186-187. **STUDY**

Bechich S, Sort Granja D, Arroyo Mateo X, *et al.* Effect of home hospitalization in the reduction of traditional hospitalization and frequency of emergencies in heart failure. *Rev Clin Esp* 2000; 200:310–4. **STUDY**

Benaiges D, Chillarón JJ, Carrera MJ *et al. Efficacy of treatment for hyperglycemic crisis in elderly diabetic patients* in a day hospital. *Clin Interv Aging* 2014; 9:843-9. **STUDY**

Bergkvist PI, Sjöbeck K. Antibiotic and prednisolone therapy of erysipelas: a randomized, double blind, placebo-controlled study. *Scand J Infect Dis* 1997; 29(4): 377–82. **STUDY**

Blunt I, Bardsley M, Dixon J. Trends in Emergency Admissions in England 2004–2009. Accessed at http://www.nuffieldtrust.org.uk/sites/files/nuffield/Trends_in_emergency_admissions_REPORT.pdf on the 21/12/15. **REPORT**

Carratalà J, Fernández-Sabé N, Ortega L *et al.* Outpatient care compared with hospitalization for community-acquired pneumonia: a randomized trial in low-risk patients. *Ann Intern Med* 2005; 142(3):165-72. **STUDY**

Caplan G, Ward J, Brennan N *et al.* Hospital in the home: a randomised controlled trial. *Med J Aust* 1999 Feb; 170(4):156–60. **STUDY**

Caplan G, Coconis J, Woods J. Effect of hospital in the home treatment on physical and cognitive function: a randomized controlled trial. *J Gerontol A Biol Sci Med Sci* 2005; 60(8):1035–8. **STUDY**

Caplan G, Coconis J, Board N *et al.* Does home treatment affect delirium? A randomised controlled trial of rehabilitation of elderly and care at home or usual treatment (The REACH-OUT trial). *Age Ageing* 2006; *35*(1): 53–60. **STUDY**

Caplan GA. A meta-analysis of "hospital in the home". *Med J Aust* 2013; 198(4):195-6. **REVIEW**

Chalmers JD, Akram AR, Hill AT. Increasing outpatient treatment of mild community-acquired pneumonia: systematic review and meta-analysis. *Eur Respir J* 2011; 37(4):858-64. **REVIEW**

Corwin P, Toop L, McGeoch G *et al.* Randomised controlled trial of intravenous antibiotic treatment for cellulitis at home compared with hospital. *BMJ* 2005; 330 (7483):129–34. **STUDY**

Cotton MM, Bucknall CE, Dagg KD *et al.* Early discharge for patients with exacerbations of chronic obstructive pulmonary disease: a randomized controlled trial. *Thorax* 2000; 55(11):902–6. **STUDY**

Crilly J, Chaboyer W, Wallis M *et al.* An outcomes evaluation of an Australian Hospital in the Nursing Home admission avoidance programme. *J Clin Nurs* 2011; 20(7-8):1178-87. **STUDY**

Davies L, Wilkinson M, Bonner S, Calverley PM, Angus RM. "Hospital at home" versus hospital care in patients with exacerbations of chronic obstructive pulmonary disease: prospective randomised controlled trial. *BMJ* 2000; 321(7271):1265–8. **STUDY**

de Zuazu HMR, de los Cobos JR, Basurto EA *et al.* Treatment of congestive heart failure in the setting of hospital at home. Study of 158 patients. *Med Clin* 2003; 120:405–7. **STUDY**

D'Souza S, Guptha S. Preventing admission of older people to hospital. *BMJ* 2013 May 20; 346: f3186 **BACKGROUND**

EPOC Effective Practice and Organisation of Care Cochrane Group. Risk of Bias criteria Accessed at http://epoc.cochrane.org/sites/epoc.cochrane.org/files/uploads/14%20Suggested%20risk%20of%20bias%20criteria%20for%20EPOC%20reviews%202015%2009%2002.pdf on 22/12/15. **METHODS**

Frick KD, Burton LC, Clark R *et al.* Substitutive Hospital at Home for older persons: effects on costs. *Am J Manag Care* 2009; 15(1):49-56. **STUDY**

Garåsen H, Windspoll R, Johnsen R. Intermediate care at a community hospital as an alternative to prolonged general hospital care for elderlypatients: a randomised controlled trial. *BMC Public Health* 2007 May 2; 7:68. **STUDY**

Garåsen H Magnussen J Windspoll R *et al.* Elderly patients in hospitals or nursing homes in intermediæravdeling - A cost analysis. *Tidsskr Nor Legeforen* 2008a; 128: 283-5 **STUDY EXTRA**-in Danish

Garåsen H, Windspoll R, Johnsen R. Long term patients' outcomes after intermediate care at a community hospital for elderly patients: 12-monthfollow-up of a randomized controlled trial. *Scand J Public Health* 2008b; 36(2):197-204.**STUDY EXTRA**

García-Soleto A, Parraza-Diez N, Aizpuru-Barandiaran F *et al.* Comparative study of quality of life after hospital-at-home or in-patient admission for acute decompensation of chronic heart failure. *World Journal of Cardiovascular Diseases* 2013: 3; 174-181. **STUDY**

Gray JT, Walker A. Avoiding admissions from the ambulance service: a review of elderly patients with falls and patients with breathing difficulties seen by emergency care practitioners in South Yorkshire. *Emerg Med J* 2008; 25(3):168-71. **STUDY**

Grayson ML, McDonald M, Gibson K *et al.* Once-daily intravenous cefazolin plus oral probenecid is equivalent to once-daily intravenous ceftriaxone plus oral placebo for the treatment of moderate-to-severe cellulitis in adults. *Clin Infect Dis* 2002; 34(11):1440–8. **STUDY**

Hammond CL, Pinnington LL, Phillips MF. A qualitative examination of inappropriate hospital admissions and lengths of stay. *BMC Health Serv Res* 2009; 9:44. **BACKGROUND**

Hepburn MJ, Dooley DP, Skidmore PJ *et al*. Comparison of short-course (5 days) and standard (10 days) treatment for uncomplicated cellulitis. *Ann Intern Med* 2004;164(15):1669–74. **STUDY**

HSCIC Health and Social Care Information Centre. ICD-10 classification Accessed at http://systems.hscic.gov.uk/data/clinicalcoding/codingstandards/icd10 on 22/12/15. **METHODS**

Hernandez C, Casas A, Escarrabill J *et al.* Home hospitalisation of exacerbated chronic obstructive pulmonary disease patients. *Eur Respir J* 2003; 21(1):58-67. **STUDY**

Huntley AL, Thomas R, Mann M *et al.* Is case management effective in reducing the risk of unplanned hospital admissions for older people? A systematic review and meta-analysis. *Fam Pract* 2013; 30(3):266-75. **BACKGROUND**

Jeppesen E, Brurberg KG, Vist GE *et al.* Hospital at home for acute exacerbations of chronic obstructive pulmonary disease. *Cochrane Database Syst Rev* 2012; 5:CD003573. **REVIEW**

Kalra L, Evans A, Perez I *et al.* A randomised controlled comparison of alternative strategies in stroke care. *Health Technol Assess* 2005; 9(18):iii-iv, 1-79. **STUDY**

Kovacs MJ, Anderson D, Morrow B, *et al.* Outpatient treatment ofpulmonary embolism with dalteparin. *Thromb Haemost* 2000;83: 209-211.

Lasschuit DA, Kuzmich D, Caplan GA. Treatment of cellulitis in Hospital in the Home: a systematic review. *OA Dermatology* 2014; 2(1):2. **REVIEW**

Lau L, Chong CP, Lim WK. Hospital treatment in residential care facilities is a viable alternative to hospital admission for selected patients. *Geriatr Gerontol Int* 2013; 13(2):378-83. **STUDY**

Leff B, Burton L, Mader SL *et al.* Hospital at home: feasibility and outcomes of a program to provide hospital-level care at home for acutely ill older patients. *Ann Intern Med* 2005; 143(11):798-808. **STUDY**

Leff B, Burton L, Mader SL *et al.*Comparison of functional outcomes associated with hospital at home care and traditional acute hospital care. *J Am Geriatr Soc* 2009; 57(2):273 -8. **STUDY EXTRA**

Mas MÀ, Santaeugènia S. Hospital-at-home in older patients: a scoping review on opportunities of developing comprehensive geriatric assessment based services. *Rev Esp Geriatr Gerontol* 2015; 50(1):26-34. **REVIEW** in Spanish

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 Nov 3; 335(7626):919. **STUDY**

Mason S, O'Keeffe C, Knowles E *et al. A pragmatic quasiexperimental multisite community intervention trial evaluating the impact of Emergency Care Practitioners in different UK health settings on patient pathways (NEECaP Trial). Emerg Med J* 2012; 29(1):47-53. **STUDY**

Mendoza H, Martín MJ, García A *et al*. Hospital at home care model as an effective alternative in the management of decompensated chronic heart failure. *Eur J Heart Fail* 2009; 11(12):1208-13. **STUDY**

Montalto M. Hospital in the nursing home. Treating acute hospital problems in nursing home residents using a Hospital in the Home model. *Aust Fam Physician* 2001; 30(10):1010-2. **BACKGROUND**.

NICE 2008 https://www.nice.org.uk/guidance/cg68/chapter/1-Guidance#specialist-care-for-people-with-acute-stroke **CLINICAL GUIDELINE**

NHS England, 2013. Bed availability and occupancy accessed at https://www.england.nhs.uk/statistics/statistical-work-areas/bed-availability-and-occupancy/on 22/12/15 **BACKGROUND**

NHS Interim Management and Support report 2014. Accessed at http://www.nhsimas.nhs.uk/fileadmin/Files/Corporate_docs/NHS_IMAS_Annual_Report_2014-15.pdf on 22/12/15 **BACKGROUND**

Nicholson C, Bowler S, Jackson C *et al.* Cost comparison of hospital- and home-based treatment models for acute chronic obstructive pulmonary disease. *Aust Health Rev* 2001; 24(4):181-7. **STUDY**

Nissen I, Jensen MS. Nurse-supported discharge of patients with exacerbation of chronic obstructive pulmonary disease. *Ugeskr Laeger* 2007; 169(23):2220-3. **STUDY** in Danish

Ojoo JC, Moon T, McGlone S, Martin K et *al.* Patients' and carers' preferences in two models of care for acute exacerbations of COPD: results of a randomised controlled trial. Thorax 2002; 57(2):167–9. **STUDY**

Patel H, Shafazand M, Ekman I *et al.* Home care as an option in worsening chronic heart failure-a pilot study to evaluate feasibility, quality adjusted life years and cost-effectiveness. Eur *J Heart Fail* 2008; 10(7):675-81. **STUDY**

Philp I. Community services. Reasons for redesigning care for older people. *Health Serv J* 2012; 122(6331):30-2. **BACKGROUND**

Qaddoura A, Yazdan-Ashoori P, Kabali C *et al.* Efficacy of Hospital at Home in Patients with Heart Failure: A Systematic Review and Meta-Analysis. *PLoS One* 2015; 10(6):e0129282. **REVIEW**

Ricauda Aimonino N, Tibaldi V, Leff B *et al.* Substitutive "hospital at home" versus inpatient care for elderly patients with exacerbations of chronic obstructive pulmonary disease: a prospective randomized, controlled trial. *J Am Geriatr Soc* 2008; 56(3):493-500. **STUDY**

Richards SH, Coast J, Gunnell DJ, *et al.* Randomised controlled trial comparing effectiveness and acceptability of an early discharge, hospital at home scheme with acute hospital care. *BMJ* 1998;316(7147):1796–801. **STUDY**

Rodríguez-Cerrillo M, Alvarez-Arcaya A, Fernández-Díaz E *et al.* A prospective study of the management of non-massive pulmonary embolism in the home. *Eur J Intern Med* 2009; 20(6):598-600. **STUDY**

Rodríguez-Cerrillo M, Poza-Montoro A, Fernandez-Diaz E *et al.* Treatment of elderly patients with uncomplicated diverticulitis, even with comorbidity, at home. *Eur J Intern Med* 2013; 24(5):430-2. **STUDY**

Roig E, Perez-Villa F, Cuppoletti A *et al*. Specialized care program for end-stage heart failure patients. Initial experience in a heart failure unit. *Rev Esp Cardiol 2006*; 59:109–16. **STUDY**

Salvi F, Morichi V, Grilli A *et al.*A geriatric emergency service for acutely ill elderly patients: pattern of use and comparison with a conventional emergency department in Italy. *J Am Geriatr Soc* 2008; 56(11):2131-8. **STUDY**

Shea BJ, Grimshaw JM, Wells GA *et al.* Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. *BMC Med Res Methodol* 2007; 7:10. **METHODS**

Shepperd S, Doll H, Angus RM, et al. Admission avoidance hospital at home. Cochrane Database Syst Rev. 2008 Oct 8 ;(4):CD007491. doi: 10.1002/14651858.CD007491. **REVIEW**

Siragusa S, Arcara C, Malato A, *et al.* Home therapy for deep vein thrombosis and pulmonary embolism in cancer patients. *Ann Oncol* 2005;16(suppl 4):iv136-139.

