Primary care factors and unscheduled secondary care:

a series of systematic reviews

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Library support

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South Plaza library, NHS Bristol and Bristol Community Health

Funding

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1. Executive summary

Features of primary care: impact on unscheduled care for commissioners

This systematic review was conducted by University of Bristol to identify studies that describe the influencing factors at primary care organisational level that impact on levels of unscheduled secondary care. 48 papers from around the world were identified which described 44 studies between 2000 – October 2012.

What impacts on unscheduled care?	What does this mean for commissioning?
• Seeing the same GP each time they visit the GP practice may contribute to lower ED attendance and possible emergency admissions	• Target increased continuity of care with a GP for patients in higher risk groups (see patient factors below)
• Extended in hours access - reduced ED attendances and probably emergency admissions	• Fits with current government policy but limited UK evidence, so ensure a robust evaluation is conducted
• The closer patients are to hospitals the more likely they are to attend the ED	• Co – location of urgent care centres with EDs
• Complex and confusing options for patients accessing the urgent and emergency care system	• Simplify the urgent and emergency care pathways for the public
• Practices which provide GP vocational training – have decreased emergency admissions	• Learn from practices that provide GP vocational training
• People are more likely to attend ED	• Consider the impact of the inverse

or have emergency admissions if they are:	care law* - those who most need medical care are least likely to receive it. Therefore ensure service redesign addresses these patient factors.
- From poorer backgrounds or less well educated - Socially isolated or lack social support - Older - Suffer from multiple conditions	

What doesn't impact on unscheduled care?

- Size of GP practices
- Most QOF indicators

What we still don't know for sure

- The impact of continuity of care or access on emergency admissions
- Quality of care – other than QOF

*http://www.kingsfund.org.uk/publications/articles/inverse-care-law

Background

Reducing unscheduled secondary care use i.e. Emergency Department (ED) attendance and emergency hospital admission (EHA) is a priority for many health care systems. In a recent King's Fund report, it was suggested that emergency admissions among people with long-term conditions that could have been managed in primary care cost the NHS £1.42 billion annually and that this could be reduced by 8–18 per cent through investment in primary and community-based services. The aim of this report was to systematically identify studies that describe factors and interventions in primary care that impact on levels of utilisation of unscheduled secondary care (USC).

Key findings

Continuity of care

ED attendance

Five studies, three from the USA and two from Canada, consistently showed that continuity of care as measured by seeing the same family or specialist physician reduced ED attendance.

Emergency hospital admissions

Three studies suggest that higher continuity of care with an individual family doctor is associated with lower rates of EHA. One is from the UK, one from the USA and one from Canada. However, one further US study of diabetes, CHD and depression patients suggests that improved continuity of care with the same physician had no effect on EHA.

Access to primary health care

Generally, better access to primary care was associated with reduced USC. Much of the evidence is from the USA. However, the relationship between satisfaction with access and USC use in the NHS is becoming clearer.

ED attendance

Evidence from the USA shows increased access to primary care in terms of opening hours, appointments available and nurse triage reduces ED attendance. Two UK studies link lower patient satisfaction with access to primary care and increased ED use, and one study suggests no association.

ED attendance is increased if patients are not registered with a GP. However the picture is mixed in terms of physician to patient ratio and ED attendance.

Patients' poor perception of primary health care access in terms of telephone access, shorter opening hours, no other place to go, refusal of requests for appointments and unmet needs were associated with increased ED attendance.

Emergency hospital admissions

One US study showed that poorer access to primary care services increased EHA, but a study in Ireland showed that increasing free primary care to those patients over 70 years of age had no effect on EHA. Five UK cross sectional studies suggest an association between lower patient satisfaction with certain aspects of access and higher long term condition EHA rates.

The evidence (10 studies) for GP supply on EHA is mixed with equal numbers of positive and negative studies; however these studies use a wide range of measures making it difficult to compare them.

Proximity to services

Overall, the evidence suggests that patient proximity to a primary health care practice reduced ED attendance, and that proximity to an ED department is associated with increased use.

Two studies show that an increased distance of the primary care practice from the hospital is associated with reduced levels of EHA. Equally, patient data shows that urban dwelling and proximity to hospitals increases EHA.

Patient features

Lower socioeconomic status is consistently associated with increased ED attendance and EHA. A similar effect is seen with social isolation and lack of social support for both ED attendance and EHA. Higher levels of education are consistently associated with lower USC use.

Studies show that increased age results in increased ED attendance and EHA. Gender appears to be less important on ED attendance with the majority of studies showing no effect. For EHA data is mixed and suggests gender effects are country/culture specific. The evidence for the effect of ethnicity is also mixed for both ED attendance and EHA. Having a chronic disease and multimorbidity is associated with higher rates of ED attendance and EHA, as is the combination of smoking with CHD, asthma or COPD.

Patients' poor perception of primary health care is associated with increased ED attendance.

Features of primary health care practice

Practice size does not seem to be associated with USC utilisation.

ED attendance

One study showed that practices that have same day turnaround of laboratory tests were shown to reduce ED attendance.

The evidence for the influence of type of primary health care professional on ED attendance was mixed.

Emergency hospital admissions

There is evidence from three UK studies that provision of post graduate training within GP practices is associated with lower levels of EHA.

Features that do not appear to reduce EHA are the numbers of partners, the number of partners with MRCGP, or the share of salaried GPs. The evidence for practices providing specific services is mixed. However certain services do seem to impact on

reducing EHA with both health visitor hours per 1000 children under the age of five, and the number of primary care visits in the last months of life in congestive heart failure and COPD patients being associated with fewer EHA.

Quality of care

ED attendance

Overall there is a paucity of data on the effect of quality measures on ED attendance however one study showed that quality of care for diabetes patients reduced ED attendance of these patients.

Emergency hospital admissions
The evidence for quality of care measures affecting EHA for specific conditions is mixed. There were individual positive studies for diabetes, angina and asthma diagnosis by spirometry.

Qualitative studies & self-reported surveys

All the identified studies related to ED use, there were no studies on EHA. These data show different attitudes to USC between USA and the UK reflecting differences in primary care provision in these countries.

Intervention or evaluation studies

Most of the identified studies related to ED use. This section describes a small heterogeneous set of studies from the UK and the USA describing care models and scheduling/engagement systems in primary health care. Overall the primary health care management studies appear to reduce unscheduled secondary care but it is important to note that the interventions are diverse, engage different populations and thus data are limited.

Summary

Overall the issue of which features of primary care affect USC is complex. However the following appear to consistently affect USC utlisation:

- ❖ Being able to see the same primary health care doctor reduces USC

- ❖ Generally, better access is associated with reduced USC.

- ❖ Proximity to health care provision influences patterns of use

- ❖ Patients who live in deprivation have markedly higher levels of USC use

2. General introduction

Unscheduled care is defined as health care which cannot reasonably be foreseen or planned in advance of contact with the relevant professional. [Welsh Assembly, 2008]. It is otherwise known as urgent or emergency care. There are five levels of need in unscheduled health care from self-care (Level 1), primary care, minor injury unit etc. (level 2) through to level 3 (emergency department (ED) and hospital admission (levels 4 and 5). [Welsh Assembly, 2008] Reducing unscheduled care use in the secondary care sector (i.e. ED attendance and emergency hospital admission) is a priority for many health care systems. For example, the NHS has a number of performance indicators including reducing emergency hospital admissions (EHAs) for chronic ambulatory care sensitive conditions; reducing emergency admissions for acute conditions that should not usually require hospital admission and reducing emergency readmissions within 28 days of discharge from hospital [Department of Health, 2010]. In a recent King's Fund report, it was suggested that emergency admissions among people with long-term conditions that could have been managed in primary care cost the NHS £1.42 billion annually and that this could be reduced by 8–18 per cent through investment in primary and community-based services [Tian 2012]

The patterns of attendance vary according to the local health care system and population. In the UK, despite the provision of free health care at the point of delivery and universal provision of primary care there were 17.6 million ED attendances recorded at major ED departments, single specialty A&E departments, walk-in centres and minor injury units in England in 2011-12; an increase of 8.5 per cent from 2010-11. [New HES data] Overall, we know that attendances at ED are rising in developed countries. [Lowthian 2010]

In the UK many patients use ED even when primary care offices or practices are open, with weekday attendances peaking in the mid-morning. The majority of ED attendances are self-referred, some 64.7 per cent (11,404,438) in 2011-12 and 34.4% (6.1 million) of all attendances had a recorded treatment of 'guidance/advice only' and 58.4% (10.3 million) of all attendances were discharged ('GP follow-up required' or 'no follow-up required').

There is considerable variation in attendance rates at EDs across practices. [Baker 2011] There is also considerable variation in emergency inpatient admissions across practices. [Saxena 2006] The reasons for this variation in rates across practice are poorly understood.

3. Methods

Our objective was to conduct a systematic review to identify studies that describe factors and interventions at primary care organisation level that impact on levels of utilisation of unscheduled secondary care (USC).

Inclusion criteria

Types of studies
Observational studies randomised controlled trials (RCTs) and other controlled studies and qualitative studies about interventions delivered in primary care to reduce unscheduled secondary care use.

Types of factors and interventions
Factors and interventions at the primary care organisation level, to include general practice, concerning organisation of out-of-hours service primary care services, access to primary care services (including financial barriers), clinician and practice culture factors and population and socio-demographic factors.

Study population
Studies that included people of any age of either sex living in OECD countries. [OECD website]

Other criteria
Any studies concerning any health condition as long as the outcome of interest is unscheduled secondary care i.e. attendance at an emergency department (ED) or an emergency hospital admission. We included studies written in any language.

Exclusion criteria

Studies that only reported admission for elective or planned health care including planned diagnostic services, admission to a community or non-acute hospital as an outcome and studies primarily about the clinical management of conditions.

Searches & reference management

A search strategy was developed for the electronic databases according to their specific subject headings or searching structure to search for papers of both primary studies and systematic reviews. Appendix one: Parent search strategy run in Medline. The search strategy was modified to search internet sites such as the Agency for Healthcare Research and Quality (AHRQ) and the King's Fund. These references underwent a two stage process of screening using the inclusion and exclusion criteria by two reviewers independently: a screen of titles and abstracts followed by a screening of the full papers. Where there was disagreement between reviewers about including or excluding a paper, a third reviewer made the final decision.

Struture of report

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

- *Systematic review*

This was used for topics that have either not been reviewed before or there has been many more studies since previous reviews.