Skwarska E, Cohen G, Skwarski KM *et al.* Randomized controlled trial of supported discharge in patients with exacerbations of chronic obstructive pulmonary disease. *Thorax* 2000; 55(11): 907–12. **STUDY**

Sun BC, McCreath H, Liang LJ *et al.* Randomized clinical trial of an emergency department observation syncope protocol versus routine inpatient admission. *Ann Emerg Med* 2014; 64(2):167-75.**STUDY**

Shepperd S, Iliffe S. Hospital at home. *BMJ* 1996; 13; 312(7036):923-4. **BACKGROUND**

Tibaldi V, Isaia G, Scarafiotti C *et al.* Hospital at home for elderly patients with actue decompensation of chronic heart failure: a prospective randomized controlled trial. *Arch Intern Med* 2009; 169(17):1569-75. **STUDY**

Varney J, Weiland, TJ, Jelinek G. Efficacy of hospital in the home services providing care for patients admitted from emergency departments: an integrative review. *Internat J Evidence-Based Healthcare* 2014; 12(2): 128–141. **REVIEW**

Vicente V, Svensson L, Wireklint Sundström B *et al.* Randomized controlled trial of a prehospital decision system by emergency medical services to ensure optimal treatment for older adults in Sweden. *J Am Geriatr Soc* 2014; 62(7):1281-7. **STUDY**

Vinson DR, Zehtabchi S, Yealy DM. Can selected patients with newly diagnosed pulmonary embolism be safely treated without hospitalization? A systematic review. *Ann Emerg Med* 2012; 60(5):651-662. **REVIEW**

Walsh B, Lattimer V, Wintrup J *et al.* Professional perspectives on systemic barriers to admission avoidance: learning from a system dynamics study of older people's admission pathways. *Internat J Older People Nursing* 2015; 10(2):105-14.

Wells PS, Anderson DR, Rodger MA, *et al.* A randomized trial comparing 2 low-molecular-weight heparins for the outpatient treatment of deep vein thrombosis and pulmonary embolism. *Arch Intern Med* 2005; 165:733-738. **STUDY**

White AL, Armstrong PA, Thakore S. Impact of senior clinical review on patient disposition from the emergency department. *Emerg Med J* 2010: 296: 262-5. **BACKGROUND**

Wolter JM, Cagney RA, McCormack JG. A randomized trial of home vs hospital intravenous antibiotic therapy in adults with infectious diseases. J Infect. 2004;48(3):263–8. **STUDY**

Zondag W, Mos IC, Creemers-Schild D, *et al.* Outpatient treatment in patients with acute pulmonary embolism: the Hestia Study. *J Thromb Haemost* 2011; 9:1500-1507. **STUDY**

8. Tables

Table 1: Descriptions of studies not previously included in a systematic review

Study ID Year	**Study**	**Participants**	**ED or triage procedure**	**Intervention**	**Control**	**Outcomes assessed**	**Results**
Lau **[1171]** **2013** **Australia**	**Controlled (his) Case series** **Intervention** Treatment in residential care facilities (TRC) grp **n=95** **Control** Hospital-based aged care unit (ACU) **n=167** **Aim: '**To determine if hospital treatment in residential care facilities, led by a geriatric team, might be a viable alternative to inpatient admission for selected patients.' **Setting:** ***Control*** Tertiary hospital ***Intervention*** A total of 38 residential care facilities within hospital catchment area (30 min by car) ***Power calculation*** No	**Inclusion criteria:** Patient and/or family consent Capacity within HITH to accept the patient Facility able to manage the care needs of the patient in the residential aged care facility (RACF) **Exclusion criteria:** Lack of consent from patient and/or family. Behavioural disturbances, which may prevent the delivery of care e.g. aggressive behaviour and frequent removal of IV, access device. History of recent falls, which may impact on the delivery of care in the RACF. If there was conflict regarding management, further input and discussion were carried out in ACU. **Baseline characteristics of participants** TRC vs. ACU **Age** 83.5 vs.82.8yrs **Female** 53 vs.59% **Non-English speaking** 42 vs.48% **High level of nursing homecare** 72 vs.76% **Dementia 77.9vs.45.5% p<0.001** **Charlson score** 7.1 SD 1.9 vs. 7.2 SD 2.3	In the ED the acuity of presenting complaint was triaged to maximize service capacity. Overnight referrals were assessed next morning, (those who presented after hours were put in Short Stay Unit adjacent to ED for assessment. TRC generally provided once daily visits for patient. The geriatrician & team members would use clinical judgement to determine if a patient was suitable for TRC.	**Outline of intervention** Treatment in Residential Care facilities (TRC) delivered by the Residential Care Intervention Program into the Elderly (RECIPE) service between July-Oct 2008. **Appropriate Clinical Diagnosis** Dehydration, Pneumonia, Urinary Tract Infection, Gastroenteritis, Deep Venous Thrombosis, Terminal care support. **Treatment can therefore include any of the following:** IV antibiotics & IV fluids Anticoagulation Oxygen therapy (low flow) Appropriate Allied Health intervention Palliative support* Referral to other appropriate support programs * [TRC also offered palliative care as appropriate. If patient's condition changed and management could not be continued, transfer into acute hospital was organized. If patients had uncertain prognosis, treatment was given, followed by palliative care if no response despite optimal treatment.] **Intervention delivered by:** Geriatrician, registrar and nursing staff with access to allied health staff such as physiotherapy, OT, speech pathology and social work.	**Outline of control** Aged care unit (ACU) Inpatients treated in ACU in preceding year July-October 2007, before existence of TRC. ACU is a service for inpatients who have been admitted from residential care facilities for the management of general medical conditions. **Intervention delivered by:** No details but presumably usual hospital staff	**Relevant measures & outcomes** ***Palliative care*** ***Mortality on discharge*** ***6-month mortality*** ***Rehospitalisation within 1-month*** ***Total hospitalisation at 6 months*** **Length of hospital care/stay** All measured as 'present or not' **Costs** None	TRC vs. ACU ***Palliative care*** **34 (35.8%) 13 (7.8%) <0.001** ***Mortality on discharge*** 11 (11.6%) 20 (12.0%) p=0.924 ***6-month mortality*** 29 (30.5%) 51 (30.5%) p=0.184 ***Re-hospitalization within 1 month*** 20 (21.1%) 35 (21.0%) p=0.986 ***Total re-hospitalization at 6 months*** 39 (41.1%) 68 (40.7%) p=0.963 ***Length of stay*** **Mean (no SD given) 2vs.11 days** **P<0.001** Equivalent of 270 vs. 1840 bed days **Overall summary (authors)** **'**Hospital treatment in residential care is viable for most patients, including those with dementia and those who need palliative care . This model of care offers a valuable geriatric service to residents who would prefer to avoid hospital with no difference in mortality or rehospitalisation rates for those treated in residential care, but a significant reduction in length of care.

Study ID Year	**Study**	**Participants**	**ED or triage procedure**	**Intervention**	**Control**	**Outcomes assessed**	**Results**
Crilly [1607] **2010** **Australia**	**'quasi experimental'** **[Controlled (his) study]** **Intervention:** Hospital in the nursing home (HINH) n=62 **Control:** Usual in-hospital care n=115 **Aim:** 'To undertake an outcomes evaluation of a Hospital in the Nursing Home (HINH) admission avoidance programme.' **Setting:** ***Intervention*** Outreach service operated from regional hospital for residents of aged care facilities (ACF ***Control*** Regional hospital ***Power calculation*** The sample size is sufficient to detect 20% difference in risk of having a hospital stay of >six days, with a power of 0.80 and alpha of 0.05, assuming a risk of 40% in comparison group.	**Inclusion criteria:** Reside in an ACF. Have a signed GP request for HINH review from the ACF. Be of any age (usually≥ 65 yrs). Present with an illness that required hospital services but not necessarily admission e.g. UTI & could have treatment e.g. antibiotics continued by ACF staff. Prior to start of HINH, patients who would have fit inclusion criteria for hospital admission **Exclusion criteria:** ACF residents who required extensive treatment that could not be managed in ACF or who required specific services that could only be received in hospital e.g. surgery **Baseline characteristics of participants** **HINH vs. Control** Age (SD) 85(7.1) vs.84.6(6.6)years Triage category 3.2 (0.7) vs.3.2(0.7) Female 76vs. 75% Diagnostic category: Respiratory 24 vs.26% Cellulitis 18 vs.17% Kidney/urinary tract 18vs.16% Cardiac 10 vs. 10 % Abdominal/GI 8vs.8% Viral/sepsis 7 vs.6% All other 16 vs.17%	In the ED. Enrolments were made by HINH programme manager (registered nurse) with programme director (ED director), GPs and ACF nursing staff, as appropriate. After hours and on weekends, if patient was suitable for HINH , they stayed in ED short stay unit and were reviewed by HINH nurse on next weekday.	**Outline of intervention** The HINH nurse checks with the ACF registered nurse and patient on the patients' progress initially on a daily basis and then every couple of days. Discharge occurs when required treatment has ceased. This completes the patients' hospital-affiliated episode. **Intervention delivered by:** HINH programme delivers acute care nursing support services, medication and equipment to the ACF registered nurse and/or enrolled nurse. These services may include initial training and education regarding antibiotic or IV fluid administration; specific wound treatment and dressing procedure (with dressing materials); suprapubic catheter care, behaviour management and palliative care.	**Outline of control** The comparison group was selected from patients who presented to ED and were subsequently admitted during the same time period. To be included in this group, the patients had to reside in an ACF and be aged ≥65yrs. ACF residents who presented to the ED were in some cases not enrolled in HINH because they had a medical problem that was judged as possibly requiring in-hospital admission services beyond those offered by the HINH. **Intervention delivered by:** No details but presumably usual hospital staff	**Relevant measures & outcomes** ***Hospital LOS (days)*** ***ED LOS (hours)*** ***Episode of care (total time) LOS (days)*** ***Long (≥6days) vs. short hospital LOS*** ***Long (≥8 days) ED LOS vs. short*** ***Long episode of care (≥6 days)*** ***Hospital readmissions within 28 days*** ***Costs*** None	HINH vs. Control Mean (SD) ***Hospital LOS*** **2.19 (0.82) vs.6.2(0.59) days p<0.001** ***ED LOS*** **9.94(0.66) vs. 7.01(0.47) hrs p=0.005** ***Episode of Care LOS*** 9.56(1.26)vs. 6.20(0.59) days p=0.14 Percentages ***Hospital LOS 6+days*** **9.6 vs. 40 p<0.001** Episode of care 6+days 46.8 vs.40.0 p=0.35 ***LOS in ED 8+ hours*** **50.0vs.33.9 p=0.05** ***Readmission in 28 days*** 11.3 vs. 11.3 p=0.99 **Overall summary (authors)** **'**A significant independent relationship between HINH programme enrolment and shorter in-hospital LOS was identified The HINH model can impact on health service delivery.'

Study ID Year	**Study**	**Participants**	**ED or triage procedure**	**Intervention**	**Control**	**Outcomes assessed**	**Results**
Garåsen **[0273]** **[0464]** **[1942]** **2007/8** **Norway**	**RCT** **Intervention:** Community hospital (CH) n=72 assigned but 8 went on to GH **Control:** General hospital (GH)admission n=70 **Aim:** 'to study the efficacy of intermediate care at a community hospital compared to standard prolonged care at a general hospital' **Setting:** ***Intervention*** 20 beds at SØbstad nursing home set up as a community hospital performing intermediate care ***Control*** City general hospital in Trondheim ***Power calculation*** Sample size was estimated to detect a difference of 25% in no. of readmissions for same disease, as assessment of morbidity, between the groups with alpha 0.05 and power of 0.80. To achieve this 65 patients were needed per group	**Inclusion criteria:** Patients aged ≥60 years admitted to general hospital due to acute illness or acute exacerbation of known chronic disease Probably in need of in ward care for ≥ 3-4 days Admitted from own homes and expected to return home when care finished. **Exclusion criteria** Severe dementia or a psychiatric disorders needing specialised care 24 hours a day. **Baseline characteristics of participants** **(No stats given)** [including data from n=8 who were assigned CH then went to GH] CH vs.GH **Age** 80.6 (0.8)vs. 81.3(0.8)yrs **Female** 72 vs.61% **Living with spouse** 16 vs. 15 **ADL (SD)** 2.24(0.9) vs. 2.05 (0.7) **Primary diagnosis** **Cardio dis** 31 vs.29% **Infect** 18vs. 23% **Fractures/contusions** 19vs. 17% **Pulmonary disease** 7vs.9% **Neurological** 7 vs.6% **Cancer** 3 vs 6% **Psychiatric** 1vs.0% **Other** 14 vs 11%	Assume from the inclusion criteria that all patients came to the general hospital initially then ' When an eligible patient was identified and accepted for inclusion, a blinded randomisation was performed by the Clinical Research Department at the Faculty of Medicine.' All patients randomised for care at the community hospital were transferred from the general hospital within 24 hours after the time of inclusion to the study and immediately after the time of randomisation.	**Outline of intervention** On admission to CH the physicians performed a medical examination of the patients and a careful evaluation of available earlier health records from the **admitting general practitioner, the general hospital physicians and the community home care services**. The communication with each patient and his family focusing on physical and mental challenges was also essential to understand the needs and level of care. **Intervention delivered by:** Physicians initially and then most likely nursing staff .	**Outline of control** The care at different departments at GH and communication with primary health care followed the standard routines through the formal organisation. **Intervention delivered by:** Not stated. Assume ER staff then usual hospital staff	**Relevant measures & outcomes** Follow up at 26 weeks & 12 months ***No. of readmission for index disease*** ***Need for community home care*** ***Need for long term nursing home*** ***No. of days in institutions after randomisation [intervention +rehab +readmissions] data is available for separate services*** ***No. of deaths*** ***No. of days before death*** ***No care*** 12 month data in [0273] **Costs** None	CH vs. GH No. (%) At 26 weeks ***No. of readmission for index disease*** **14(19%) vs. 25 (36%) p=0.02** ***Need for community home care*** 38(53%) vs. 44(63%) p=0.37 ***Need for long term nursing home*** 7(10%) vs. 5(7%) p= 0.76 ***No. days in institutions*** 31(95% CI 26.1,34.7) vs.29.8 (95% CI 23.2,36.4) p=0.80 ***No. of deaths*** 9(12.5%) vs14(20%) p=0.15 **No. days before death** 165 (95% CI 154-176) vs. 156 (95% CI 144,165) **No care** **18(25%) vs. 7(10%) p=0.01** 12 month data **No. of deaths** **13(18.1%) vs. 22 (31.4%) p=0.03** **Total observation period** **335.7(95% CI 312.0,359.4) vs. 292.8(95%CI 264.1,321.5) days p=0.01** **Overall summary** Intermediate care signif. reduced HF readmissions, & increased no. of patients were independent of community care after 26wks, without any increase in mortality & no. of days in institutions. At 12 months, significantly fewer patients had died in intervention grp.