- *Brief description of studies.*

This was used for topics that had very little evidence.

Data collection, analysis & reporting

For the studies that were systematic reviewed for publication, standardised data extraction forms were developed and then data will be abstracted by one reviewer and a second reviewer checked data abstraction against the original paper. Quality of studies was assessed by two reviewers. The risk of bias tool was used to assess RCTs and in an adapted form for controlled studies. Qualitative studies were assessed using CASP guidelines [CASP, 2006].

4. Results

Overall 148 papers describing 69 studies were included in this report (Appendix two: PRISMA diagram). [PRISMA website] Excluded studies are listed in appendix three along with reasons for their exclusion. The excluded studies are also included in the reference list.

4.1 Features of primary care:

This topic was reviewed for academic peer-reviewed for publication as a full systematic review as well as for inclusion in this report.

Results

General

We identified 48 papers relevant to the aim of our study, 26 papers describe studies of features influencing ED visits, and 22 papers describe studies of features influencing EHA. (appendix two) This includes one paper describing both outcomes [Christakis], and two sister papers describing ED visits and EHA respectively within the same population. [Baker, Bankart] The majority of studies are cross-sectional in design (n=42). The remaining studies are a mixture of designs: longitudinal (n=2), before and after (n=1) and case control (n=2).Generally the papers described data across two or more of features of primary health care

ED attendance studies (n=27)

More than half of these studies (n=16) were conducted in the US and Canada. [REF] The majority of the studies are cross-sectional in design (n=20). These studies are described in detail in **table 2a** and the main results are summarised in **table 2b.**

EHA studies (n=22)

The majority of these studies (n=12) were conducted in the UK and cross-sectional in design (n=18). These studies are described in detail in table **3a** and the main results are summarised in table **3b**.

Quality appraisal (table 1)

Several issues came out of the CASP quality appraisal of the studies. One was the generalizability of the studies; whilst some studies were country or state-wide for the whole population [e.g.Dusheiko, Purdy 2011a&b]; other studies analysed much smaller populations e.g. inner city boroughs. [E.g. Menec, Pereira] Equally some studies involved all patients on GP lists [e.g. Baker, Bottle 2008] whilst others dealt with specific groups such as patients with diabetes or paediatric patients. [E.g. Stern 2009, Brousseau 2007 & 2008,]

The majority of the studies described problems with response rates, bias and confounding factors, however for some studies that would impose serious caveats on the results of the study e.g. if there were poor response rates [e.g.Brousseau 2009] or only univariate analysis was performed. [Baker, Thomas 2008] The majority of studies however did perform multivariate analysis and so were able to model for the confounding factors. It was perhaps surprising that only four studies described cost data [Solberg, Dusheiko 2011b, Begley, Carlsen], the majority of the rest of the studies merely stated that the results had cost implications.

Continuity of care

ED attendance

Five studies consistently showed that continuity of care as measured by seeing the same family or specialist physician reduced ED attendance. [Christakis, Gill, Ionescu, McCusker 2012, Burge]

Emergency hospital admissions

The data suggests the effect of continuity of care may be context and condition-specific. One UK study shows that the easier it is to get an appointment with your own GP, the lower the EHA. [Bankart] A US study shows that reduced continuity of care with paediatric patients on Medicaid or with asthma was associated with increased EHA and one study carried out in Manitoba, Canada showed that high continuity of care was associated with a reduction in EHA. [Christakis, Menec] However, one further US study of diabetes, CHD and depression patients suggests that improved continuity of care with the same physician had no effect on EHA. [Solberg]

Access

ED attendance

Three US studies and one UK study indicate that increased access to primary care in terms of opening hours, slots available and nurse triage reduces ED attendance [Brousseau 2007 & 2009, Lowe, Sturm, Cowling] One of these suggests that this is true for both public & private insurance patients [Brosseau 2007]

One study in the Netherlands showed that positioning GP out of hours clinics near EDs reduced ED attendance. [van Uden] However, changes to the delivery of out of hours primary health care in the UK since 2004 and telephone triage by GPs replacing rota systems in Denmark have increased ED admissions in both countries. [Thompson, Vedsted] ED attendance is also increased if patients do not have a regular GP [Ionescu, McCusker 2010 & 2012] or a specialist practitioner [McCusker 2012]. However the picture is mixed in terms of higher physician to patient ratio

influencing ED attendance as one study [Ionescu] showed that high family physician availability was associated with greater ED use, although this grouping of the data includes areas with low specialist availability which could limit access to more intensive management of ambulatory care sensitive conditions. A higher ratio of GPs to registered patients has no effect on certain types of ED usage in a recent UK study [Ionescu, Cowling]

Patients' poor perception of primary health care access in terms of telephone access, shorter opening hours, no other place to go, refusal of appointments and unmet needs were associated with increased ED attendance. [Baker, Carret, McCusker 2010, Cheung 2011]

Emergency hospital admissions
One US study showed that poorer access to primary care services increased EHA, but a study in Ireland showed that increasing free primary care to those patients over 70 years of age had no effect on EHA.[Hossain, Nolan]
Whilst there are five studies which suggest that an increase in GP supply (availability of GPs in an area), reduced workload in relation to all patients, and a higher ratio of practitioners to MI patients reduces admissions [Guliiford, Purdy 2011b, Magan, Rizza, Basu], there are also five studies that looked at similar measures; physician density, GP per 10K population, average list per partner, physician supply and percentage of GPs with >2,500 patients which showed no effect on admissions [Carlsen, Purdy 2011a Magan, Duffy, Saxena]

Proximity

ED attendance

Practice features have an inconsistent association with ED attendance. One UK, county-wide study suggests that a smaller practice size increases ED attendance. [Baker] This same study also showed that patient proximity to a primary health care practice reduced ED attendance. [Baker] A US study focussed on the paediatric population showed that proximity to a primary health care practice also reduced ED attendance and in addition that proximity to ED department, increased use.[Ludwick] However, one UK study based in a north London district showed that close proximity

to primary care practice had no effect on ED attendance.[Harris] However the more recent and larger England wide study by Cowling suggested the shorter distance to GP practice compared to distance to hospital by foot or public transport reduced ED attendance.[Cowling]

Emergency hospital admissions
Two studies show that an increased distance of primary care practice from the hospital reduces EHA. [Carlsen, Bankart]   Equally, patient data shows that urban dwelling and proximity to EHA increases admissions. [Purdy 2011a&b, Basu] There is evidence that training (n=3 studies) and course provision (n=1 studies) within GP practices decreases EHA of patients from those practices.

Patient characteristics

All studies show that increased age results in increased ED attendance [Brosseau, Carret, Ionesco] and increased EHA. [Carlsen, Bankart, Duffy, Rizza, Basu] The only exception was Cowling 2013, a study covering 95% of GP practices in England, which showed that the percentage of patients 65 years or older was associated with a small reduction in patients who self-referred to, and were then subsequently discharged from, ED (relative rate 0.989 (95%CI 0.984, 0.994) p<0.001) suggesting that older patients may be less likely to attend with minor illness.. However, gender appears to be less important on ED attendance with four studies showing no effect with gender [Baker, Brosseau, Harris, Cowling] although one study from South America suggests women are more likely to attend the ED.[Carret] The EHA data is mixed with two studies from the UK and Norway showing women are more likely to experience EHA [Bankart, Carlsen] and three studies from Italy, Spain and USA showing men are more likely to undergo EHA [Rizza, Magan,Basu] It is therefore possible that these effects are country/culture specific. The evidence for the effect of ethnicity is also mixed for both ED attendance [Baker, Thomas, Brosseau, Harris] and EHA.[Rizza, Downing, Carlsen, Magan, Basu 2002] However this may be due to lack of data on ethnicity admissions and dependency on location and ethnic mix of population.
Decreased socioeconomic status is consistently associated with increased ED attendance [Begley, Baker, Ionescu, Harris, Lowe, Sturm, Cowling] and increased

EHA. [Magan, Duffy, Bankart, Purdy 2011a&b, Bottle 2008, Saxena, Christakis, Majeed] A similar effect is seen with social isolation and lack of social support for both ED attendance. [Carret, Harris, Ionescu] and EHA. [Carlsen, Majeed, Saxena]

One study associates increased education with reduced ED attendance. [Brousseau]. However, another study suggested that in the 50 years plus population, an increase in education increased ED attendance. [Carret] These two latter studies may suggest that overall education enables you to use ED services wisely but that with increasing age you need more heath care services generally. Increased education is consistently associated with EHA. [Carlsen, Magan, Majeed]

Two studies suggest that a proportion of the population may be reluctant to seek or choose to be low-users of health care and ED departments. A study by Harris in the UK, suggests that for a population that is older, male, white and living alone, being on a GP register as opposed to having no GP has no effect on ED use. [Harris] One study In Australia showed that non-attendance at primary health care centres for the past 3 years is associated with less ED attendance.[Thomas] One US study showed that parents of children with public health insurance that perceive good family centeredness in their primary health care provision was associated with a reduction in ED attendance.[Brousseau 2007]. However, two studies show that adult Medicaid versus private insurance patients use the ED department more and have more EHA. [Chueng 2012, Basu 2002] Patient satisfaction with primary health care services is also associated with reduction of EHA. [Carlsen, Rizza]

Having a chronic disease and multimorbidity is associated with ED attendance and EHA. One study showed that underlying morbidity in the presence of cardiovascular disease and digestive disease as well as terminal illness is associated with increased ED attendance, as is overall comorbidity.[Ionescu] Another study showed that a longer duration of symptoms until consultation and an absence of self-reported chronic diseases is associated with increased ED attendance.[Carret] A further study showed that an increased number of days in hospitals is associated with subsequent increased ED attendance.[Ionescu]

The presence of chronic diseases CHD, angina, asthma, COPD has been associated with EHA. [Downing, Ricketts, Purdy 2011a] As is the combination of

smoking with CHD, asthma or COPD. [Purdy 2011 a&b] However Cowling 2013 showed no effect of the prevalence of asthma, obesity and hypertension in English practice on ED visits.(Cowling) Underlying patient mortality is associated with increased EHA, although If patients with a higher risk of death are admitted rather than sent home from the ED, then that is an appropriate group to select for hospital admission.[Carlsen, Saxena]

There is one study associating worse self-reported health and increased admissions.[Rizza] This same study linked a greater number of hospital admissions following lower primary health care use in a period of one year and that shorter previous hospital stays resulted in increased EHA.[Rizza]

Practice features

ED attendance

Whilst practices lacking nebulizers for children and peak flow meters for adults increased ED attendance in one study, this study also found that practice lacking inhalers reduced ED attendance. [Lowe] The authors suggest that patient behaviour may be affected differently by these devices. Practices that have same day turnaround of laboratory tests were shown to reduce ED attendance. [Sturm]

Practices with nurse practitioners or physician assistants were associated with increased ED attendance [Lowe 2005] but another study found that if care was provided by either nurse or doctor there was no effect on ED use [Harris] Practices in which at least one clinician made hospital rounds, or having a specialist physician as opposed to a family physician (in older people) were associated with increased ED attendance. [Lowe, McCusker]

Emergency hospital attendance

The impact of overall size of a GP practice on EHA is conflicting. The evidence from two studies shows that that list size has no effect on EHA [Saxena, Ricketts] but two further studies contradict each other by one suggesting larger, and the other smaller practice size increase EHA. [Bankart, Purdy 2011a]

Features that do not appear to reduce EHA are the numbers of partners, the number of partners with MRCGP, or the share of salaried GPs. [Duffy, Carlsen] However

there is one US study which shows an increase in specialists in primary care is associated with increased EHA. [Basu 2002]There is one study that shows having female GPs in a practice reduces EHA. [Majeed]

The evidence for practices providing specific services is mixed. One study showed that cervical screening, child health surveillance, emergency contraception and maternity services was associated with increased EHA. [Downing] One UK study showed that providing prescription services for asthma, diabetes, heart failure, hypertension and COPD, and providing diabetes and asthma specialist services has no effect on admissions. [Saxena]

However the amount of certain services does seem to impact on reducing EHA with both health visitor hours per 1000 children under the age of five, and the number of primary care visits in the last months of life in congestive heart failure and COPD patients being associated with less EHA. [Hull, Kronman]

Quality of care measures

ED attendance

Overall there is a paucity of the effect of quality measures on ED attendance and quality measures data however one study showed that quality of care for diabetes patients reduced ED attendance of these patients. [Stern]

Emergency hospital admissions
Whilst two UK studies showed that general performance indicators for primary care practice had no effect on EHA. [Bankart, Downing], the evidence for quality of care measures for specific conditions is mixed. For patients with diabetes, two studies show that improved quality indicators reduce EHA [Bottle 2008, Dusheiko] but one of these studies suggests this association is only valid when comparing moderate to poor QoF indicators, and when moderate is compared with high indicators there is no effect. [Dusheiko]

High quality scores for angina were associated with reduced EHA, but condition specific quality markers for MI had no effect on EHA [Purdy 2011b]

Diagnosis of asthma by spirometry was shown to reduce EHA but there was no effect on EHA for asthmatics who received a review. [Purdy 2011a] There was also

no effect on EHA with increased clinical QoF scores for COPD patients. [Purdy 2011a]

Extra studies

Three additional UK studies concerning EHA became available to us shortly after the completion of the review. [Soljak, Calderon-Larranaga, Bottle 2011] Two sets of data from a cross-sectional study in the English population looked at stroke and COPD respectively. [Soljak, Calderon-Larranga] These studies reported an association of increased risk of EHA with the condition, smoking and deprivation. They reported a reduced risk of EHA with the individual QoF domains of influenza immunisation with COPD and cholesterol testing with stroke. Patient reported access to care (ability to obtain a consultation with a GP, and ability to book an appointment with a GP more than 2 days ahead) was also associated with reduced UHA. The third study looks at first time EHA with cancer in England. [Bottle 2011] Increased deprivation, higher total QoF, having no GPs with a UK medical qualifications and patient reported reduced access (providing appointments within 48hrs) were associated with increased UHA.

4.3: Qualitative & self-reported surveys

Due to the small amount of studies over a relatively wide topic area these studies are described just briefly in both tabular (**table 4**) and text format. There were 11 studies in total.

Adult patients and USC

There were six patients' surveys or semistructured interviews on use of USC of which four from the USA and two from the UK.

Studies conducted in the USA

Marco 2012 conducted standardised verbal interview with adult ED patients in Ohio, USA. Consenting patients were asked a series of questions on access to primary care, factors that influenced their decision to attend the ED, health insurance status and demographic information.292 study participants (89% response).Most

participants had a primary care physician (73%), but a minority had called their PCP about the current problem (31%). Most participants came to the ED because of convenience/location (41%) or preference for this institution (23%). Participants came to the ED, rather than their regular doctor, because they had no PCP (27%), an emergency condition (19%), or communication challenges (17%).

A cross-sectional survey of 563 patients who had self-referred to a university ED (USA) sought to determine whether these patients had PCPs or knew of other care sources and why they chose the ED. [Northington 2005] Of this sample, 56% had a PCP but for 66% of them, the ED was the only place they knew to go for their current problem. Twenty-seven percent said they depended on the ED for all their medical care and of those, 47% though that ED care rated better than care from a PCP. However, 52% though their PCP would be more efficient and 42% thought they would be cheaper.

A study by Rocovich 2012 involved a questionnaire administered to patients who were triaged into an acute or fast track part of the ED on a week day 8:00 am-5:00 pm July- August 2011 in Michigan, USA. 262 patients responded and were grouped according to self-reported severity of their complaints.129 patients put themselves into the non-emergent (unscheduled care) category and 131 categorized themselves into the emergent group. 61.5% of the non-emergent patients were single, 58.3% of the emergent patients were married. In the non-emergent group, 59.7% were unemployed, but in the emergent group 60.3% were employed (p<0.05). No other factors were significantly different.

A survey by Rust *et al* (2008) amongst 30 677 adults 18 years or older in New York, USA who reported having a usual source of medical care other than the ED answered questions related to barriers to primary health care. Four of the 5 following timely access barriers was independently associated with ED use, after adjusting for socioeconomic and health-related factors: "couldn't get through on phone" (OR 1.27 (95% CI 1.02,1.59); "couldn't get appointment soon enough" (OR, 1.45; (95% CI, 1.21,1.75); "waiting too long in doctor's office" (OR, 1.20; 95% CI, 1.02,1.41); "not open when you could go" (OR, 1.24; 95% CI, 0.99,1.55); and "no transportation"

(OR, 1.88; 95% CI, 1.50, 2.35). For those reporting no access barriers, 1 in 5 adults visited an ED at least once during the preceding year. For those reporting ≥1 barriers, the proportion was 1 in 3.

Studies conducted in the UK

In a UK study by Rajpar and colleagues, used semi-structured interviews with 102 patients attending ED departments and GP out of hours centres for primary care problems. 62% of ED attenders were unemployed compared with 41% of out of hours attenders. White people were more likely to attend ED departments and Asians the out of hours centre (p<0.01), and unemployed were more likely to attend ED departments (70% *v* 30%). 46.3% of ED department attenders had not contacted their GP before attending; 81.3% of first time users of the out of hours centre found out about it on the day of interview. Those attending ED thought waiting times at the out of hours centre would be 6.3 hours (median) compared with a median perceived time of 2.9 hours by those actually attending the out of hours centre.

One study conducted in the UK by Gerard 2005, a discrete choice experiment involved a self –completre questionnaire being given to NHS direct callers, A&E, GP services and NHS walk in centre attenders. Of the questionnaires distributed, 71% (432) were usable. None of the responses were from the NHS direct callers. There was no differences in responses between the remaining services. The survey population was 52% female, 80% 18-45yrs and 87% white. The most important preferences identified were: being informed at waiting times, quality of consultation, having a consultation with a nurse, having a consultation with a doctor and contacting the service in person. There were age differences in participants responses about contacting services, patients younger than 45 years had strong preferences, older patients did not. There was some evidence for the younger group suggesting they preferred to contact the system via an integrated telephone system rather than making contact in person.

Children care and USC

There were three qualitative studies and two survey studies describing childrens' use of USC all published 2011-12 , three of these were conducted in the USA and one in the UK.

Studied conducted in the USA

Separate focus group sessions were conducted with groups of guardians, primary care practitioners (PCP) and paediatric ED physicians in West Philidelphia with the aim of eliciting the opinions on non-urgent, paediatric ED visits. [Fieldston] Two main themes emerged from the guardian focus groups: a) perceived medical need in terms of receiving timely assurance of their concerns b) the accessability and availability of the ED system, it was felt that ED was more convinient and in some ways superior in what it could offer compared to primary care. In the health professional groups, it was thought that families could not perceive the difference between urgent and non-urgent medical needs and that familes found ED services much more convinent that primary care hours, Health professionals suggested that extending primary care to out of hours provision would improve this situation. The further health professional theme suggested that familes'personal issues also influence guardians' use of ED services but authors reported that family issues were not mentioned often in the guardian focus groups.

In a cross-sectional survey using questionnaires given to caregivers, PCP and ED personnel, the aim was to determine the most important reasons for non-urgent paediatric ED visits.[Salami] Less than 30% of caregivers considered consulting their PCP before a ED visit whilst 80% of PCP expected this to be the case. The reasons caregivers gave for non-urgent visits to the ED were need for medical attention outside PCP hours, lack of health insurance and better hospitality. Caregivers suggested improvements could be made by PCPs having longer hours and more EDs. Health professionals suggested caregivers had a lack of knowledge as to what consitutes an emergency and suggested the solution was caregiver education.

Semi-structured interviews of 26 specialists and 14 PCP in Cook county Ilinois [Rhodes] The aim was to explore the relationship between ED referrals and specialist willingness to accept children covered by Medicaid and CHIP. The main

themes identified by this study were a) rationing by insurance status b) strategies for allocation new patients appointments to children on Medicaid and c) that ED acted as access providers.

Studies conducted in the UK

In telephone interviews, McQuire *et al* 2011 sought to explore how parents navigate unscheduled care when their child of under five years old had a feverish illness. This was a UK study recruiting in three localities during a 6-month period. They were invited to participate in a telephone questionnaire supplemented by case note review. A subset of parents participated in an in-depth interview. Parents' first preference for advice was to see a GP (67%) and when unavailable, NHS Direct (46%). 155 made more than one contact and 63% of the repeat contacts were initiated by a service provider. A range of factors influenced parents' use of services. Parents who reported receiving 'safety netting' advice (81%) were less likely to represent to USC services than those who did not recall receiving such advice. Parents identified a need for accurate, consistent, written advice regarding fever and antipyretics.