Study ID Year	**Study**	**Participants**	**ED or triage procedure**	**Intervention**	**Control**	**Outcomes assessed**	**Results**
Vicente **[1927]** **2014** **Sweden**	**RCT** **Intervention:** Going to a community-based hospital n=410 **Control:** Going to ED n=396 **Aim:** **'**To evaluate the feasibility and appropriateness of a prehospital system allowing ambulance nurses to transport older adults directly to geriatric care at a community-based hospital (CH) or to an ED.' **Setting:** Suburban area of Stockholm studied had population of 126,000, 14% were aged ≥65 yrs ***Intervention*** Geriatric ward (GW) or, a Community Emergency care centre (CECC) at a community-based hospital (CH). ***Control*** An ED at a tertiary hospital. ***Power calculation****:* With 600 study participants an observed proportion of 20% would yield a 95% CI of 15-25%, which was deemed narrow enough to match objective. Assuming a 25% exclusion rate, 100 in each group, 800 participants needed to be included.	**Inclusion criteria:** No specific information **Exclusion criteria:** No specific information older adults were randomized when they called the emergency number **Baseline characteristics of participants** Intervention vs. control **Mean age (SD)** 81 (8) vs. 81(8) yrs **% Female** 56 vs. 59% **Priority level when ambulance sent out (% individuals)** **1. 1.6 vs. 0%** **2. 59 vs. 47 %** **3. 39 vs.53%** **P=0.001** **Priority level when ambulance arrives at hospital (% individuals)** 1. 7.2 vs.3.6% 2. 39 vs.35% 3.54 vs.61%	Not applicable	**Outline of intervention** The study was conducted over 14 months from Oct 2008 to Dec 2009. Two EMS companies were included in the study. Ambulance personnel at Company 1 had training in and access to the system and tool and could triage eligible individuals to a GW or, a CECC at a CH. By following system and tool & after assessment of the individual's medical situation and care needs, the ambulance nurse was able to decide whether the individual required full ED services or would benefit more from being transported to an assessment at the CH instead. **Delivered by:** The ambulance nurse education are required to have a course of 60 credits includes ≥ 30 credits in Caring Science. The criterion for entering this program is a BSc Caring Science and Nursing. Since 2007, a 1-year Master's Degree & postgraduate Diploma in Specialist Nursing, Prehospital Emergency Care Program has been available.	**Outline of control** Ambulance personnel at Company 2 had no training in the system and tool, and transported all individuals to a full-service ED at a tertiary hospital **Delivered by:** unknown	**Relevant measures & outcomes** Primary outcome: ***No. of individuals sent direct to CH for either to GW or CECC*** *Secondary outcome:* ***No. of subsequent transfers from CH to ED within 24 hrs*** Calculated as Intention to treat (ITT) and per protocol (pp) analysis **Costs** None	Intervention vs. control ***No. of individuals sent direct to CH for either to GW or CECC*** ITT 90/449 20% (16.6,24) PP 56/273 20.5% (16.1,25.7) ***No. of subsequent transfers from CH to ED within 24 hrs*** ITT 6/90 6.7% (3.1,13.8) PP 4/56 7.1 (2.8,17.0) **Overall summary** 'Ambulance nurses are able to send older adults to an alternative healthcare facility with the help of a prehospital decision support system. In this geographical setting, this appears to be a promising method to optimize resources and improve emergency care of elderly adults.'

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Salvi **[0197]** **2008** **Italy**	**Controlled cohort (secondary analysis)** **Intervention:** Geriatric ED (GED) n=100 **Control:** Conventional ED (CED) n=100 **Aim:** Not really an aim given 'Here patient characteristics and 6-month mortality, ED return, hospitalization, and functional decline are described in a sample of geriatric patients from two Italian EDs to determine the non-inferiority of a GED compared with a CED.' **Setting:** ***Intervention*** GED was a hybridized ED with a six bed observation unit (OU) designed for elderly non-trauma patients and staffed by geriatricians within the 214-bed academic affiliated INRCA hospital. ***Control*** The CED was part of a 633-bed tertiary-care academic hospital (Azienda Ospedali Riuniti) ***Power calculation****:* No	**Inclusion criteria:** Patients aged ≥ 65yrs were enrolled in June 2006 from the GED and July 2006 from the CED taking care that none presenting to the ED in the course of the study period was recruited again. **Exclusion criteria** Cognitive impairment (a score of ≥5 on the Short Portable Mental Status Questionnaire SPMSQ) and no proxy, Those too ill to respond, Trauma patients **Baseline characteristics of participants** CED vs GED Mean(SD) **Age 78.1(7) vs.82.5(7.20 p<0.001** **Female 47 vs. 68% p<0.001** **Married 70 vs. 40% p<0.001** Living alone 12 vs 14 **Triage code** Urgent/semi-urgent (2/3) 97 vs.90 % Charlson Index 3.3(2.3) vs. 3.4(1.7) **SPMSQ** **2.5(3.3) vs. 5.2(4.2) p<0.001** **ADL4.3(2) vs. 3.2(2.5)** **P=0.001** No differences in profile of diagnosis in ED between groups	See details on CED. No details of GED.	**Outline of intervention** No details beyond ED plus observation unit of 6 beds **Intervention delivered by:** No details	**Outline of control** Patients presenting to ED were screened Mon-Fri 9am- 6pm using standard information sheet. Interviews conducted with patients or family member/other for patients with cognitive impairment. Written consent & access to medical records was obtained. patients a underwent a brief geriatric assessment using the Charlson Index, SPMSQ, and ADL before the current event **Intervention delivered by:** Trained research assistant. Others? GED managed by geriatric staff with several years clinical experience	**Relevant measures & outcomes** ***Mean duration (SD)*** ***No. of initial admissions*** ***LOS in hospital days*** ***Both of above presented as baseline data*** ***No. ED visits at 30 days and 6 mths*** ***Frequent ED return (≥3 visits over 6 mths)*** ***No. hospital admissions at 6mths*** ***ADL at 6mths (defined as functional decline*** ***Mortality at 30 days & 6 mths*** **Costs** None	CED vs. GED ***Mean duration (SD)*** **6.2(4.5) hrs vs. 12.8 (8.5) hrs** **P<0.001** ***No. of initial admissions*** 53 vs.63 p=0.2 ***LOS in days*** 10(6.65) vs. 10.5(7.2) p=0.74 ***No. ED visits*** 30 days 25 vs. 23 visits p=0.88 6months 51 vs. 42 p=0.25 ***Frequent ED return (≥3 visits over 6 mths)*** 11 vs.13 visits p=0.84 ***No. hospital admissions at 6mths*** 36 vs.29 p=0.2 ***ADL*** 20 vs. 20 p=0.34 ***Mortality*** **30 days 8 vs. 5 deaths** **6months 20 vs. 19** Statistically significant at 6mths after adjustment for age, sex, living status, admission at time of recruitment Charlson index, SPMSQ and ADL **p=0.047** **Overall summary** **'**The data suggest non-inferiority and, indirectly, a slight superiority for the GED system in the acute care of elderly people, supporting the hypothesis that ED facilities specially designed for older adults may provide better care.

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Sun **[0924]** **2014** **USA**	**RCT** **Intervention:** ED observation syncope protocol n=62 **Control:** Normal In-patient admission n=62 **Aim:** 'Can patients with syncope be more efficiently managed in an emergency department observation unit under protocol?' **Setting:** '5 EDs from March 1, 2010, to October 1, 2011 (ClinicalTrials.gov identifier NCT01003262).' ***Power calculation****:* Sample size was designed to achieve 80% power to detect 22% reduction in inpatient admission rate in the observation group.	**Inclusion criteria:** Patients aged≥ 50 years or older diagnosed with intermediate syncope. **Exclusion criteria** Patients with a serious condition: symptomatic arrhythmias, myocardial infarction, pulmonary embolism, acute pulmonary edema, stroke, severe anaemia or blood loss requiring blood transfusion, sepsis, and major traumatic injury. Also: seizure, head trauma, or intoxication as reason for loss of consciousness; new/ baseline cognitive impairment; do-not-resuscitate or do-not-intubate status; active chemotherapy and inability to speak either English/Spanish. Met high risk criteria. **Baseline characteristics of participants** Observation vs. control Mean(SD) or% **Mean age** 65 (11) vs. 64(11) **% Female** 53 vs. 48 **Syncope index complaint (vs near syncope)** 74vs. 61% **Congestive heart failure** 2vs. 3% **Coronary artery disease** 13vs.8% **Arrhythmia** 8vs.6% **Syncope in previous yr** 16vs.21% **Quality of well-being scale** 0.55(0.15) vs. 0.55(0.14) **Syncope functional status** 29((25) vs.25(26) **Syncope risk score** 0.76 (0.840 vs.0.76 (0.67)	Criteria used in ED **High Risk Criteria** • Serious condition identified in the ED • History of ventricular arrhythmia • Cardiac device with dysfunction • Exertional syncope • Presentation concerning for acute coronary syndrome • Severe cardiac valve disease (e.g., aortic stenosis <1 cm2) • Known cardiac ejection faction <40% • Electrocardiogram findings of QTc>500 mS, pre-excitation, non-sustained ventricular tachycardia • Emergency physician judgment **Intermediate Risk Criteria** • No high risk features **AND** • No low risk features **AND** • Clinical judgment by emergency physician that patient requires further diagnostic evaluation **Low Risk** • Symptoms consistent with orthostatic or vasovagal syncope • Emergency physician judgment that no further diagnostic evaluation is needed	**Outline of intervention** Patients received continuous cardiac monitoring ≥ 12hrs. ≤2 serial cardiac troponin tests approx. 6 hours apart to exclude acute MI. A rest echocardiogram for patients with cardiac murmur, if not been performed in previous 6mths. Additional testing performed as required. Maximum stay in observation unit could not be more than 24hrs. Observation protocol patients who received a diagnosis detailed in exclusion list or had pending tests at 24hrs were admitted All other patients were eligible for discharge. **Intervention delivered by;** 'The ED treating team'	**Outline of control** The syncope protocol was not used. Contamination between groups was minimized by being managed in distinct physical spaces by different clinical services. **Intervention delivered by:** No detail	**Relevant measures & outcomes** Primary outcomes ***Inpatient admission rates*** ***Hospital LOS at indexed visit*** Secondary outcomes ***30 day and 6mth serious events*** ***Index and 30 day hospital costs*** ***30 days changes in QoL*** ***30 day patient satisfaction***	***Observation vs. s care*** ***Inpatient admission rates*** **9 (15%) vs. 57 (92%)** **Relative rate 0.16 (95%CI 0.09,0.29, p<0.001)** ***Hospital LOS at indexed visit*** **mean SD (hrs) 29 (15) vs. 47hrs (34) (p<0.001)** ***Serious events*** ***During hospital visit*** Death 0 vs. 0 Arrhythmia 2 vs. 2 Pacemaker insertion 1vs.1 Syncope with bone fracture 2 vs.1 30 days recurrent syncope 1 vs 1 30 day serious outcomes after discharge 2 vs. 0 6mth serious outcomes after hospital discharge 4 vs.5 ***Costs $ (SD)*** At index visit 1,400(1,220) vs.2,420(3,930) Within 30 days 1,800(2,150) vs.2,520(3,980) ***Change in quality of life*** mean SD 0 (0.2) vs. 0.03 (0.18) ***Change in syncope functional status*** -7.6(20.1) vs.-2.4(26.3) ***Patient satisfaction*** 8.9(1.40 vs.9.3(0.9) **Overall summary** 'An ED observation syncope protocol reduced admission rate & hospital LOS plus reduction in index costs, with no difference in safety events, QoL, or patient satisfaction.'