Health professionals & USC

In a focus group study in which eight primary and secondary care clinicians in Derbyshire, UK discussed inappropriate hospital admissions and length of stay of patients with long-term neurological conditions.[Hammond 2009] The output was analysed thematically resulted in three main themes: the limitied capacity of health and social care resources, poor communication between primary and secondary health professionals and the cautioness of health professionals working in the community. Suggestions for improvements made by the health professionals were: new sub-acute care facilities, introduction of auxiliary nurses to support specialist staff and patient-held summaries of specialist consultations.

4.3 Intervention or evaluation studies of specific primary health care patient management

Due to the small amount of studies over a relatively wide topic area these studies are described just briefly in both tabular (**table 4**) and text format. There were 11 studies (n=8 USA studies, n=1 Canada, n= 2 UK)

Care models based on initial identification & subsequent management of frequent users of USC

Primary care physician identification of patients for case management n=1

A "controlled cohort study" in the USA by Sommers 2000 randomised 18 private primary care physicians who were asked recruit in turn 543 patients (~35 each) with preset criteria which included 1 or more visits to office in past year, age 65 years plus, 2 or more chronic diseases and unable to do one instrumental activity of daily living. The intervention was to provide case management with the primary care physician working with a registered nurse and a social worker over one year. The control group received usual care from the primary care physician only. Outcomes included hospital admissions, readmissions and ED visits . Baseline data were used from 1992-1993 and the study data were collected from 1993-1994. Odds ratios showed a significant effect of the intervention on number of hospital admissions per patient per year 0.63 (95%CI 0.41,0.96) and patients with ≥1 hospital readimissions within 60 days 0.26 (95% CI 0.08,0.84) but no effect on patients with ED visits p=0.77 Substracting implementation costs, this saved $90 per patient per year.

Primary intensive care n=2

In a pre and post study by Brown 2005 they sought to determine whether primary care patients with perceived inappropriate high healthcare use would require fewer emergency or inpatient services if enrolled in a weekly multidisciplinary clinic. Seventeen high-users or difficult management patients of a primary care centre were referred for the intervention, Primary Intensive Care (PIC) and were enrolled for 5-12 months. By chance, 16 patients had comorbid psychiatric diagnoses. Patients followed in the PIC Clinic had significantly lower hospitalisations (2.5± SD 3.5 vs. 0.9 ± 1.6; p=0.02) & and ED use (6.9± 12.2vs. 4.9 vs.9.0; p=0.05) during their enrolment

in the intervention compared to pre-enrolment time period, although the total hospital cost differences did not reach statistical significance. Patient and staff satisfaction was high, although the intervention was very difficult for the providers. There was no statistically significant cost differences pre and post intervention $1,904/month (range 0-4,380) vs. $1537 (range 0-6,830). This study was very small and the intervention very intensive in terms of time, expertise and cost, this was reflected in very wide confidence intervals.

A RCT by Sledge (2006) aimed to determine if a clinic-based ambulatory case management intervention, PIC, would reduce hospital utilization and total cost and/or improve health outcomes among primary care patients with a recent history of high use of inpatient services. Patients with 2 or more hospital admissions per year in the 12–18 months prior to recruitment in an urban primary care clinic were enrolled. Patients were randomized to the PIC intervention or usual care. PIC patients received a comprehensive multidisciplinary assessment and a team-generated plan. The PIC team nurse practitioner served as case manager for the 12 months

There were no significant differences when either comparing the number of admissions pre and post enrollment within groups or the follow up results post intervention between groups. A similar result was noted for the number of emergency department visits. The number of clinic visits increased in the intervention group by 1.5 visits per year which was statistically significant when compared to the control group. There was no difference is costs pre and post intevention and between intervention and control groups. (p=0.082)

Primary care of medicare patients n=1

Gilifilan 2010 studied the efficacy in a pre and post study with a propensity-selected control cohort (75 sites) of Proven Health Navigator (PHN), an intensive multidimensional medical home model that addresses care delivery including case management and financing, which was introduced into different primary care practices (11 sites) for Medicare beneficiaries in Pennsylvania, USA. Four years of claims data for Medicare patients at were analysed to calculate hospital admission and readmission rates, and the total cost of care. Regression modelling was used to

calculate predicted rates and costs in the absence of the intervention. Actual results were compared with predicted results to compute changes attributable to the PHN model. PHN was associated with an 18% (p <0.01) cumulative reduction in inpatient admissions and a 36% (p = 0.02) cumulative reduction in readmissions across the total population over the study period. Cost data showed a non-statistically significant reduction in costs of 7%.

Primary care of acutely ill patients n=1

In a controlled study, Stewart 2010 evaluated a new program, Integrating Physician Services in the Home (IPSITH) to integrate family practice and home care for acutely ill patients (5-10 day period) in London, Ontario, and surrounding communities, where home care is coordinated through the Community Care Access Centre (CCAC). The IPSITH program comprised of a medical coordinator (family physician, 1 day per week) and a full-time nurse practitioner were hired. Family physicians were invited to participate in recruitment meetings, where the IPSITH program was described and patient eligibility was explained. A medical infrastructure was put in place within the existing local CCAC that sought to enhance the usual care provided. Usual care included a case manager, who ordered nursing and allied health professional services as required. A total of 82 patients received the new IPSITH program of care between 2000 and 2002 (including 29 family physicians and 1 nurse practitioner), 82 non-randomized matched patients receiving usual care (and their physicians), community nurses, and caregivers. Controlling for symptom severity, fewer IPSITH patients had ED visits (3.7 vs. 20.7%; p = 0.002).

Primary care of elderly patients n=3
Walker 2005 carried out an evaluation of the "Keep Well At Home" (KWAH) Project for patients 75 years old or over in a west London primary care trusts in the UK. KWAH involves a two-phase screening process, including a home visit by a community nurse. It was left to the professional judgement of the community nurse, with support, if required, from the project coordinator, as to which, if any, of a range of personal care, domestic care, home maintenance and rehabilitation services was recommended for each participant. The aim of the evaluation was to determine whether KWAH resulted in fewer ED attendances and EHAs to hospital from Oct

1999-Dec 2002. The rates of EHAs in the 9 months before screening were similar in practices that did and did not join the project (rate ratio (RR) 1.05; 95% CI 0.95, 1.17), suggesting absence of volunteer bias. Over the first 37 months of the project, there was no significant impact on either ED attendances (RR = 1.02; 95% CI 0.97, 1.06) or EHA of elderly patients (RR = 0.98; 95% CI 0.93, 1.05).

Bynum *et al* 2011 compared two different models of primary care in four different continuing care retirement communities in New Hampshire, USA. In the first model (one site D), the physicians and two part time nurses delivered clinical care only at that site, and covered all settings within it and provided all after-hours coverage. In the second model (over three sites A, B & C), on-site primary care physician hours were limited; the same physicians also had independent practices outside the community; and after-hours calls were covered by all members of the practices, including physicians who did not practice on site. Residents at sites A and B had similar rates of EHA (19/100 person-years) and ED visits (0.60 per person-year). Site C had significantly fewer EHA (15/100 person-years) and half as many ED visits (0.31 per person-year). Site D had many fewer of both EHA & ED visits: only 7/100 person-years and 0.16 ED visits per person-year. Compared to site D, the other sites had 2.0–3.8 times higher rates of EHA and ED visits.

Lisk *et al* 2012 identified three nursing homes that had the highest number of multiple admissions (≥ 4) in a Surrey based NHS Trust in the UK from April 2006 to March 2009 inclusive). Four strategies were out in place to reduce hospital admissions these nursing homes for 3 months. An alert was also sent to the geriatrician if one of the residents was admitted so that their discharge from hospital could be expedited. The project was then extended for another 4 months with 6 nursing homes. The results showed that geriatrician input into all seven of the nursing homes had a significant impact on admissions. Geriatrician input into the initial three nursing homes had a significant impact on admissions from nursing homes (p < 0.05). The second part of the project (7 homes) also showed significant impact on admissions (p < 0.05).The length of stay in hospital for the residents was reduced.

Primary care group visits n=1

In a RCT conducted over 2 years, Coleman 2011 investigated whether monthly group visits (generally 8 to 12 patients) with a primary care physician, nurse, and pharmacist compared with usual care held in 19 physician practices reduced ED use in chronically ill older adults. The trial recruited 295 older adults 60 years old or more who were frequent utilization of outpatient services and one or more chronic illnesses. On average, patients in the intervention group attended 10.6 group visits during the 2-year study. These patients had fewer ED visits (0.65 vs.1.08 visits; p =0.005) and were less likely to have any ED visits (34.9 vs. 52.4%; p =0.003) than controls. These differences remained statistically significant after controlling for demographic factors, comorbid conditions, functional status, and prior utilization. Adjusted mean difference in visits was -0.42 visits (95% CI, -0.13, -0.72), and adjusted RR for any ED visit was 0.64 (95% CI, 0.44, 0.86).

Scheduling/engagement systems for patients who are potential freqent users of USC n=2

Patients without primary care provider n=1

In a controlled study, Murnik 2006 examined whether an enhanced scheduling system for follow-up care from the University of New Mexico Hospital Emergency Department (UNMH-ED) which assigned patients to a family medicine home could decrease ED use. A web-based information system was used by the UNMH-ED to refer uninsured, unassigned patients to family medicine homes. The outcome measured were ED use by eligible patients referred by the Web site to a family medicine home and outcomes of controls discharged from the ED in the usual Manner.756 patients were referred to family medicine homes through the web site and showed a 31% reduction (1,130 vs. 1,648 visits) in subsequent ED visits compared to controls. This reduction was most evident among those who had infrequent ED use prior to the study.

Recently released prisoners n=1

In a randomised trial by Wang 2012 two interventions were compared designed to improve primary care engagement and reduce USC: a "Transitions Clinic", a primary

care–based care management program with a community health worker, versus expedited primary care over 12 months. They recruited 200 recently released prisoners who had a chronic medical condition or were older than 50 years. Both groups had similar rates of primary care use (37.7 vs. 47.1%; p= 0.18).but Transitions Clinic participants had lower rates of ED use (25.5 vs 39.2%; p= 0.04).

5. Tables

Table 1 - Quality Assessment of cohort & case-control studies for section 4.1 features of primary care Adapted from http://www.casp-uk.net/wp-content/ Responses are Yes, No, Don't know

ED attendance studies

Author year	Is the study relevant to the needs of the project?	Does the paper address a clearly focussed issue?	Is the choice of study method appropriate?	Is the population studied appropriate?	Is confound-ing and bias considered?	Are tables/ graphs adequat ely labelled and understa ndable?	Are you confident with the authors' choice and use of statistical methods, if employed?	Can the results be applied to the local situation?	Were all important outcomes/ results considered ?	Is any cost-information provided?	Accept for further use as Type IV evidence?
Baker 2011	YES	YES	YES	YES But only Leicestershire & Rutland	YES Response rate varied median practice response was 47%	YES	Only univariate analysis	YES	YES	NO	YES
Basu 2002	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES
Begley 2006	YES	YES	YES	Data from very specific source (safety net	YES Discussion around data source	YES	YES?	YES	YES	YES	YES

				hospitals in Houston)							
Brousseau 2007	YES	YES	YES	YES	YES 96% response rate	YES	YES Univariate analysis	YES	YES	NO	YES
Brousseau 2009	YES	YES	YES	YES Children only in Wisconsin area	YES Poor response rate (40%)	YES	YES	YES	YES	NO	YES
Burge 2003	YES	YES	YES	YES	Don't know	YES	Yes But univariate analysis only	YES	YES	NO	YES
Christakis 2001	YES	YES	YES	YES Children only	YES in analysis & discussion	YES	Yes but univariate analysis only	YES	YES	NO	YES
Carret 2007	YES	YES	YES	YES	YES in analysis & discussion	YES	YES	YES	NO	NO	YES
Cheung 2011 & 2012	YES	YES	YES	YES but US only comparing insurance status	YES	NO No graphs	YES	YES to US	YES	NO But was about insurance status	NO
Cowling 2013	YES	YES	YES	YES	Yes in analysis & discussion	YES	YES	YES	YES	NO	NO
De la Fuente 2007	YES	YES	YES	YES	YES	YES	YES Time-series co-integration	YES	YES	NO	YES

							analysis				
Gill 2000	YES	YES	YES	YES but only Medicaid population	YES	YES	YES	YES	YES	NO	YES
Harris 2011	YES	YES	YES	YES but just one inner-London primary care trust	YES	YES	YES	YES	YES	NO	YES
Hull 2000	YES	YES	YES	YES	YES	NO Selective data reported	YES	YES	YES But not all reported	NO	YES
Ionescu 2007	YES	YES	YES	YES But only 65yrs plus patients	YES	YES	YES	YES	YES	NO	YES
Kronman 2008	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Lowe 2005	YES	YES	YES	YES but only Medicaid enrollees	NO	YES	YES	YES	YES	NO	YES
Lowe 2009	YES	YES	YES	YES but only Medicaid enrollees	YES Described in analysis	YES	YES	YES	YES	NO	YES

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Ludwick 2009	YES	YES	YES	YES but only paediatric Medicaid enrolees	YES In analysis & discussion	YES	YES	YES	YES	NO	YES
McCusker 2010	YES	YES	YES	YES but only adults with chronic conditions	YES A overall response rate of 76.4% Bias described in analysis & discussion	YES	YES	YES	YES	NO	YES
McCusker 2012	YES	YES	YES	YES	YES in analysis & discussion	YES	YES	YES	YES	NO	YES
Periera 2003	YES	YES	YES	YES for both cases & controls but only adult patients	YES In analysis	YES	YES	YES	YES	NO	YES
Stern 2009	YES	YES	YES	YES for both cases & controls but only diabetes patients	YES Response rate was 54% In analysis & discussion	YES	YES	YES	YES	NO	YES
Sturm 2010	YES	YES	YES	Yes but only pediatrics	YES in analysis & discussion	YES	YES	YES	YES	NO	YES
Thomas 2008	YES	YES	YES	YES but comparing Aboriginal & Torres Strait Islanders	YES Briefly in discussion	YES	YES but only univariate	YES	YES	NO	YES

				with other Australians							
Thompson 2010	YES	YES	YES	YES	YES in the discussion	YES	YES Only univariate	YES	YES	NO	YES
Van uden 2004	YES	YES	YES	YES	YES in the discussion	YES	YES B&A	YES	YES	NO	YES
Vedsted 2001	YES	YES	YES	YES	YES in the discussion	YES	YES	YES	YES	NO	YES

* There were two case–control studies Pereira 2003 & Stern 2009

Emergency hospital admissions

Author year	Is the study relevant to the needs of the project?	Does the paper address a clearly focussed issue?	Is the choice of study method appropriate?	Is the population studied appropriate?	Is confounding and bias considered?	Are tables/ graphs adequately labelled and understandable?	Are you confident with the authors' choice and use of statistical methods, if employed?	Can the results be applied to the local situation?	Were all important outcomes/ results considered?	Is any cost-information provided?	Accept for further use as Type IV evidence?
Bankart 2011	YES	YES	YES	YES	Response rate was only 44% & there was response rate variation between practices. Test of validity using model on previous yr's data	YES	YES	USE	YES	NO	YES
Bottle 2008	YES	YES	YES	YES	No pilot study or validation described	YES Although some data presented as graphs	YES But only univariate analysis	YES	YES but only diabetes	NO	YES
Carlsen 2007	YES	YES	YES	YES	The patient response rate varied between counties from 52-70%	YES	YES	YES	YES But no physician data	YES	YES

					data was lacking from 4/435 municipalities						
Christakis 2001	YES	YES	YES	YES	YES Used validated scores for CoC & PCDS	YES	YES	YES	YES	NO	YES
Downing 2007	YES	YES	YES	YES But only 2 PCTs were involved both in the west Midlands, UK	YES In the form of discussion around confounding factors	YES	YES	YES	YES	NO	YES
Dusheiko 2011b	YES	YES	YES	YES	Yes But analysis is at practice level not patient level	YES	YES	YES	YES But only diabetes	YES	YES
Duffy 2012	YES	YES	YES	YES But study performed in Dundee, Scotland only	YES In the form of discussion around confounding factors	YES	YES	YES (most data involved just one hospital)	YES	NO	YES
Guliiford 2002	YES	YES	YES	YES	YES As part of analysis &	YES But only final	YES	YES	Selective criteria	NO	YES

					discussion	analysis data given					
Hossain 2009	YES	YES	YES	YES	YES Yes as part of analysis & discussion	YES	spatial structural equation modelling on cross sectional data	YES	YES	NO	YES
Magan 2011	YES	YES	YES	YES	Data provided was often incomplete & imprecise It was not possible to distinguish admission s from readmissions	YES	YES	YES	YES	NO	YES
Majeed 2000	YES	YES	YES	YES But study performed in London area only	YES Within multivariate analysis	YES	YES	YES	YES	NO	YES
Menec 2006	YES	YES	YES	YES but >67yrs only	YES	YES	YES	YES	YES	NO	YES
Nolan 2011	YES	YES	YES	YES But a very specific population in special situation	YES unique patient identifier not available so could not identify	YES	YES	YES	NO? Admission related data could also have been correlated	NO	YES

					repeat admissions. Used hospital discharge.				e.g. length of stay		
Purdy 2011a	YES	YES	YES	YES But only asthma & COPD	YES a priori confounders in analysis	YES	YES	YES	YES	NO	YES
Purdy 2011b	YES	YES	YES	YES But only CHD	YES a priori confounders in analysis	YES	YES	YES	YES	NO	YES
Ricketts 2001	YES	YES	YES	YES	YES As part of analysis	YES	YES	YES	YES	NO	YES
Rizza 2007	YES	YES	YES	YES But is a select population	'A random sample of 520 medical records of patients' but 94.6%, response rate. Question-naire was pretested to improve validity of responses.	YES	YES	YES, but only one hospital	YES	NO	YES
Saxena 2006	YES	YES	YES	YES but only London data	YES Analysis at primary care trusts level Some patient	YES	YES	YES, but London area only	YES	NO	YES

					registered in one PCT, lives in another Data quality was not validated						
Solberg 2004	YES	YES	YES	YES USA data	Don't know	YES	YES	YES To the US population	YES But admission related data could also have been correlated e.g. length of stay Only diabetes, CHD & depression	YES	YES

Responses are Yes, No, Don't know

Table 2a: Primary care features & ED attendance n=27 studies

+ Positive association i.e. increases ED use -negative associations i.e. decrease ED use # no effect on ED use

Study Year country Design	Setting & participants	Methods	Primary care features which have associations with emergency department attendance				
			Access	Patient features	Practice features	Continuity of care	Quality of care
Baker 2011 UK sister paper to Bankart Cross-sectional	Attendances at emergency departments data in '06/'07 and '07/'08 in relation to 2 English PCTs, Leicester City & Leicestershire County and Rutland, with 145 general practices	A hierarchical negative binomial regression model was used. Data were expressed as regression coefficient (95% CI, p value)	Lower patient satisfaction with practice telephone access (+) -0.004 (-0.008, -0.0004, p=0.03)	Deprivation (+) 0.02 (0.01, 0.03, p<0.0001) % of patients 65yrs plus (#) White ethnicity (+) 0.004 (0.001,0.007, p=0.006) Gender (#)	Smaller list size (+) -0.0000 (-0.0000, -0.0000, p= 0.0005) Shorter distance from hospital (+) -0.02 (-0.03,-0.01, p<0.0001)		Quality and outcomes framework points (#)
Begley 2006 USA Cross-sectional	ED visit data from 5 safety net hospitals(provides subsidised	New York University ED algorithm was applied. Data expressed		Increased IMU (+) -.46 p<.0001			

	care for all): two public hospitals operated by district and 3 private non-profit general hospitals that serve substantial no. of uninsured in '02 & '03 in Houston , Texas	as Pearson correlation coefficients (p value)& used in regression model.		Unit decrease in IMU score is associated with >1.7 per 1,000 in PC-related ED visit rate p<0.0001 Rate of uninsurance (+) .56 (p<0001) 1% increase in un-insured rate associated with >35.2 per 1,000 population in PC-related ED visit rate p<0.0001 Deprivation (+) .85 P=0.001 unit increase in the % below poverty was associated with >4.3 per 1,000 in PC-			