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Mason **[0387]** **2007** **UK**	**Cluster RCT by service** **56 clusters** **Intervention:** paramedic practitioner service n=1469 **Control:** Inactive paramedic practitioner service n=1549 **Aim:** **'**To evaluate the benefits of paramedic practitioners assessing and, when possible, treating older people in the community after minor injury or illness.' **Setting:** A large urban area in England ***Power calculation****:* 1100 patients needed in each group to have 80% chance of detecting as significant at the 5% level a 5% change in the proportion of "very satisfied" patients.	**Inclusion criteria:** Patients aged ≥60yrs recruited from 1 Sep 2003- 26 Sep 2004. Call originated from a Sheffield postcode between 8am-8pm, with a presenting complaint that fell within the scope of practice of the paramedic practitioners. **Exclusion criteria:** **None given in fact** 'If patients were unable to complete questionnaires e.g. because of cognitive impairment or who were unable to read English—we obtained consent for follow-up by review of clinical records only. **Baseline characteristics of participants** Intervention vs. control **Mean age (SD)** 82.6(8.3) vs. 82.5(8.3) yrs **Women %** 72 vs.73% **Living in on own home %** 78vs.78 % **Presenting complaint %** Fall 88 vs.89% Haemorrhage 6 vs.5% Acute medical condition 6vs.5%	Scope of practice of paramedic practitioners Presenting complaint _ Falls _ Lacerations _ Epistaxis _ Minor burns _ Foreign body in ear, nose, or throat Practical skills _ Local anaesthetic techniques _ Wound care and suturing techniques _ Principles of dressings and splintage Special skills _ Joint examination _ Examination of neurological, cardiovascular, and respiratory system _ Examination of ear, nose, and throat _ Protocol led dispensing: simple analgesia, antibiotics, tetanus toxoid _ Assessment of mobility and social needs Additional options for referral and requesting investigations _ Requests for radiography _ Referral processes: emergency department, general practitioner, district nurse, community social services	**Outline of intervention** A paramedic practitioner based in the ambulance control room identified eligible calls by the presenting complaint and notified a paramedic practitioner in the community during intervention weeks. All identified patients were approached face to face either in the community or in the ED for written consent to follow-up. Patients who had more than one eligible episode were recruited only for their first episode. The research team independently checked the ambulance service call database at the end of each month for any additional eligible calls not identified These were checked for selection bias but not followed up. **Intervention delivered by:** paramedic practitioners	**Outline of control** A paramedic practitioner based in the ambulance control room identified eligible calls by the presenting complaint and notified a paramedic practitioner in the ED Procedure continued as for intervention **Intervention delivered by:** paramedic practitioners	**Relevant measures & outcomes** Primary outcomes ***ED attendance*** ***Hospital admissions within 28 days*** ***Time of call to time of discharge*** ***Patient satisfaction survey including the EQ-5D*** Secondary outcomes (only listed relevant ones) ***Subsequent unplanned contact with secondary care*** ***Mortality at 28 days***	Intervention vs. control Primary outcomes ***ED attendance (28 days)*** **970 (62.6%) vs. 1286 (87.5%) p<0.001** ***Hospital admissions (28 days)*** **626 (40.4%) vs. 683 (46.5%) p<0.001** ***Mean Time of call (SD) to time of discharge in mins*** **235.1(183.3) vs. 277.8(182.6) p<0.001** ***Patient satisfaction survey including the EQ-5D*** **Very satisfied with care 656 (85.5%)vs.528 (73.8%) p<0.001** Secondary outcomes ***Subsequent unplanned contact with secondary care*** **330(21.3%) vs. 259 (17.6%) p<0.01** ***Mortality at 28days*** 68(4.4%) vs.74(5%) p=0.41 **Overall summary** 'Paramedics with extended skills can provide a clinically effective alternative to standard ambulance transfer and treatment in an ED for elderly patients with acute minor conditions.'

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Gray **[2704]** **2008** **UK**	**Case series with historical controls** **Intervention:** Emergency care practitioner **(ECP)** intervention n=233 **Control:** Historical control group from ED n=772 **Aim:** **'**To determine the true impact of emergency care practitioners on admissions relative to ED attendance.' **Setting:** ***Intervention*** Yorkshire Ambulance Service ***Control*** Sheffield Teaching Hospitals NHS Foundation Trust- the primary receiving unit for emergency admissions across two sites (Northern General Hospital and Royal Hallamshire Hospital) and has the only adult ED in Sheffield. ***Power calculation****:* No	The study included two groups of patients a) those with breathing difficulties & b) elderly patients >65yrs with a fall. The latter only is reported here. **Inclusion criteria:** Elderly patients >65yrs with a fall. **Exclusion criteria:** None given **Baseline characteristics of participants** None given	Not applicable	**Outline of intervention** Jan-April 2006 inclusive, all the patients seen by the ECP service who had rung 999 and were an elderly patient (>65yrs) with a fall were reviewed. Each patient seen by an ECP was searched for in the hospital records for ED attendance or admissions in 72 h and 28 days following attendance by an ECP **Intervention delivered by:** Emergency care practitioner	**Outline of control** Comparison data taken Jan- April 2005 inclusive for attendances to same ED for patients with the same criteria as above & seen by non-ECP ambulance service personnel. These dates were chosen because, during this time, the ECP service was not tasked to patients with breathing difficulties and Yorkshire Ambulance Service had only 12 operational ECPs during this comparison period compared with 24 whole-time equivalent operational ECPs during the study period **Intervention delivered by:** ED staff	**Relevant measures & outcomes** Outcome on initial contact: ***Treated at and stayed home*** ***ED and or admitted*** At 72hrs & 28 days ***At home*** ***ED attendance*** ***Admission*** **Costs** None	**ECP vs. ED** Outcome on initial contact: ***Stayed at home (PC referral)/went home*** 171 vs. 369 (73% vs. 48% avoidable admission rate) **At 72hr:** 21/171 (intervention grp) attended ED and or were admitted **At 28 days:** A further 19 (intervention grp) attended ED and or were admitted Avoidable admission rate (intervention grp) at 28 days was 56% (17% better) compared to control group p<0.05 **Overall summary** **'**ECPs help to prevent attendances and admissions by delivery of clinical care and assessment at point of access to health care beyond that traditionally provided by UK ambulance services. This study was limited in scope owing to the difficulties in ensuring an accurate comparison group.'

Study ID Year	**Study**	**Participants**	**ED or triage procedure**	**Intervention**	**Control**	**Outcomes assessed**	**Results**
Mason [Extra] **2012** **UK**	**Controlled study** **Intervention:** Five teams of Emergency Care Practitioners (ECP) n= 256 for care home cohort **Control:** Five usual care providers n=201 for care home cohort **Aim:** **'**The aim of this study was to evaluate the impact of ECPs on patient pathways and care in different emergency care settings.' **Setting:** Ambulance, **care home**, minor injury unit, urgent care centre and GP out of hours. All NHS trusts employing ECPs in England & Scotland were invited. 'intervention' trust sites were selected based on heterogeneity of ECP service 'Control' trust sites that did not employ ECPs, but were in close geographical proximity and which offered same service configurations as the intervention trusts, were selected. **Only the care home data was relevant to us** ***Power calculation****:* recruitment target of n=600 in each group in each of participating pairs of trust sites. Within each site, this gave 90% power at a α0.01 to detect effect sizes of 0.3SD and adjusting for case-mix differences in potential confounders such as age and sex.	**Inclusion criteria:** Informed consent was obtained from all study participants prior to recruitment. Within each pair of services all patients presenting with emergency or urgent complaints that were eligible to be seen by ECPs and presented to either the intervention or the control services between May 2006 and August 2007 were included in the trial. **Exclusion criteria:** No detail **Baseline characteristics of participants** (no stats given) Care home cohort Intervention vs. control **Mean age** 83.5(10.40 vs. 84.5(8.5) yrs **% Female** 68 vs.66% **Clinical complaint %** Adult medical 30 vs.41 % Adult trauma 46 vs.13 % Elderly falls 23vs.46%	Not applicable	**Outline of intervention** **Intervention delivered by:** **Duration:** No detail	**Outline of control** **Intervention Delivered by:** **Duration:** No detail	**Relevant measures & outcomes** Using paired services Primary outcomes ***% of patients Discharged following consultation with no further follow up by any health professional*** ***Urgently referred to hospital (both ED or direct admission)*** ***Non-urgently referred to GP or community care*** Secondary outcomes (relevant ones only) ***Episode time from first contact to discharge***	***Discharged with no further follow up by any health professional*** 49.2 vs.12.4% MD 36.8% (95% CI 26.7,46.8) ***Urgently referred to hospital (both ED or direct admission)*** 22.7 vs. 87.6% MD -64.9% (95% CI -71.8 ,.-58.0) ***Non-urgently referred to GP or community care*** 28.1vs. 0% 28.1% (22.6,33.7) ***Episode time from first contact to discharge median in mins (IQR)*** 60 (40,80) vs. 39 (29,58) Time ratio 1.36 (1.24,1.49) **Overall summary** 'A significantly greater % of patients were discharged by ECPs working in care home service (36.8%, 26.7% to 46.8%)…..'

Study ID Year	**Study**	**Participants**	**ED or triage procedure**	**Intervention**	**Control**	**Outcomes assessed**	**Results**
Leff **[3066]** **2005** **USA** **Plus** Leff 2009 [2545] Frick 2009 [0158]	**Prospective quasi experimental** 2 consecutive 11 month phases **Intervention:** Treatment in a hospital-at-home model of care that substitutes for treatment in an acute care hospital. Offered In the 2nd phase of study n=169 **Control:** Described as 'observation group' in the first phase of study. Eligible patients were identified and followed through usual hospital care. n=286 **Aim:** 'to evaluate the safety, efficacy, clinical and functional outcomes, patient and caregiver satisfaction, and costs of providing acute hospital level care in a hospital at home that substituted entirely for admission to an acute care hospital for older persons.' **Setting:** **Intervention** (if received): At home **Control** **Secondary hospital care** ***Power calculation****:* No	**Inclusion criteria:** Community-dwelling persons ≥65 yrs old, Lived in catchment area In the opinion of a physician not involved in study, required admission to an acute care hospital for these illnesses: community-acquired pneumonia, exacerbation of chronic heart failure or chronic obstructive pulmonary disease, or cellulitis. Required to meet validated criteria of medical eligibility for hospital-at-home care. **Exclusion criteria** Most common reasons for medical ineligibility were uncorrectable hypoxemia, suspected myocardial ischemia, and presence of an acute illness, other than the target illness, for which the patient was required to be hospitalized. **Baseline characteristics of participants at all sites (Stats shown if signif)** Observation vs. intervention Age (SD) 77.3 (6.6) vs.77.2(7.0) % female 34 vs. 42% % white 90 vs.86% **% in poverty 11 vs.19% p=0.027** **% live alone 43 vs.33% p=0.022** Mean mini mental state (SD)25.5 (4.2) vs. 25.2(4.4) Mean Charlson score (SD) 3.1 (2.0) vs.3.0 (1.8) **Mean medications (SD) 6.8 (3.9) vs. 8.1(4.5) p=0.002** %Primary admission diagnosis Pneumonia 31vs. 32% COPD 32 vs.28% Cellulitis 12 vs 18% CHF 25vs.22%	The study was conducted in 3 Medicare managed care (Medicare +Choice) plans at 2 sites and at a Veterans Administration medical centre. Univera Health and Independent Health, in Buffalo, New York, are Medicare + Choice plans These 2 plans collaborated to provide hospital- at-home care and made up 1 study site (site 1). The Fallon Health Care System (site 2), in Worcester, Massachusetts, operates a not-for-profit Medicare +Choice plan, and the Fallon Clinic, a for-profit multispecialty physician group, provides care on a capitated basis to Medicare + Choice beneficiaries. The Portland, Oregon, Veterans Administration Medical Center (site 3) is a quaternary care and teaching facility. A patient requiring admission to the acute care hospital for a target illness was identified in an ED or ambulatory site and his or her eligibility status was determined. Non-study medical personnel, usually ED physicians, made the decision to hospitalize the patient. All patients who were offered but who declined hospital-at-home care were admitted to the acute care hospital.	**Outline of intervention &who delivered** 1 Nov 2001-30 Sep 2002 Patients evaluated by HaH physician either in ED or after ambulance transfer to home. HaH nurse met ambulance at patient's home and provided direct one-on-one nursing for an initial period of ≤ 8hrs at site 3 and ≤24 hrs at sites 1 & 2. followed by intermittent nursing visits and HaH physician at least daily. HaH physician was available 24 hours a day for visits. Nursing and other care components, e.g. durable medical equipment, oxygen therapy were provided and some services e.g. home radiology, support provided by independent contractors. Lifeline devices were provided for patients living alone. Diagnostic tests , IV fluids, IV antimicrobial agents, etc. and oxygen/respiratory therapies were provided at home. Patient was followed by same physician until discharged to primary care	**Outline of control** 1 Nov 1990-30 Sep 2001) Eligible patients identified & followed through usual hospital care. Study coordinators verified the patient's eligibility for HaH using a standard protocol at enrollment. Most patients were identified the morning after admission.	**Relevant measures & outcomes** Intervention group comprised all patients eligible for hospital-at-home care, irrespective of where they were treated. [thus some outcomes are NOT useful to us but some measures are HaH specific] **Mean LoS (SD) days [Leff 2005]** ***Mean time in ED (SD) in hrs*** **…….** Sub-analysis of HaH vs. Non-HaH (i.e. different to main report [Leff 2009] ***Changes in ADL and IADL from 1mth before admission -2 weeks after intervention*** **Costs** ***Within each health system and per condition*** [Frick 2009] **Overall summary** 'The HaH care model is feasible, safe, and efficacious for certain older patients with selected acute medical illnesses who require acute hospital-level care.' Leff 2005 HaH care is associated with modestly better improvements in IADL status and trends toward more improvement in ADL status than traditional acute hospital care. Leff 2009 Total costs seem to be lower when substitutive HaH care is available for patients with CHF or COPD disease.Frick2009	Intervention vs. control **Mean LoS (SD) days** **4.9 (9.9) 3.2 (2.5) p =0.004** ***Mean time in ED (SD) in hrs*** **6.4(1.8,11.6)SD 1.9 vs. 5.5(1.0,21.3) SD3.2** **P=0.001** [Leff 2005] ---------- ***Changes in ADL and IADL from 1mth before admission -2 weeks after intervention*** ADL 0.39(3.13) vs. -0.6(3.09) p=0.1 **IADL 0.74(2.86) vs. -0.70(2.68) p=0.007** [Leff 2009] --- **Costs** ***Within each health system and per condition*** **Mean (SD)** Overall **$5081(4427)vs.$7480(8113) p<0.001** Pneumonia $5272(6036) vs. $6761(6451) NS Congestive heart failure **$3310(2118) vs. $6399(6643) p≤0.001** COPD **$4293(3806) vs. $6500(7305) p≤0.05** Cellulitis $4262(2309) vs. $7287(11471) NS [Frick 2009]