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				related ED visit rate p<0.0001			
Brousseau 2007 USA Cross-sectional	8823 children (≤17 yrs)from '00–'01 & '01–'02 Medical Expenditure Panel Survey panels- a subsample of the US National Health Interview Survey	Parent-reported quality of PC was assessed using Consumer Assessment of Healthcare Providers and Systems survey & related to the primary outcomes of no. of subsequent (non-urgent- not reported here) & urgent ED visits per child. Data expressed as IRR (95% CI)	Greater realized PC access for publicly and privately insured (-) 0.97 (0.70,1.34) 0.96 (0.68,1.34) respectively Timeliness of care (#)				Parent's perception of high-quality family-centeredness for publicly insured children & children ≤ 2yrs (-) 0.95 (0.69,1.29) Quality-of-care domains (#)
Brousseau 2009 USA Cross-sectional	5468 children enrolled in Wisconsin Medicaid whose parents had completed the Consumer Assessment of Healthcare Providers and Systems surveys during fall '02 and fall '04	Baseline parent-reported quality of PC was assessed & negative binomial regression used to determine association between domains of care and urgent ED utilization. (non-urgent not reported here Data expressed	High-quality realized PC access (-) 0.67 (0.52,0.86, P<0.05) High-quality timeliness (-) 0.82 (0.67,0.99, P<0.05)	Older children vs. younger (<17yrs) (+) 1.70 (1.35,2.14 P<0.05) Female vs male (#) Health status excellent/	Nurse or doctor care (#)		Parent's perception of high-quality family centeredness (#)

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		as IRR (95% CI, p value)		v.good vs. good/fair/ poor (#) increased education (beyond high school) (-) 0.80 (0.67,0.96, P<0.05) Spanish vs. English (#) Ethnicity (#)			
Burge 2003 USA Cross-sectional	Hospital admissions & separation data from 8702 adults with a recorded date of cancer diagnosis who died of cancer & who made ≥3 visits to FP in last 6ths of life on the Nova Scotia Cancer Registry, and Physician Services **(**1992 to 1997)	The relationship was made between total ED visits & continuity of care, developed using Modified Continuity Index using negative binomial regression with adjustments for demographic factors & health status. Data expressed as Rate R (95% CI)				Lower FP continuity of care (+) Low vs. high RR -3.93 -3.57,-4.34 Moderate vs. high 2.28 (2.15 ,2.42)	
Cheung	2005 data	Statistical		Adults with			

2011 & 2012 USA Cross-sectional	from 317, 497 adults (age,≥18 years)from the National Health Interview Survey (NHIS), a cross-sectional household interview survey that approximates non-institutionalize d US civilian population. ('99 – '09)	analyses using Stata 10.1 Survey commands were used to create nationally representative estimates. Multivariable analyses adjusted for demographic, socioeconomic status, health conditions, & access to care variables. Barriers were 1) "Couldn't get through on the telephone"; (2) "Couldn't get an appointment soon enough"; (3) "Once you got there, you have to wait too long to see the doctor"; (4) "The (clinic/doctor's) office wasn't open when you could get there"; and (5) "Didn't have transportation." These barriers were used to predict self-reported		higher number of barriers to PC were more likely to visit ED (+) OR 1.37 [95% CI1.31,1.43] for 1 barrier OR 1.68 [95% CI, 1.60,1.78] for≥2 barriers Medicaid vs. private insurance patients (+) OR 1.48; 95% CI 1.41 , 1.56 Medicaid beneficiaries with 1 barrier or ≥2 barriers compared with that for individuals with private insurance and same barriers. (+) OR 1.66;			

		ED visits during the past 12 months. Data expressed as % of patients with barriers and ODs		95% CI 1.44, 1.92) OR 2.01; 95% CI 1.72 , 2.35 respectively			
Christakis 2001 USA Cross- sectional	46 097 paediatric patients at Group Health Cooperative, between 01/01/93-31/12/98	A continuity of care index that quantifies the degree to which a patient has experienced continuous care with a provider. Data expressed as HR (95% CI)				Higher continuity of care [-] High vs medium HR 1.28 (1.20,1.36) High vs. low HR 1.58 (1.49,1.66)	
Carret 2007 S America Cross-sectional	ER service data utilization of all patients aged 15 years or older in Pelotas, Brazil. was collected in spring of '04 to monitor ER demand 24 hrs a day for 13 consecutive days (9 wkdys, 3 w'kend dys	Urgency of presenting complaint was defined by Hospital Urgencies Appropriateness Protocol. Multivariable Poisson regression was carried out to examine factors associated with inappropriate ER	Patients who reported that the PHC clinic which they use is open for shorter periods during the day (+) No data Patients who reported there was no other place to go (+) 1.38 (1.01,1.89, p=0.009)	Greater age (+) p= 0.001 (some results stratified by age) Longer duration of symptoms until consultation (+) from 1 vs. 11 days			

	& 1 holiday).	use. Data expressed as PR (95% CI, p value)	Patients reporting that doctor at regular place of care refused them without a prior appointment (+) 1.44 (1.02,2.02, p=0.05)	PR= 2.18 (1.66 ,2.87, p<0.001) Being female (15-49yrs) (+) PR = 1.52 (1.23, 1.88) Amongst older (50+) patients: More education (+) Greatest vs. least PR= 1.49 (0.91, 2.44, P=0.06) Absence of self-reported chronic diseases (+) PR= 1.50 (1.03 ,2.17, p=0.03) Lack of social		

				Support (+) PR=1.40 (1.01,1.95, p=0.05)			
Cowling 2013 UK	Patients registered with 7,856 general practices in England (April '10- March '11 with a total registered population of 54,225,700 (~95% of practices in England)	Main outcome was the number of type 1 ED visits recorded as a self-referral & discharged either without need for follow up or follow up with GP related to measures of primary care access Negative bionominal regression model was used Analysis controlled for age, sex, ethnicity, socioeconomic health & urban/rural profiles, supply of GPs and relative travel to nearest hospital Data presented as RR (95% CI)	GP practices providing for timely access (seeing GP within 2 days(-) RR=0.898 (95% CI 0.853,0.945) p<0.001 No. of GPs per 1,000 registered patients (#)	≥65yrs (-) RR 0.989 (95% CI 0.984,0.994) P<0.001 % of males (#) % White (#) Deprivation (IMD) (highest to lowest) (+) RR 1.417 (95% CI 1.330,1.509) P,0.001 Prevalence (%) of asthma, hypertension, obesity (#)	Increased travel time to hospital relative to GP practice by public transport/on foot (-) RR 0.974 (95% CI 0.963,0.984) P<0.001 Rural vs. urban (-) RR 0.85 (95% CI 0.811,0.890) P<0.001		
De la fuente	All emergency	The time series	Greater				

2007 Spain Cross-sectional	visits (n=6.454.034) made to ED & PC continuing care points (CCP's~ out of hours service) in Asturias & of each one of the healthcare districts ('94- '01)	were constructed with monthly frequencies for Asturias & each one of the districts, a co-integration analysis having been made to assess whether the two series are inter replaceable. Data expressed as annual % increase	accessibility to the PC CCP's (#)				
Gill 2000 USA Cross-sectional	100% sample (n= 11 474). of Delaware Medicaid claims for 1 year '93-94	Continuity with single provider during year was calculated for each participant. These data were related to ED attendance in a multivariate analysis Data were expressed as ORs with 95% CI				Continuity with a single provider (-) for a single ED visit 0.82 (0.70,0.95) & for multiple ED visits 0.65 (0.56,0.76)	
Harris 2011 UK Cross-sectional	68 general practices in Brent Primary Care Trust, north London, UK. (2007- 2009)	Routinely collected data from GP practices, HES, and census data across three broad domains: GP access characteristics,	Total opening hours (#) Total whole-time equivalents (#) Satisfied with the GP practice (#)	Increase in IMD score (+) 60.13 (40.56,70.70, P<0.05)	Registered population that live within 1 km from GP practice (#)		

		population characteristics, and health status aggregated to the level of the GP practice. Multiple linear regression was used. Data expressed as Beta coefficient (95% CI, p value) for 2007-2009 period	Able to get through to GP practice on telephone(#) Able to speak to GP(#) Able to get appointment fairly quickly(#) Able to book ahead(#) Satisfied with the opening hours(#) Desired more opening hours(#) Felt out-of-hours care took a long time(#) Felt that the out-of-hours GP service was good(#) Able to see a preferred GP(#) Had to wait a long time at GP practice(#)	Standardised Mortality Ratio (+) 20.16 (10.07,30.25, P<0.05) % registered population receiving incapacity benefits (+) 230.89 (160.81,300. 98,P<0.05) % Registered lone-parent households (+) 160.74 (120.19,210. 29,p<0.05) %Male (#) On GP register and aged >65 years (#) On GP register and white (#) On GP register and			

				in a lone-pensioner household (#)			
Ionescu 2007 Canada Cross-sectional	A random sample of 95, 173 people aged ≥65 yrs drawn from provincial administrative databases in Quebec for '00 & '01.	Data were collected on rate of ED use, use of hospital & ambulatory physician services, residence (urban v. rural), socioeconomic status, access and continuity of primary care. Data were adjusting for age, sex and comorbidity & expressed as Rate R (95% CI, p value)	Lack of a primary physician (+) 1.45 (1.41,1.49) Residence in a region with a higher physician :population ratio (+) Mixed vs. low 1.23 (1.21,1.26) High vs. low 1.10 (1.08,1.11) Both p<0.001	Living in a rural area (+) Intermediate vs. urban 1.22 (1.20,1.23, p< 0.001) Rural vs. urban 1.51 (1.48,1.54, p< 0.001) low socio-economic status (+) high vs. low 1.50 (1.46,1.54, p< 0.001) high overall comorbidity (+) (Charlson comorbidity score & medication-based chronic disease	Living near ED department (+) 1.21 (1.19,1.22, p< 0.001)	Higher continuity of care [-] (Stronger protective effect in urban than rural area) High vs. low 0.46 (1.44,1.48, p < 0.001) High vs. medium RR 1.27 (1.25,1.29, p< 0.001)	

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				score) 1.07 (1.07,1.07) & 1.04 (1.04,1.05) p< 0.001 for both presence of cardio-vascular or digestive disease (+) 1.41 (1.39,1.44) 1.66 (1.64,1.68) P<0.001 for both increased no. of days in hospital (+) 1.05 (1.05, 1.05, P< 0.001) terminal illness (or deteriorating health) (+) 2.01			

				(1.98,2.05, p< 0.001) Greater age (+) 1.18 (1.17,1.18, p< 0.001)			
Lowe 2005b USA Cross-sectional	57,850 patients assigned to 353 primary care practices affiliated with a Medicaid HMO (Aug 1st-, '98-July 31'99)	A survey instrument was used to measure practice characteristics that might reflect access or quality of care. Analyses was adjusted for patient characteristics Data were expressed as RR (95%, p value)	Higher ratio of no. of active patients per clinician-hour of practice time (+) 1.05 (1.01,1.11, p=0.01) No. of week day daytime office hours per week (#- but near significance) Greater no. of week day evening office hours per week (-) greater effect for adults compared with children No hours vs.≥12hrs for all patients 0.80 (0.67,0.95,		% of Medicaid patients in a practice (+) 1.04 (1.001,1.08 p= 0.04) Practices with nurse practitioners or physician assistants (+) 1.11 (1.0002,1.22p =0.049) Practices where at least 1 clinician made hospital rounds (+) 1.09(1.004, 1.19, p=0.04) Practices lacking		

			p=0.01)		nebulizers for bronchodilators (+ for children) 1.13 (1.02,1.24,p=0.02)		
					Practices lacking peak flow meters (+ for adults overall and for adults with respiratory conditions) 1.15 (1.07,1.2,p<0.001) 1.20 (1.05,1.37)		
					Practices lacking inhalers (-) 0.78 (0.68,0.90 p= 0.001)		
Lowe 2009 USA Cross-sectional	Admin data from July 1, '03-Dec 31, '04. Residence ZIP codes were used to assign all 555,219 Medicaid enrollees to	Andersen's model of access to care, which includes predisposing characteristics enabling resources, perceived & objective needs; & health	Great PC capacity (estimated provider visits available/ visits needed) (-) 0-1 vs.2.0 visits -0.10 (-0.20, -0.026, p= 0.044) 0-1 vs.1-2 visits		Driving time to hospital (+) ≤10 vs. >30 mins -0.26 (-0.38, -0.13, p<0.001)		

	130 primary care service areas (PCSAs).	care system characteristics Data expressed as ED (95% CI,p value)	-0.12 (-0.20, -0.044, p=0.002)				
Ludwick 2009 USA Cross-sectional	26,038 children ≤ 18 yrs in 332 PC practices affiliated with a Medicaid HMO in South eastern Pennsylvania. (Aug 1 '98- July 31, '99).	Secondary analysis of cohort study data that examined association between PC practice characteristics & ED use. Data expressed as RR (95% CI, p values)	Distance from PC practice (-) 0-0.7 vs. .3.13miles 1.10 (0.99,1.21, p=0.06) (p=0.06 overall) Distance from nearest ED department (+) 0-0.58 vs.1.19 miles 0.89 (0.81–0.99, p=0.03) (p=0.01 overall) Distance from nearest children's hospital (#)				

McCusker 2010 Canada Cross-sectional	33,491 Québec residents aged ≥18yrs who reported at least one GP contact during previous 12 mths & were not hospitalized.	Multiple logistic regression of data from 2 cycles (2003 & 2005) of the Canadian Community Health Survey carried out in 2003 & 2005. Data expressed as OR (95% CI) .	No regular GP(+) 4.23, (3.43, 5.21)		Perception of unmet needs (+) 1.28 (1.01, 1.63) Presence of chronic conditions (#)	
McCusker 2012 Canada Cross-sectional	Cohort of 367, 315 adults ≥18 yrs resident in urban areas of Quebec. (Apr. '03- Mar '06).	Multivariable negative binomial regression to investigate relationships between measures of care & ED use in 12mth period IRR (95% CI)	No registered FP or specialist for those <65yrs (+) 1.11 (1.05, 1.16) & 1.10 (1.04, 1.17) respectively. Specialist physician as opposed to fam. physician for those >65yrs (+) 1.13 (1.09,1.17)			Greater CoC with FP with participants ≥ 25 visits to a physician during the 2 yr baseline period. (-) 1.17 (1.07,1.28) Greater CoC with specialist physician (-) Low v. high 1.17 (1.07,1.28) Medium v. high 1.10 (1.01,1.18)

Pereira 2003 USA Case-control	3,931 adults whose PCP who left a large multi-specialist practice (Jul '94- Jun '96) compared with those adults (8,009) in the same practice who still had their PCP for the study period.	Comparison of measures of quality of care & use of urgent care & the ED department Data expressed as mean numbers of ED visits.				PCP departure (#)	
Stern 2009 Israel Case control	919 type 2 diabetes mellitus patients within a large HMO who were admitted to one of West Jerusalem's ERs (May – June '04 & were compared with 1952 control subjects not admitted.	Study covariates were retrieved from the HMO's database & a study subset of the study population was interviewed. Logistic regressions were conducted to estimate ODs (95% CI, p value) of being admitted according to measures of quality of care.					Quality of care for diabetes patients as measured by Cholesterol testing (-) 0.23 (0.19, 0.29, p< 0.001) Glycated haemoglobin test (-) 0.26 (0.24,0.29, p < 0.001) Visiting an ophthalmologist (-) 0.47 (0.32,0.68, p =0.001) Recommendations to stop smoking

							(-) 0.10 (0.05,0.21 p < 0.001)
Sturm 2010 USA Cross-sectional	127 017 patient visits to the 2 tertiary care PEDs (Nov '06, -Oct '07) were reviewed with PC practice characteristics prospectively collected from 33 practices.	Discriminant analysis classification model used to identify practice characteristics associated with Non-urgent versus urgent utilization of the PED. Data presented as discriminatory patterns.	Greater total available sick slots to see patients per physician (-) Office policy to have after-hours nurse triage line call on-call physician prior to disposition to PED (-) Office policy to accept all walk in sick visits (-)		% patients with Medicaid (+) closer distance to the PED (+) Ability of practice to have same-day turnaround of laboratory tests (-)		
Thomas 2008 Australia Cross-sectional	2004–05 data from the National Non-admitted Patient Emergency Department Care database from Northern Territory &Western Australia	Data used to assess equity in the accessibility and quality of care received in EDs by Aboriginal and Torres Strait Islander people compared with other Australians. Data presented as ratio.			Indigeous people (+) 1.7:1 ratio of presentation at ED with non-indigenous people		
Thompson 2010	Routinely collected data	The data were analysed by using	Change in the delivery of OoH				

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UK longitudinal	before, during & after the delivery of out-of-hours primary medical care in the UK were changed in 2004. (Sep & Oct '99- '06 were included)	a simple linear regression model to analyse the yearly trend for 1999–2003 and plotting subsequent observed monthly attendances against predicted numbers. Data presented in graph form only.	primary medical care in UK since 2004 (+) Increase in % non-trauma vs. trauma patients, at all times 1999-2006 Slope=0.015, SE=0.00081, x2 (df=1) for trend=363.1, p<0.001				
Van uden 2004 The Netherlands Before & after	Until Sep '01, OoH PC was organised in 24 small practice rotas. OoH was reorganised & 3 large GP cooperatives were created, located near but independent of the only 3 hospital EDs in the province of Limburg	Before & after (4wks) reorganisation of primary care all patient contacts with GPs & hospital EDs were analysed using GP cooperatives' & hospital computer system. Data presented as total numbers & %.	Presence of GP OoH cooperatives near EDs (-) Absolute change -2292 (8.9%)				
Vedsted 2001 Denmark Longitudinal	A reorganisation of the OoH GP service in Denmark in 1992 including	Calculation of the number of annual contacts per inhabitant from 1988 to 1997. Linear regression	A mandatory telephone triage staffed by GPs & replacing small rota systems (+) 0.0026				

	a mandatory telephone triage staffed by GPs & the replacement of small rota systems with county-based health centres. in the County of Aarhus.	Data presented as correlation coefficient (95% CI, p value)	(0.0017, 0.0036, P=0.0002)				

Index ACSC =ambulatory care sensitive condition(s);GP =general practitioner;CHD= coronary artery disease; COPD= Chronic obstructive pulmonary disease

DOH= Department of Health; DSR=directly standardised rates; EA =emergency admissions ;ED= estimate of difference ; FP family physician; HES= Hospital Episode Statistics; HF= heart failure;HR= hazard ratio; HMO health maintenance organisation; IRR=Incident rate ratio; Rate R =rate ratio; Rel.rate =relative rate; RR = risk ratio; IMU Index of Medical Underservice; IMD index of multiple deprivation;NS= not statistically significant; OR=odds ratio; PEDs Paediatrics emergency departments ; PCT=primary care trust; PR –=prevalence rate; QoF – Quality and outcomes framework; 95% CI Confidence intervals

Table 2b: Summary of features of primary care that influence ED attendance.

Features which **REDUCE** unplanned ED attendance (author, country)

Access	Practice factors	Patient factors	Continuity of care	Quality of care
Greater realized PC access [Brousseau 2007,2009, USA] Greater realized PC access for publicly and privately insured [Brousseau 2007,USA] High-quality timeliness /timely access (2 days) [Brosseau 2009, USA, Cowling 2013, UK] Greater no. of week day evening office hours per week -greater effect for adults compared with children [Lowe, USA] Great PC capacity (estimated provider visits available/ visits needed)[Lowe, USA] Greater total available sick slots to see patients per physician [Sturm, USA] Office policy to have after-hours nurse triage line call	Short distance from PC practice [Ludwick, USA, Cowling 2013] Practices lacking inhalers [Lowe, USA] Ability of practice to have same-day turnaround of laboratory tests [Sturm, USA] Rural vs. urban practices (Cowling 2013, UK)	Increased education [Brousseau 2009 , USA] Parent's perception of high-quality family-centeredness PC for publicly insured children & children ≤ 2yrs [Brousseau 2007, USA] % of patients ≥65yrs of age (Cowling 2013, UK)	Higher continuity of care [Christakis,USA; Gill USA Ionescu, USA; McCusker, Canada]	Quality of care for diabetes patients as measured by: Cholesterol testing Glycated haemoglobin test Visiting an ophthalmologist Stopping smoking [Stern, Israel]

on-call physician prior to disposition to PED [Sturm, USA] **Office policy to accept all walk in sick visits [Sturm, USA]** **Presence of GP OoH cooperatives near EDs [van Uden, The Netherlands]** **Availability of a Transitions Clinic [Wang, USA]**				