Study ID Year	**Study**	**Participants**	**ED or triage procedure**	**Intervention**	**Control**	**Outcomes assessed**	**Results**
Benaiges **[1942]** **2014** **Spain**	**Controlled study** **Intervention:** 'Day hospital' (DH) n=64 **Control:** Conventional hospitalisation (CH) n=36 **Aim:** 'To compare the treatment costs of hyperglycemic crises when managed by DH and CH in diabetic subjects >74 yrs. The secondary objectives were to compare the effectiveness in terms of glycemic control, emergency and outpatient visits, readmissions, rates of hypoglycemia, and in-hospital morbidity. **Setting:** Hospital del mar Barcelona for both interventions ***Power calculation:*** No	**Inclusion criteria:** Patients with sustained hyperglycemia (>300 mg/dL) for at least 3 days with or without ketosis **Exclusion criteria** Ketoacidosis (venous pH <7.31 and/or HCO3 <22 mEq), hyperosmolar crisis (glycemia >600 mg/dL and effective plasma osmolarity >320 mOsm/L), unstable hemodynamic status or need for ventilatory support, severe precipitating factors such as acute myocardial infarction, stroke, sepsis, social deprivation, and dependence for four or more activities of daily living (Katz index >D). **Baseline characteristics of participants** **(Stats shown if signif)** DH vs.CH **Age** 80.3(4.8)vs. 80.6(4.6)yrs **Female** 67 vs. 56% **BMI** 26.1(4.9)vs.25.5(5.1) **Katz A&B** 72.2vs.72.2% **Charlson Index** 3.2(2.0)vs. 3.3(1.7) **Family support** 88.1 vs.97.1% **Diabetes duration** 14.4 (8.0) vs. 97.1 yrs Plus other specific diabetes measures	Patients were treated with same protocol for both DH and CH: this included initial evaluation with a blood test, urinalysis, chest radiograph to rule out underlying infectious disease, and hourly measurement of glycemia and ketonemia. Treatment included hydration as required, an insulin regimen with insulin, and oral carbohydrate intake if glucose levels were less than 250 mg/dL with persistent ketosis. If infection was diagnosed, treatment was initiated. Diabetes education was delivered by specialist diabetes nurse with specific attention paid to dietary advice, physical activity, and recognition of hypoglycemia. Measurement of glycated hemoglobin (HbA1c) and clinical evaluation was scheduled for 3 & 6 mths for patients in both groups	**Outline of intervention** Patients assigned to DH if they were admitted to hospital within DH opening hours (week days from 8 am -4 pm); otherwise they were treated in ED and subsequently hospitalized. After initial treatment of hyperglycemic crisis DH patients were scheduled for follow-up visits at 24, 72 hours, and 7 days to adjust treatment and to complete their diabetes education **Intervention delivered by:** Unclear but diabetes education continued so possibly specialist diabetes nurse.	**Outline of control** At hospital discharge, CH patients were scheduled for a one-week follow-up visit in outpatient clinic. **Intervention delivered by:** Unclear but normal outpatient staff I	**Relevant measures & outcomes** (no distinguishing between primary and secondary outcomes) At 3 mth follow up **[*No. of mild or severe hypoglycemic episodes]*** ***Readmissions for diabetes or unrelated cause*** ***[Nosocomial complications]*** ***No. of outpatient visits*** ***No. of ER visits*** [outcomes] not detailed as not relevant to our question ***Costs*** ***Initial care*** ***Complementary examinations*** ***Pharmacy*** ***Outpatient visits*** ***Readmissions*** ***Total*** In euros	Mean (SD) DH vs.CH **Readmissions for diabetes (%)** **1(1.6)vs. 5 (13.9)** **P=0.04** Readmission for any cause (%) 4(6.3)vs.7(19.4) p=0.085 **No. of outpatient visits (SE?)** **5.0(2.2)vs. 2.5(2.0)** **p=0.012** No. of ER visits (SE?)? 0.2(0.6)vs.0.2(0.4) P=0.59 **Costs** **Initial care** **580.2(489.1) vs. 2,013.6(790.4) p<0.001** **Complementary examinations** **123.7(276.3) vs. 281.3(188.1) p=0.007** Pharmacy 12.8(95.6)vs. 20.3(24.8) P=0.676 Outpatient visits **116.7(75.3) vs. 56.9(105.7) p=0.003** **Readmissions (total)** **340.8(1190)vs.288.3(916.8)p=0.835** **Total** **1,345.1(793.6) vs. 2,212.4(982.5) p<0.001** **Overall summary (authors)** 'DH care for hyperglycemic crises is more cost-effective than CH, with saving of 1,418.4 € per case, lower number of readmissions & pressure ulcer rates, and similar short-term glycemic control and hypoglycemia rates.

Table 2: EPOC Risk of bias

Study name: Leff 2005/2009 'quasi experimental'

Bias	Authors' judgement	Support for judgement
Was the allocation sequence adequately generated?	High risk	'During the acute care hospital observation phase (1 November 1990 to 30 September 2001), eligible patients were identified and followed through usual hospital care.' 'Patients (that) made up the acute hospital observation comparison group. During the intervention phase (1 November 2001 to 30 September 2002), eligible patients were identified at the time of admission and were offered the option of receiving their care in hospital at home rather than in the acute care hospital.'
Was the allocation adequately concealed?	High risk	As above
Were baseline outcome measurements similar?	Unclear risk	There was no baseline measure of outcomes- as outcomes were related to receiving the intervention e.g. time before evaluation etc
Were baseline characteristics similar?	High risk	Populations differed in measures of poverty, living alone and medication. This was acknowledged but not adjusted for.
Were incomplete outcome data adequately addressed?	Low risk	Intention to treat analysis was conducted. p.801 (2005) it was reported that there was substantial missing data for endpoints including functional status (47% of Ps).
Was knowledge of the allocated interventions adequately prevented during the study?	Low risk	Outcomes are objective in Leff 2005 (main publication) In Leff 2009 – there was self-reported daily activity of living of outcomes – subjective objectives
Was the study adequately protected against contamination?	Low risk	? I think it is unlikely that the control group would receive intervention and vice versa rather they were allocated HaH or admitted. If they did not want HaH they were admitted
Was the study free from selective outcome reporting?	Low risk	All outcome measures in methods appear to be in Leff 2005 results but there is no mentions of activities of daily living these are reported in Leff 2009. [no details on a published protocol]
Was the study free from other risks of bias?	Unclear risk	Perhaps selection bias – related to baseline characteristic diffs i.e. functional status.

Study name: Lau 2003 (historical controls)

Bias	Authors' judgement	Support for judgement
Was the allocation sequence adequately generated?	High risk	Control trial with historical control group
Was the allocation adequately concealed?	High risk	As above
Were baseline outcome measurements similar?	Unclear risk	There was no baseline measure of outcomes- as outcomes were related to receiving the intervention e.g. palliative care received during intervention
Were baseline characteristics similar?	High risk?	This is a case of in balance in patient characteristics may be due to recruitment bias whereby the provider was responsible for recruiting patients into the trial. There were more dementia patients kept out of hospital- presumably fairly 'mild' as more pronounced behavioural problems were excluded from HaH group.
Were incomplete outcome data adequately addressed?	Unclear risk	Authors do not refer to missing data or how it might be handled.
Was knowledge of the allocated interventions adequately prevented during the study? 1	Low risk	Outcomes variables are objective
Was the study adequately protected against contamination?	Low risk	I think it is unlikely that the control group would receive intervention and vice versa rather they were allocated HaH or admitted. Historical controls so were 'recruited' before intervention existed
Was the study free from selective outcome reporting?	Low risk	All outcome measures in methods appear to be in results.
Was the study free from other risks of bias?	Low risk	Nothing obvious.

Study name: Crilly 2010 'quasi experimental'

Bias	Authors' judgement	Support for judgement
Was the allocation sequence adequately generated?	High risk	The intervention group included 62 Aged Care Facility (ACF) residents who were enrolled in the Hospital in Nursing home programme during the first 12 months that the programme was operational, from 1 July 2003–30 June 2004. All sample members were ACF residents who presented to the ED and were admitted to the hospital.
Was the allocation adequately concealed?	High risk	As above
Were baseline outcome measurements similar?	Unclear risk	There was no baseline measure of outcomes- as outcomes were related to receiving the intervention e.g. palliative care received during intervention
Were baseline characteristics similar?	Low risk	Baseline characteristics of the study and control are reported and similar.
Were incomplete outcome data adequately addressed?	Unclear	Authors do not refer to missing data or how it might be handled.
Was knowledge of the allocated interventions adequately prevented during the study?	Low risk	The outcomes are objective

Was the study adequately protected against contamination?	Low risk	I think it is unlikely that the control group would receive intervention and vice versa rather they were allocated HaH or admitted.
Was the study free from selective outcome reporting?	Low risk	All outcome measures in methods appear to be in results.
Was the study free from other risks of bias?	Low risk	Nothing obvious

Study name: Mason 2007 (RCT)

Bias	**Authors' judgement**	**Support for judgement**
Was the allocation sequence adequately generated?	Low risk?	'We used cluster randomisation to reduce the risk of contamination (practice in the control group being influenced by the presence of the paramedic practitioner in the community) and to allow service level, rather than individual patient level, evaluation of the intervention. Weeks were randomised before the start of the study (to allow for rostering of the paramedic practitioners) to the paramedic practitioner service being active (intervention) or inactive (control), when the standard 999 service was available.'
Was the allocation adequately concealed?	Low risk	I think this fits in to the category of 'episode of care and there was some form of centralised randomisation scheme'
Were baseline outcome measurements similar?	Unclear risk	There was no baseline measure of outcomes- as outcomes were related to receiving the intervention e.g. ED attendance
Were baseline characteristics similar?	Low risk	Baseline characteristics of the study and control are reported and similar.
Were incomplete outcome data adequately addressed?	Low risk	Flow of patients through trial presented and intention to treat analysis
Was knowledge of the allocated interventions adequately prevented during the study?	Low risk	The ¾ outcomes are objective but there is one on satisfaction with service but that is not a risk of bias issue?
Was the study adequately protected against contamination?	Low risk	'We used cluster randomisation to reduce the risk of contamination (practice in the control group being influenced by the presence of the paramedic practitioner in the community) and to allow service level, rather than individual patient level, evaluation of the intervention'.
Was the study free from selective outcome reporting?	Low risk	All outcome measures in methods appear to be in results.
Was the study free from other risks of bias?	Low risk	Nothing obvious

Study name: Mason 2012 'quasi experimental'

Bias	**Authors' judgement**	**Support for judgement**
Was the allocation sequence adequately generated?	High risk	'Potential 'intervention' trust sites were selected on the basis of their heterogeneity of service delivery of ECP care. 'Control' trust sites that did not employ ECPs, but were in close geographical proximity (ie, within the same or in a neighbouring county) and which offered the same service configurations as the intervention trusts, were then selected'.
Was the allocation adequately concealed?	High risk	As above
Were baseline outcome measurements similar?	Unclear risk	There was no baseline measure of outcomes- as outcomes were related to receiving the intervention e.g. ED attendance
Were baseline characteristics similar?	High risk	For the care home subgroup - Figures were given on selected baseline characteristics but no formal comparison appeared to be made but on face value the clinical characteristics were not even '**Clinical complaint %** Adult medical 30 vs.41 % Adult trauma 46 vs.13 % Elderly falls 23 vs.46%'
Were incomplete outcome data adequately addressed?	Unclear risk	Authors do not refer to missing data or how it might be handled.
Was knowledge of the allocated interventions adequately prevented during the study?	Low risk	Outcome measures are objective
Was the study adequately protected against contamination?	Low risk	There were separate control and intervention PCTs.
Was the study free from selective outcome reporting?	Low risk	All outcomes in methods were in results .

Was the study free from other risks of bias?	Low risk	Nothing obvious

Study name: Gray 2008 historical controls

Bias	Authors' judgement	Support for judgement
Was the allocation sequence adequately generated?	High risk	'From January to April 2006 inclusive, all the patients seen by the ECP service who had rung 999 with a diagnosis of either breathing difficulties or an elderly patient (.65 years of age) with a fall were reviewed.' 'Comparison data were taken from January to April 2005 inclusive for attendances to the same ED for patients with the same criteria as above seen by non-ECP ambulance service personnel.'
Was the allocation adequately concealed?	High risk	As above
Were baseline outcome measurements similar?	Unclear risk	There was no baseline measure of outcomes- as outcomes were related to receiving the intervention e.g. ED attendance
Were baseline characteristics similar?	Unclear risk	No details given 'Elderly patients >65yrs with a fall.'
Were incomplete outcome data adequately addressed?	Unclear risk	Authors do not refer to missing data or how it might be handled.
Was knowledge of the allocated interventions adequately prevented during the study?	Low risk	Outcome measures are objective
Was the study adequately protected against contamination?	Low risk	Different intervention and control data collection time periods.
Was the study free from selective outcome reporting?	Low risk	All outcomes in methods were in results.
Was the study free from other risks of bias?	Low risk	I am not sure if only taking half of the study population is an issue for risk of bias but think it is worth noting.

Study name: Vicente 2014 RCT

Bias	Authors' judgement	Support for judgement
Was the allocation sequence adequately generated?	Low risk	'The dispatchers at the EMCC randomized older adults into the study. A sealed envelope randomization procedure was initiated when the dispatcher received the incoming call and identified the participant as an individual aged 65 who resided in the specified geographical area and was assigned a priority level 2 or 3, and the call occurred between 8:00 a.m. and 10:00 p.m.'
Was the allocation adequately concealed?	Low risk	'The envelope contained the name of the EMS Company 1 or the name of the EMS Company 2. There was an equal chance (1:1) of being assigned to either of the ambulance companies.'
Were baseline outcome measurements similar?	Unclear risk	There was no baseline measure of outcomes- as outcomes were related to receiving the intervention e.g. No. of individuals sent direct to community hospital.
Were baseline characteristics similar?	High risk	There was a difference in the Priority level when ambulance sent out (% individuals) 1. 1.6 vs. 0% 2. 59 vs. 47 % 3. 39 vs.53% P=0.001
Were incomplete outcome data adequately addressed?	Unclear risk	Authors do not refer to missing data or how it might be handled.
Was knowledge of the allocated interventions adequately prevented during the study?	Low risk	Outcome measures are objective
Was the study adequately protected against contamination?	Low risk	Not likely – envelope opened for each case?
Was the study free from selective outcome reporting?	Low risk	All outcomes in methods were in results.
Was the study free from other risks of bias?	Low risk	Nothing obvious

Study name: Garasen 2007/8RCT

Bias	Authors' judgement	Support for judgement
Was the allocation sequence adequately generated?	Low risk	'When an eligible patient was identified and accepted for inclusion, a blinded randomisation was performed by the Clinical Research Department at the Faculty of Medicine using random number tables in blocks to ensure balanced groups.'
Was the allocation adequately concealed?	Low risk	As above
Were baseline outcome measurements similar?	Unclear risk	There was no baseline measure of outcomes- as outcomes were related to receiving the intervention e.g. No. of readmission for index disease
Were baseline characteristics similar?	Unclear risk	Baseline characteristics are given but no formal comparison performed. Groups appear to be balanced
Were incomplete outcome data adequately addressed?	Unclear	Authors do not refer to missing data or how it might be handled.
Was knowledge of the allocated interventions adequately prevented during the study?	Low risk	Outcome measures are objective
Was the study adequately protected against contamination?	Low risk?	Participants were allocated by a distinct process but n=8 who were assigned CH then went to GH – but this was clearly stated See bottom of P.3 – ITT/treatment analysis
Was the study free from selective outcome reporting?	Low risk	Yes, all outcome measures were in results plus 12mth data in Garasen 2008
Was the study free from other risks of bias?	Low risk	Nothing obvious

Study: Sun 2014 (RCT)

Bias	Authors' judgement	Support for judgement
Was the allocation sequence adequately generated?	Low risk	'Patients were block randomized (n=4) by site in a 1:1 ratio to either the observation protocol or routine inpatient admission. .
Was the allocation adequately concealed?	Low risk	'A computer generated the study arm assignment at randomization, and no research personnel had advance knowledge of study arm assignment. We could not blind this health service intervention to patients, providers, or research personnel.'
Were baseline outcome measurements similar?	Unclear risk	There was no baseline measure of outcomes- as outcomes were related to receiving the intervention e.g. No. of readmission for index disease e.g. inpatient admission rates
Were baseline characteristics similar?	Low risk	Baseline characteristics given for both groups and no differences were found.
Were incomplete outcome data adequately addressed?	Low risk	Flow chart of participants plus intention to treat analysis performed.
Was knowledge of the allocated interventions adequately prevented during the study?	Low risk	Outcomes measures were objective. But participant satisfaction (subjective) is a secondary outcome
Was the study adequately protected against contamination?	Unclear risk	As both treatment and control was allocated and given within the same department it is technically possible that participants swopped allocation.
Was the study free from selective outcome reporting?	Low risk	All outcomes in methods are in results
Was the study free from other risks of bias?	Low risk	Nothing obvious

Study: Salvi 2008 CT

Bias	Authors' judgement	Support for judgement
Was the allocation sequence adequately generated?	High risk	'Trained research assistant (VM) screened patients presenting to the ED Monday to Friday from 9:00 AM to 6:00 PM using a standard information sheet explaining the study protocol to patients and proxies.'
Was the allocation adequately concealed?	High risk	As above
Were baseline outcome measurements similar?	Unclear risk	There was no baseline measure of outcomes- as outcomes were related to receiving the intervention e.g. No. of initial admissions
Were baseline characteristics similar?	High risk	Intervention and control were unbalanced in Age 78.1(7) vs.82.5(7.20 p<0.001 Female 47 vs. 68% p = 0.004 Married 70 vs. 40% p<0.001 SPMSQ 2.5(3.3) vs. 5.2(4.2) p<0.001 ADL4.3(2) vs. 3.2(2.5) P=0.001

Were incomplete outcome data adequately addressed?	Unclear risk	Authors do not refer to missing data or how it might be handled.
Was knowledge of the allocated interventions adequately prevented during the study?	Low risk	Outcome measures were objective
Was the study adequately protected against contamination?	Unclear risk	Treatment and control were delivered at two different sites.
Was the study free from selective outcome reporting?	Low risk	All outcomes in methods were reported in results
Was the study free from other risks of bias?	Low risk	Nothing obvious

Study: Benaiges 2014 CT

Bias	**Authors' judgement**	**Support for judgement**
Was the allocation sequence adequately generated?	High risk	'Patients were assigned to the DH group if they were admitted to hospital within DH opening hours (week days from 8 am to 4 pm); otherwise they were treated in the emergency department and subsequently hospitalized.'
Was the allocation adequately concealed?	High risk	As above
Were baseline outcome measurements similar?	Unclear risk	There was no baseline measure of outcomes- as outcomes were related to receiving the intervention e.g. No. of ER visits
Were baseline characteristics similar?	Low risk	baseline characteristics of the study and control are reported and similar
Were incomplete outcome data adequately addressed?	Unclear risk	Authors do not refer to missing data or how it might be handled.
Was knowledge of the allocated interventions adequately prevented during the study?	Low risk	Outcome measures were objective
Was the study adequately protected against contamination?	Low risk	'Patients were treated with same protocol for both DH and CH'- so contamination was possible.
Was the study free from selective outcome reporting?	Low risk	All relevant outcomes in the methods section are reported in the results
Was the study free from other risks of bias?	Low risk	Nothing obvious

Table 3: AMSTAR ratings of systematic reviews

Yes, No, can't answer, not applicable

Study/ Question	1. Was an 'a priori' design provided?	2. Was there duplicate study selection and data extraction?.	3. Was a comprehensive literature search performed?	4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?	5. Was a list of studies (included and excluded) provided?.	6. Were the characteristics of the included studies provided?	7. Was the scientific quality of the included studies assessed and documented?	8. Was the scientific quality of the included studies used appropriately in formulating conclusions?.	9. Were the methods used to combine the findings of studies appropriate?	10. Was the likelihood of publication bias assessed?	11. Was the conflict of interest included?
Caplan 2012	YES	YES	YES	YES	NO (excluded studies not listed)	NO (studies were grouped by medical, surgical, rehabilitation and psychiatric)	YES	YES	YES	YES	YES
Chalmers 2011	YES	YES	YES	NO	NO (excluded studies not listed)	YES but no ages and no direct reporting of participants in both groups	YES but not detailed. Quote Cochrane but only one RCT	YES	Not sure I am not sure it is commonly accepted to combine these study types	No	YES
Jeppensen 2012 (Cochrane)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Lasschuit 2014	YES	NO	YES	NO	NO (excluded studies not listed)	YES	NO	N0	NO	NO	YES
Qaddoura 2015	YES	YES	YES	YES	NO (excluded studies not listed)	YES	YES	NO Relatively high risk of bias over all but all data used	NO Meta-analysis of two RCTs &combinatio n of different QoL measures from the same study in meta-analysis	NO	YES
Varney 2014	YES	NO (single reviewer)	YES	YES	NO	YES	YES	NO	N/A (they did not combine data)	NO	YES
Vinson 2012	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO

Table 4: Hospital Admission Criteria for Acute ACSCs.

Condition	Date and web link of guidance	Admission criteria	Comments on evidence
Dehydration and Gastroenteritis	**NICE - Sept 2009** http://cks.nice.org.uk/gastroenteritis#!Scenario2	Arrange emergency admission to hospital if: • The person is vomiting and unable to retain oral fluids. • They have features of shock or severe dehydration. Other factors influencing admission (clinical judgement should be used) include: • Recent foreign travel. • Older age (people 60 years of age or older are more at risk of complications). • Home circumstances and level of support. • Fever. • Bloody diarrhoea • Abdominal pain and tenderness. • Faecal incontinence. • Diarrhoea lasting more than 10 days. • Increased risk of poor outcome, for example: • Coexisting medical conditions — immunodeficiency, lack of stomach acid, inflammatory bowel disease, valvular heart disease, diabetes mellitus, renal impairment, rheumatoid disease, systemic lupus erythematosus. • Drugs — immunosuppressant's or systemic steroids, proton pump inhibitors, H2-receptor antagonists, simple antacids, angiotensin-converting enzyme inhibitors, diuretics.	These recommendations are based on an expert-consensus guideline from the British Society for the Study of Infection [Farthing *et al*, 1996].
Pyelonephritis	**NICE - Jun 2013** http://cks.nice.org.uk/pyelonephritis-acute	Admit people who: • Are significantly dehydrated or who are unable to take oral fluids and medications. • Have signs of sepsis, including: • A temperature greater than 38°C or less than 36°C, and Marked signs of illness (such as impaired level of consciousness, perfuse sweating, rigors, pallor, significantly reduced mobility), or Significant tachycardia, hypotension, or breathlessness. • Are pregnant and pyrexia. • Are frail, elderly residents in care homes who have recently been hospitalized or who have had recurrent urinary tract infection. • Fail to improve significantly within 24 hours of starting antibiotics. Consider admitting people who • are able to take oral fluids and medications if they are pyrexial and have a risk factor for developing a complication. In the absence of any widely accepted admission criteria, clinical judgement on when to admit is required.	These recommendations are largely based on expert opinion and limited evidence of the risk factors for developing complications from acute pyelonephritis. **Absolute indications for hospital admission** There is expert consensus to arrange admission for people with acute pyelonephritis who: Are unable to take fluid and medications [Neumann and Moore, 2011]. Have signs of sepsis [Neumann and Moore, 2011]. Fail to improve within 24 hours of starting antibiotics in primary care [HPA and British Infection Association, 2013]. A number of experts recommend arranging admission for all pregnant women with acute pyelonephritis, for at least a short observation period, because of the risk of preterm labour and maternal renal complications [Ramakrishnan and Scheid, 2005; COMPASS, 2012]. Experts from the Health Protection Agency recommend treatment with ertapenem, or other carbapenem, for frail, elderly residents from care homes who have been recently hospitalized or who have had recurrent urinary tract infection, because they are at increased risk of having a pathogen resistant to ciprofloxacin and cephalosporins. [Livermore, Personal Communication, 2009]. Treatment requires hospital admission because carbapenems are only available in an intravenous form

		A low threshold is required for people with: • Immunocompromise, for example due to immunosuppressant drug use, cancer, cancer therapies, or AIDS. • A foreign body within the renal tract, including renal stones and ureteric or nephrostomy catheters. • Abnormalities of renal tract anatomy or function, including vesico–ureteric reflux and polycystic kidney disease. • Diabetes mellitus. • Renal impairment. • Advanced age.	and no suitable oral alternative exists.
Perforated/bleeding Ulcer (upper GI haemorrhage)	**NICE - Jun 2012** CKS Guidance http://cks.nice.org.uk/dyspepsia-proven-peptic-ulcer#Search?q=dyspepsia on dyspepsia during pregnancy, with proven GORD, with proven gastric ulcer , with proven duodenal ulcer and with unidentified cause (alarm features & no alarm features taking NSAIDS or not taking NSAIDS)	All dyspepsia guidance has well written referral guidelines that define when to refer immediate and urgent. No admission criteria for pregnancy- associated proven GORD, proven gastric- ulcer and proven duodenal ulcer Dyspepsia with alarm features guidance recommends that people with dyspepsia and significant acute gastrointestinal bleeding arrange immediate admission to hospital. http://cks.nice.org.uk/dyspepsia-unidentified-cause#!scenario Dyspepsia with no alarm features and not taking NSAID guidance recommends immediate admission to hospital for people with dyspepsia and significant acute gastrointestinal bleeding, http://cks.nice.org.uk/dyspepsia-unidentified-cause#!scenario:1 Dyspepsia with no alarm features and taking NSAID guidance recommends immediate admission to hospital for people with dyspepsia and significant acute gastrointestinal bleeding. http://cks.nice.org.uk/dyspepsia-unidentified-cause#!scenario:2	These recommendations conform with those issued by the National Institute for Health and Care Excellence (NICE), covering the management of dyspepsia, and referral guidelines for suspected cancer [NICE, 2005b; NICE, 2005a].
Acute Upper and lower GI haemorrhage	**SIGN – Sept 2008** http://www.sign.ac.uk/pdf/sign105.pdf	<u>Acute Upper GI haemorrhage</u> Consider for admission and early endoscopy (and calculation of full Rockall score) if: • age ≥60 years (all patients who are aged >70 years should be admitted), or • witnessed hematemesis or haematochezia (suspected continued bleeding), or • haemodynamic disturbance (systolic blood pressure) <u>Acute lower GI haemorrhage</u> Consider for admission if : • age ≥60 years, or • haemodynamic disturbance, or • Evidence of gross rectal bleeding, or • Taking aspirin or an NSAID, orƒ • Significant comorbidity	SIGN states that this evidence is level 3 which means that the studies are non-analytical, for example, case reports.
Pelvic Inflammatory disease	**NICE - March 2013** http://cks.nice.org.uk/pelvic-inflammatory-disease	Admit urgently if: • Ectopic pregnancy cannot be ruled out, or the woman is pregnant. • Symptoms and signs are severe (such as nausea, vomiting, and a fever greater than 38°C). • There are signs of pelvic peritonitis. • A surgical emergency such as acute appendicitis cannot be ruled out.	These recommendations are based on expert opinion in guidelines from the Royal College of Obstetricians and Gynaecologists (RCOG) [RCOG, 2009], the British Association for Sexual Health and HIV (BASHH) [BASHH, 2011a], the International Union Against Sexually Transmitted Infections [Ross et al, 2008], and the Department of Health and Human Services Centres for Disease Control and Prevention [CDC, 2006].

		• A tubo-ovarian abscess is suspected. • The woman is unwell and there is diagnostic doubt. • The woman is unable to follow or tolerate an outpatient regimen.	
Cellulitis	**NICE - Sept 2012** http://cks.nice.org.uk/cellulitis-acute incorporating CREST 2005 guidance http://www.acutemed.co.uk/docs/Cellulitis%20guidelines,%20CREST,%2005.pdf	Urgently admit to hospital a person who: • Is significantly unwell with symptoms such as tachycardia, tachypnoea, hypotension, vomiting, or acute confusion; or has unstable co-morbidities such as uncontrolled diabetes; or has a limb threatening infection due to vascular compromise. • Has septicaemia or a severe life-threatening complication such as necrotizing fasciitis. • Has severe or rapidly deteriorating cellulitis (for example cellulitis affecting extensive areas of skin). • Is very young (such as children under 1 year of age) or frail. • Is immunocompromised. • Has significant lymphoedema (gross swelling of the limb). • Has facial cellulitis (unless very mild). • Has periorbital cellulitis — refer to an ophthalmologist	The evidence was based on an observational retrospective cohort study involving 697 patients.
Ears, Nose throat **Otitis media – acute** **Sore Throat - acute**	NICE - July 2009 CKS Guidance (http://cks.nice.org.uk/#?char=A) Acute OM (Initial presentation, treatment failure, recurrent) and sore throat.	Otitis media – Initial presentation (acute) admit if: • People with suspected acute complications of acute otitis media (AOM), such as meningitis, mastoiditis, and facial paralysis. • If the person was not admitted at initial presentation, admit: Children younger than 3 months of age with suspected AOM or a temperature of 38°C or more. • Children 3–6 months of age with a temperature of 39°C or more. http://cks.nice.org.uk/otitis-media-acute#!scenario Otitis media- initial presentation (Treatment failure) If an episode of acute otitis media (AOM) fails to improve or worsens, reassess the person: • Admit for immediate paediatric assessment, children younger than 3 months of age with a temperature of 38°C or more. • Admit for immediate specialist assessment, people with suspected acute complications of AOM (such as meningitis, mastoiditis, or facial nerve paralysis). • Consider admitting people who are systemically very unwell, children younger than 3 months of age, and children 3–6 months of age with a temperature of 39°C or more. http://cks.nice.org.uk/otitis-media-acute#!scenario:1 Sore throat • Admission is required for conditions that are immediately life-threatening (for example acute epiglottitis or Kawasaki disease). • Other conditions may require referral or expert advice should be sought (for example consideration of tonsillectomy for recurrent tonsillitis). Admit immediately anyone who has: • Stridor or respiratory difficulty. • Respiratory distress, drooling, systemically very unwell, painful swallowing, muffled voice: suspect acute epiglottitis. Do not examine the throat of anyone who has suspected epiglottitis.	Otitis media – Initial presentation acute and treatment failure The recommendation to admit young children with acute otitis media (AOM) and a high temperature for immediate paediatric assessment is based on the National Institute for Health and Care Excellence (NICE) guideline *Feverish illness in children — Assessment and initial management in children younger than 5 years* [National Collaborating Centre for Women's and Children's Health, 2013]. The recommendation to admit people with acute complications of AOM is pragmatic and is supported by expert opinion in the US Institute for Clinical Systems Improvement guideline on the diagnosis and treatment of otitis media in children [ICSI, 2008]. The recommendation to consider admitting people who are systemically very unwell is extrapolated from the NICE guideline *Prescribing of antibiotics for self-limiting respiratory tract infections in adults and children in primary care* [NICE, 2008a]. Evidence on the most appropriate management of children younger than 3 months of age with suspected AOM is limited or conflicting, and the NICE guideline *Prescribing of antibiotics for self-limiting respiratory tract infections in adults and children in primary care* excludes children in this age group from its scope [NICE, 2008a]. CKS recommends considering admission in this age group on the basis of expert opinion in US and Canadian guidelines [University of Michigan Health System, 2007; Alberta Medical Association, 2008] and the textbook *Advanced therapy in otitis media*[Barnett, 2003], which suggests that AOM may be associated with bacteraemia, meningitis, or other systemic illness in young children. Sore throat The basis for these recommendations is expert advice from national guidance [NICE, 2001; SIGN, 2010], standard textbooks [Breathnach, 2004; Caserta and Flores, 2010] and advice from our expert reviewers.

		• Upper airway obstruction. • Dehydration or reluctance to take any fluids. • Severe suppurative complications (e.g. peri-tonsillar abscess or cellulitis, parapharyngeal abscess, retropharyngeal abscess, or Lemierre syndrome) as there is a risk of airway compromise or rupture of the abscess. • Signs of being markedly systemically unwell and is at risk of immunosuppression. • Suspected Kawasaki disease. • Diphtheria: characteristic tonsillar or pharyngeal membrane. • Signs of being profoundly unwell and the cause is unknown or a rare cause is suspected, for example: • Stevens–Johnson syndrome: high fever, arthralgia, myalgia, extensive bullae in the mouth followed by erosion and a grey–white membrane. • Yersinial pharyngitis : fever, prominent cervical lymphadenopathy, abdominal pain with or without diarrhoea. http://cks.nice.org.uk/sore-throat-acute#!scenario	
Dental Conditions - Dental abscess	NICE - Sept 2012 CKS guidance (http://cks.nice.org.uk/) Guidance on dental abscess, Gingivitis and periodontitis	Seek further advice or admit a person to hospital if they have a dental abscess and: • Are unwell with a high temperature and cardio-respiratory compromise (rapid pulse rate or low blood pressure, high respiratory rate). • Early signs of dysphagia or a significant 'floor of mouth' swelling. • Are in severe pain despite analgesia (maximum tolerated dosage) prescribed in primary care. • Have a spreading facial infection. • Have a history of being immunocompromised. http://cks.nice.org.uk/dental-abscess#!scenario No admission criteria for gingivitis and periodontitis	These admission criteria are based on pragmatic advice and include criteria from the British Society for Antimicrobial Chemotherapy [BSAC, 2007].
Epilepsy	The College of Emergency Medicine - 2009 https://www.google.co.uk/search?q=The+College+of+Emergency+Medicine&rlz=1C1TEUA_enGB501GB502&oq=The+College+of+Emergency+Medicine&aqs=chrome..69i57&sourceid=chrome&es_sm=93&ie=UTF-8	"Patients who have fully recovered, have no neurological deficit, and have normal initial investigations can be discharged from the ED. Admission should be considered in all patients with alcoholism, poor social circumstances or those without a responsible adult to stay with."	There is a list of at least eighty references in this document, however there was no numerical reference for these admission criteria.

Table 5 : Hospital Admission Criteria for chronic ACSCs.

Condition	Date and web link of guidance	Admission criteria	Comments on evidence
Asthma	**BTS and SIGN May 2008 revised January 2012 and October 2014** https://www.brit-thoracic.org.uk/document-library/clinical-information/asthma/btssign-asthma-guideline-2014/	Criteria for adult with acute asthma admission • Admit patients with any feature of a life-threatening or near-fatal asthma attack. • Admit patients with any feature of a severe asthma attack persisting after initial treatment. • Patients whose peak flow is greater than 75% best or predicted one hour after initial treatment may be discharged from ED, unless there are other reasons why admission may be appropriate. Referral to intensive care Refer any patient: • requiring ventilatory support y with acute severe or life-threatening asthma, who is failing to respond to therapy, as evidenced by: - deteriorating PEF - persisting or worsening hypoxia - hypercapnia - ABG analysis showing ↓ pH or ↑ H+ - exhaustion, feeble respiration - drowsiness, confusion, altered conscious state - respiratory arrest Follow up • It is essential that the patient's primary care practice is informed within 24 hours of discharge from the emergency department or hospital following an asthma attack. • Keep patients who have had a near-fatal asthma attack under specialist supervision indefinitely • A respiratory specialist should follow up patients admitted with a severe asthma attack for at least one year after the admission. There is detailed guidance on treatments on admission and separate guidance on admission with children with asthma	Based on a large observation study [Campbell 1997] and small cohort study [Innes 1998] and confidential enquiry reports from 1984-1999
Congestive heart failure	NICE guidance (Aug 2010) updated October 2014 http://www.nice.org.uk/guidance/cg108/evidence/full-guideline-136060525	No specific guidance on admission	There was no evidence for published trials Referenced RCP London 'Guideline development group recommended referral in certain clinical situations but health professionals should always use their judgement in deciding when a course of action is appropriate'
	Heart failure Society of America (HFSA) 2010 http://www.hfsa.org/wp-content/uploads/2015/04/Executive-Summary.pdf	Hospitalization recommended for • Evidence of severe ADHF, including: Hypotension Worsening renal function Altered mentation dyspnea at rest Typically reflected by resting tachypnea Less commonly reflected by oxygen saturation <90% Hemodynamically significant arrhythmia Including new onset of rapid atrial fibrillation Acute coronary syndromes Hospitalization should be considered for • Worsened congestion even without dyspnea	Referenced ADHERE a large multicentre registry set up to compile clinical characteristics of patients hospitalised for heart failure. [Adams 2005] No specific referencing for most guidance.

		• Signs and symptoms of pulmonary or systemic congestion even in the absence of weight gain • Major electrolyte disturbance • Associated comorbid conditions Pneumonia Pulmonary embolus Diabetic ketoacidosis • Symptoms suggestive of transient ischemic accident or stroke • Repeated ICD firings • Previously undiagnosed HF with signs and symptoms of systemic or pulmonary congestion	
	ACC/AHA 2005 (American College of cardiology/American Heart Association) Hunt SA *et al.* Circulation. 2005 Sep 20; 112(12):e154-235. Epub 2005 Sep 13.	"If the patient continues to exhibit evidence of volume overload despite these measures, hospitalization is generally required for further adjustment of therapy (168, 488), possibly including intravenous dopamine or dobutamine." P44e "Assessment of the adequacy and tolerability of orally based strategies [Intravenous Peripheral Vasodilators and Positive Inotropic Agents] may necessitate observation in the hospital for at least 48 hours after the infusions are discontinued." P45e	Two small RCTs and previous consensus publication. [Dormans 1996] [Cotter 1997] [Stevenson 1998]
Diabetes complications	**NICE August 2015 (Type I Diabetes- adults)** http://www.nice.org.uk/guidance/NG17/evidence **NICE December 2015 (Type II Diabetes adults)** https://www.nice.org.uk/guidance/ng28 **British Diabetes Society September 2013** http://www.diabetologists-abcd.org.uk/JBDS/JBDS_IP_DKA_Adults_Revised.pdf Joint British Diabetes Societies guideline http://www.bsped.org.uk/clinical/docs/jbdsdkaguidelines_may11.pdf	No guidance No guidance The following groups of patients need specialist input as soon as possible and special attention needs to be paid to their fluid balance. • Elderly • Pregnant • Young people 18 to 25 years of age (see section on cerebral oedema) • Heart or kidney failure • Other serious co-morbidities Admission to high-dependency unit or equivalent This is of course somewhat subjective, the Joint British Diabetes Societies suggest that the presence of one or more of the following may indicate severe diabetic ketoacidosis and admission to a Level 2 / high-dependency unit environment. Insertion of a central line and immediate senior review should be considered: • Blood ketones over 6 mmol / l; • Bicarbonate level below 5 mmol / l; • Venous/ arterial pH below 7.1; • hypokalaemia on admission (under 3.5 mmol/ l); • Glasgow Coma Scale (GCS) less than 12 or abnormal AVPU (Alert, Voice, Pain, Unresponsive) scale; • Oxygen saturation below 92% on air (assuming normal baseline respiratory	No specific referencing No specific referencing

<table>
<tr><td></td><td></td><td>function);
• Systolic blood pressure below 90 mmHg;
• Pulse over 100 or below 60 b min)1 ;
• Anion gap above16 [anion gap = (Na+ + K+) – (Cl– + HCO3 –)].</td><td></td></tr>
<tr><td>COPD</td><td>NICE June 2010
https://www.nice.org.uk/guidance/cg101</td><td><table>
<tr><td>Factor</td><td>Treat at home</td><td>Treat in hospital</td></tr>
<tr><td>Able to cope at home</td><td>YES</td><td>NO</td></tr>
<tr><td>Breathlessness</td><td>Mild</td><td>Severe</td></tr>
<tr><td>General condition</td><td>Good</td><td>Poor/ deteriorating</td></tr>
<tr><td>Level of activity</td><td>Good</td><td>Poor/confined to bed</td></tr>
<tr><td>Cyanosis</td><td>NO</td><td>YES</td></tr>
<tr><td>Worsening peripheral oedema</td><td>NO</td><td>YES</td></tr>
<tr><td>Level of consciousness</td><td>Normal</td><td>Impaired</td></tr>
<tr><td>Already receiving LTOT</td><td>NO</td><td>YES</td></tr>
<tr><td>Social circumstances</td><td>Good</td><td>Living alone/not coping</td></tr>
<tr><td>Acute confusion</td><td>NO</td><td>YES</td></tr>
<tr><td>Rapid rate of onset</td><td>NO</td><td>YES</td></tr>
<tr><td>Significant comorbidity (particularly cardiac disease and insulin-dependent diabetes)</td><td>NO</td><td>YES</td></tr>
<tr><td>SaO2 < 90%</td><td>NO</td><td>YES</td></tr>
<tr><td>Changes on chest radiograph</td><td>NO</td><td>Present</td></tr>
<tr><td>Arterial pH level</td><td>>7.35</td><td><7.35</td></tr>
<tr><td>Arterial PaO2</td><td>≥7kPa</td><td><7kPa</td></tr>
</table></td><td>Grade D evidence
Evidence from expert committee reports or opinions and/or clinical experience or respected authorities</td></tr>
<tr><td>Angina</td><td>NICE March 2010
http://www.nice.org.uk/guidance/cg94/evidence/full-guidance-and-appendices-245227789</td><td>Refer people to hospital as an emergency if an Acute Coronary syndrome (ACS) is suspected and :
• They currently have chest pain or
• They are currently pain free but had chest pain in the last 12 hours and a resting lead ECG is abnormal or not available.
Refer people for an assessment in hospital if an ACS is suspected and the pain has resolved and there are signs of complications such as pulmonary oedema. Use clinical judgement to decide whether referral should be an emergency or urgent same day assessment.
Refer people to hospital as an emergency if they have a recent (confirmed or suspected) ACS and develop further chest pain.</td><td></td></tr>
<tr><td>Iron-deficiency anaemia</td><td>NICE February 2013
http://cks.nice.org.uk/anaemia-iron-deficiency#!scenario</td><td>If the person has profound anaemia with signs of heart failure — admit to hospital.</td><td>The recommendations are based on Referral advice: a guide to appropriate referral from general to specialist care [NICE, 2001]. Other guidelines used were from the British Society of Gastroenterology on the management of iron deficiency anaemia [Goddard et al, 2011] and a patient pathway on the management of anaemia from the Centre for Change and Innovation [NHS Scotland, 2005]. Feedback from expert reviewers of this CKS topic has also contributed</td></tr>
<tr><td>Hypertension</td><td>NICE August 2011
http://www.nice.org.uk/guidance/cg127/evidence</td><td>Not specifically admission guidance but
Refer the person to specialist care the same day if they have :
Accelerated hypertension that is blood pressure higher than180/110 mmHg with signs of papilledema and/or retinal haemorrhage Or suspected phaeochromoctoma (labile or postural hypotension, headache, palpitations, pallor and diaphoresis).</td><td>No specific referencing</td></tr>
<tr><td>Nutritional deficiencies</td><td>Various guidance on nutritional deficiencies from WHO (2003)</td><td>No guidance</td><td>Not applicable</td></tr>
</table>

9. List of Abbreviations

ACSC Ambulatory Care Sensitive Conditions

ADl Activities of daily living

CT controlled trial

ED Emergency department

IADL instrumental activity of daily living

MD Mean difference

nRCT nonrandomised controlled trial

OECD Organisation of Economic Co-operation and Development

OR odds ratio

RCT randomised controlled trial

RR risk ratio

95% CI ninety five percent confidence intervals

10. Appendices

Appendix 1: Parent search strategy run in Medline

Database: Medline In-process - Current week, Medline 1950 to present

Search Strategy: Run April 24th 2015

1 intervention?.ti. or (intervention? adj6 (clinician? or collaborat$ or community or complex or DESIGN$ or doctor? or educational or family doctor? or family physician? or family practitioner? or financial or GP or general practice? or hospital? or impact? or improv$ or individuali?e? or individuali?ing or interdisciplin$ or multicomponent or multi-component or multidisciplin$ or multi-disciplin$ or multifacet$ or multi-facet$ or multimodal$ or multi-modal$ or personali?e? or personali?ing or pharmacies or pharmacist? or pharmacy or physician? or practitioner? or prescrib$ or prescription? or primary care or professional$ or provider? or regulatory or regulatory or tailor$ or target$ or team$ or usual care)).ab. (178760)

2 (pre-intervention? or preintervention? or "pre intervention?" or post-intervention? or postintervention? or "post intervention?").ti,ab. (11719)

3 (hospital$ or patient?).hw. and (study or studies or care or health$ or practitioner? or provider? or physician? or nurse? or nursing or doctor?).ti,hw. (747131)

4 demonstration project?.ti,ab. (2027)

5 (pre-post or "pre test$" or pretest$ or posttest$ or "post test$" or (pre adj5 post)).ti,ab. (72037)

6 (pre-workshop or post-workshop or (before adj3 workshop) or (after adj3 workshop)).ti,ab. (653)

7 trial.ti. or ((study adj3 aim?) or "our study").ab. (697929)

8 (before adj10 (after or during)).ti,ab. (375455)

9 ("quasi-experiment$" or quasiexperiment$ or "quasi random$" or quasirandom$ or "quasi control$" or quasicontrol$ or ((quasi$ or experimental) adj3 (method$ or study or trial or design$))).ti,ab,hw. (107858)

10 ("time series" adj2 interrupt$).ti,ab,hw. (1212)

11 (time points adj3 (over or multiple or three or four or five or six or seven or eight or nine or ten or eleven or twelve or month$ or hour? or day? or "more than")).ab. (10245)

12 pilot.ti. (43282)

13 Pilot projects/ (86631)

14 (clinical trial or controlled clinical trial or multicenter study).pt. (644558)

15 (multicentre or multicenter or multi-centre or multi-center).ti. (31588)

16 random$.ti,ab. or controlled.ti. (809402)

17 (control adj3 (area or cohort? or compare? or condition or design or group? or intervention? or participant? or study)).ab. not (controlled clinical trial or randomized controlled trial).pt. (440969)

18 Aged/ (2394306)

19 "Aged, 80 and over"/ (647729)

20 older adults.mp. (38411)

21 elderly adults.mp. (2417)

22 over 65 years.mp. (3421)

23 virtual ward.mp. (12)

24 intermediate care.mp. (1478)
25 Crisis response.mp. (103)
26 Crisis resolution.mp. (99)
27 reablement.mp. (12)
28 re-ablement.mp. (11)
29 hospital care at home.mp. (14)
30 hospital-at-home.mp. (289)
31 home hospital.mp. (150)
32 medical day hospital care.mp. (2)
33 day hospital.mp. (2435)
34 out-patient facility.mp. (13)
35 Domiciliary care.mp. (247)
36 intermediate services.mp. (7)
37 Intermediate Care Facilities/ (639)
38 Home Care Services, Hospital-Based/ (1662)
39 Home Health Nursing/ (58)
40 Home Nursing/ (8049)
41 admission avoidance.mp. (56)
42 outreach program.mp. (677)
43 hospital outreach.mp. (27)
44 nursing-led units.mp. (3)
45 hospital in home.mp. (8)
46 hospital in the home.mp. (123)
47 medical home care.mp. (39)
48 Crisis intervention service.mp. (31)
49 Geriatric emergency management practice model.mp. (1)
50 day unit.mp. (169)
51 Day Care/ (4670)
52 day centre.mp. (170)
53 comprehensive elderly care.mp. (2)
54 Substitutive care.mp. (1)
55 shared care.mp. (916)
56 guided care.mp. (69)
57 home-based versus hospital-based.mp. (11)
58 home hospitalisation.mp. (28)
59 rapid response team.mp. (515)
60 rapid response nurse.mp. (2)
61 Hospitals, Community/ (10479)
62 *Ambulatory Care/ (15963)

63 *Health Services for the Aged/ (12112)

64 or/1-17 (3278427)

65 or/23-63 (57831)

66 or/18-22 (2428347)

67 64 and 65 and 66 (11288)

68 67 not (child/ or infant/ or adolescent/ or maternal health services/) (9807)

69 68 not (case report/ or case study/ or letter/ or editorial/ or expert opinion.mp.) [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (9192)

70 69 not (Algeria$ or Egypt$ or Liby$ or Morocc$ or Tunisia$ or Western Sahara$ or Angola$ or Benin or Botswana$ or Burkina Faso or Burundi or Cameroon or Cape Verde or Central African Republic or Chad or Comoros or Congo or Djibouti or Eritrea or Ethiopia$ or Gabon or Gambia$ or Ghana or Guinea or Keny$ or Lesotho or Liberia or Madagasca$ or Malawi or Mali or Mauritania or Mauritius or Mayotte or Mozambiq$ or Namibia$ or Niger or Nigeria$ or Reunion or Rwand$ or Saint Helena or Senegal or Seychelles or Sierra Leone or Somalia or South Africa$ or Sudan or Swaziland or Tanzania or Togo or Ugand$ or Zambia$ or Zimbabw$ or China or Chinese or Hong Kong or Macao or Mongolia$ or Taiwan$ or Belarus or Moldov$ or Russia$ or Ukraine or Afghanistan or Armenia$ or Azerbaijan or Bahrain or Cyprus or Cypriot or Georgia$ or Iran$ or Iraq$ or Israel$ or Jordan$ or Kazakhstan or Kuwait or Kyrgyzstan or Leban$ or Oman or Pakistan$ or Palestin$ or Qatar or Saudi Arabia or Syria$ or Tajikistan or Turkmenistan or United Arab Emirates or Uzbekistan or Yemen or Bangladesh$ or Bhutan or British Indian Ocean Territory or Brunei Darussalam or Cambodia$ or India$ or Indonesia$ or Lao or People's Democratic Republic or Malaysia$ or Maldives or Myanmar or Nepal or Philippin$ or Singapore or Sri Lanka or Thai$ or Timor Leste or Vietnam or Albania$ or Andorra or Bosnia$ or Herzegovina$ or Bulgaria$ or Croatia$ or Estonia or Faroe Islands or Greenland or Liechtenstein or Lithuani$ or Macedonia or Malta or maltese or Romania or Serbia$ or Montenegro or Slovenia or Svalbard or Argentina$ or Belize or Bolivia$ or Brazil$ or chile or Chilean or Colombia$ or Costa Rica$ or Cuba or Ecuador or El Salvador or French Guiana or Guatemala$ or Guyana or Haiti or Honduras or Jamaica$ or Nicaragua$ or Panama or Paraguay or Peru or Puerto Rico or Suriname or Uruguay or Venezuela or developing countr$ or south America$).ti,sh. (8719)

71 admission*.ab. (140603)

72 hospital*.ab. (747796)

73 71 or 72 (804011)

74 70 and 73 (3851)

75 limit 74 to yr="2005 -Current" (1880)

76 remove duplicates from 75 (1829)

Appendix 2 : PRISMA flow diagram searches run September 2012