Features which **INCREASE** ED attendance

Access	Practice factors	Patient factors	Continuity of care	Quality of care
No primary physician [Ionescu, Canada] **No registered FP or specialist for those <65yrs [McCusker, Canada]** **Absence of a regular GP [McCusker, Canada]** **Higher physician :population ratio [Ionescu, Canada]**	**Practices with nurse practitioners or physician assistants [Lowe, USA]** **Practices where at least 1 clinician made hospital rounds [Lowe, USA]** **Specialist physician as opposed to fam. physician for those >65yrs [McCusker, Canada]**	**Deprivation (Cowling , UK)** **Older children vs. younger (in practice) [Brosseau 2009, USA]** **Greater age [Carret, S. America; Ionescu, Canada]** **Being female (15-49yrs) [Carret, S. America]** **Number of barriers to PC (Cheung 2011, USA)**	**Lower continuity of care [Burge.USA]**	

		Medicaid patients vs. private insurance patients (Cheung 2012, USA)		
Change in the delivery of OoH primary medical care in UK since 2004 [Thompson,UK] A mandatory telephone triage staffed by GPs & replacing small rota systems [Vedsted, Denmark]	Smaller list size [Baker, UK] Shorter distance from hospital [Baker, UK]	White ethnicity [Baker, UK] Indigeous people [Thomas, Australia]		
Lower patient satisfaction with practice telephone access [Baker, UK] Patients who reported that the PHC clinic which they use is open for shorter periods during the day [Carret, S.America] Patients who reported there was no other place to go [Carret, S. America] Patients reporting that doctor at regular place of care refused them without a prior appointment [Carret, S.America] Perception of unmet needs [McCusker, Canada]	Practices lacking nebulizers for bronchodilators (+ for children) [Lowe, USA] Practices lacking peak flow meters (+ for adults overall and for adults with respiratory conditions) [Lowe, USA]	Amongst older (50+) patients, more education [Carret, S.America]		

		Increased IMU [Begley, USA] **Deprivation [Baker,UK;Begley, USA]** **Rate of uninsurance [Begley, USA]** **low socio-economic status [Ionescu, Canada]** **Increase in IMD score [Harris, UK]** **% registered population receiving incapacity benefits [Harris, UK]** **% of Medicaid patients in a practice [Lowe, USA; Sturm, USA]**		
		Lack of social support [Carret, S.America] **% Registered lone-parent households [Harris, UK]** **Living in a rural area [Ionescu, Canada]**		
		Longer duration of symptoms until consultation [Carret, S.America]		

		Absence of self-reported chronic diseases [Carret, S.America] high overall comorbidity [Ionescu, Canada] Standardised Mortality Ratio [Harris, UK] for both presence of cardio-vascular or digestive disease [Ionescu, Canada] terminal illness (or deteriorating health) [Ionescu, Canada] increased no. of days in hospital [Ionescu, Canada]		

Features which have **NO EFFCT** on ED attendance

Access	Practice factors	Patient factors	Continuity of care	Quality of care
Timeliness of care [Brousseau, USA] Greater accessibility to the PC CCP's [De la fuente, Spain] Total opening hours [Harris, UK]	Nurse or doctor care [Brosseau, USA] Total whole-time equivalents [Harris, UK] No of GPs per 1,000 registered patients (Cowling UK)	On GP register and aged >65 years [Harris, UK] Female vs male [Brousseau, USA, Cowling UK] % Male [Harris, UK, Cowling UK]		Quality and outcomes framework points [Baker, UK;Brousseau 2007,USA]

No. of week day daytime office hours per week (- but near significance) [Lowe, USA]	**PCP departure [Pereira, USA]**			
Had to wait a long time at GP practice [Harris, UK] **Able to see a preferred GP[Harris, UK]** **Felt that the out-of-hours GP service was good [Harris, UK]** **Felt out-of-hours care took a long time [Harris, UK]** **Desired more opening hours [Harris, UK]** **Satisfied with the opening hours [Harris, UK]** **Able to book ahead [Harris, UK]** **Able to get appointment fairly quickly [Harris, UK]** **Able to speak to GP [Harris, UK]** **Able to get through to GP**	**Distance from nearest children's hospital [Ludwick, USA]**	**Spanish vs. English [Brousseau,USA]** **Ethnicity [Brosseau, USA]** **On GP register and white [Harris, UK]** **On GP register and in a lone-pensioner household [Harris, UK]** **Health status[Brosseau, USA]** **Presence of asthma, obesity & hypertension (Cowling, UK** **Parent's perception of high-quality family centeredness [Brosseau,2009, USA]**		

practice on telephone [Harris, UK]			
Satisfied with the GP practice [Harris, UK]			

Table 3a: Primary care features & emergency hospital admissions n=22 studies

+ Positive association i.e. increases EA -negative associations i.e. decrease EA # no effect on EA

Study Year country Design	Setting & participants	Methods	Primary care features which have associations with emergency admissions				
			Access	Other practice features	Patient features	Continuity of care	Quality of care
Bankart 2011 UK Cross-sectional	145 general practices over two PCTs	Practice & patient characteristics were used as predictors of EA use in a two-level hierarchical model with 2007/8 data and evaluated against 2006/7data

Data reported as IRR (95% CI, p value) 2007/8 | Patient satisfaction with telephone access (#)

Patient being able to get an appointment within 48hrs (#)

Patient being able to book an appointment in advance (#) | Shorter distance from hospital (+) 0.99 (0.985,0.995) p<0.0001

Larger practice size (+) 0.9999 (0.9998,0.9999) p=0.0001 | Older age (+) 1.03 (1.02, 1.04) p=<0.0001

Male (-) 0.98 (0.96, 0.99) p=0.004

White (+) 1.003 (1.001,1.005) p=<0.0001 | Being able to get appointment with particular GP (-) 0.995 (0.991,0.998) p=0.0006 | Practice performance: QoF, clinical & organisational points (#) |

		data			Increased deprivation (+) 1.016 (1.012,1.02) p<0.0001		
Basu 2002 USA Cross-sectional	New York residents in the age group 20–64 hospitalized either in New York or in three contiguous states: New Jersey, Pennsylvania, or Connecticut using 1995 state-wide discharge files from the Health care Cost and Utilization Project (HCUP)	The association of primary care availability, HMO enrolment, & other person and location variables with potentially ambulatory care sensitive (ACS) hospitalisation for adults in New York State, compared with other types of hospitalisation. A multinomial logit model was used with individual discharge as the unit of analysis. ACS admissions are compared with (urgent but non-ACS admissions & referral sensitive surgeries controlling for severity of illness**.** Data expressed as OR with 95%		Higher primary care density compared with marker admissions as measured by Primary care phys. per 1000 pop & (-) OR 0.2 (0.07,057), p=0.01 Specialists per 1000 pop (+) OR 1.41 (1.11, 1.80) p=0.01	Increased age (+) e.g. 50-64 age bracket OR 1.34 (1.24,1.45) p=0.01 Being male (-) OR 0.69(0.65,0.75)p=0.01 Being black (+) OR 2.2 (1.95,2.52) p=0.01 Being Hispanic (+) OR 1.33 (1.12,1.57) p=0.01 Private vs. Medicaid insured patients (-) HMO OR 0.75 (0.69,0.81) Medicaid FFS 1.99 (1.78,2.22), Medicaid HMO 1.84 (1.55,2.18) Increasing urbanity (-) Urban(metro area) OR 0.75 (0.62,0.91) p=0.01 New York City OR 1.21 (1.04,1.4) p=0.05		

		CI			Increased Severity score (RDSCALE) (-) OR 0.61 (0.56, 0.66) p=0.01		
Bottle 2008 UK Cross-sectional	303 PCTs in England participating in performance – linked reimbursement with a focus on diabetes care (1,760,898 diabetic patients registered with GP)	Hospital admission rates were compared with quality of care scores, diabetic prevalence & deprivation Data reported as DSR (r=) & p values			Lower socio-economic status (+) 25-29yr grp 0.58 p<0.001 60yrs+ 0.45 p<0.001		PC quality scores of higher glycaemic control in patients over 60yrs (-) Correlation co-efficient of -0.21 p<0.001
Carlsen 2007 Norway Cross-sectional	Norwegian Patient Register data set with number of acute (and planned admissions) to somatic hospitals in 1998 10.5 per 100 admissions were unplanned but rates varied between municipalities	Municipalities were unit of observation a) inhabitants' need for treatment, b)supply of specialized health services c) supply of primary physician services were used to explain use of hospital admissions Data reported as coefficients relating no of emergency	Patient satisfaction with the physician (-) –0.515 (–2.86)	Physician density (#) Share of salaried physicians (#) greater distance from hospital (-) –0.189 (–7.29)	high proportion of women (+) 0.308 (3.26) A higher proportion children & adolescents (-) –0.127 (–2.38) high proportion of elderly people (+) 0.101 (2.95) high age-standardised mortality (+) 0.189 (2.38)		

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		admissions per 100 inhabitants affected by unit change in variables (t values in brackets)			Higher education (-) –0.086 (–6.63) away from coastline (+) 0.353 (2.78)		
Christakis 2001 USA Cross-sectional	46 097 paediatric patients at Group Health Cooperative, between 01/01/93-31/12/98	A continuity of care index that quantifies the degree to which a patient has experienced continuous care with a provider. Data were expressed as HR (95% CI)			Children on Medicaid or with asthma & with reduced CoC (+) 1.22 (1.09,1.38) between high & medium CoC 1.54 (1.33,1.75) For children with the lowest CoC		
Downing 2007 UK Cross-sectional	Two neighbouring PCTs with ~360,000(PCT1) & 157,000 (PCT2) individuals respectively with a GP in same PCT.	QoF data for the period April 2004 to March 2005 linked to data for emergency hospital admissions for 6+ chronic conditions for the period September 2004 to August 2005. Multilevel logistic regression models were used. Data were as expressed OR		Higher scores in the additional services (+) Signif. for Asthma 1.04 (1.01,1.08) CHD 1.03 (1.01,1.07) stroke 1.05 (1.01,1.11) other conditions 1.03 (1.01,1.04) in PCT 1 & cancer 1.03 (1.01,1.05) in PCT2	Higher clinical domain (-) significant for cancer 0.86 (0.79,0.93) and other conditions 0.94 (0.92,0.97) in PCT 2 Being female & having cancer OR CHD (-) PCT 1 0.68 (0.57,0.8) & 0.56 (0.48,0.64) Respectively PCT 2 0.74 (0.57,0.94)		

| | | (95% CI) | | organisational domain scores e.g. education for patient, information, clinical management (#) | 0.54 (0.43-0.68)

Deprivation with all conditions (+) PCT 1 1.10 (1.06,1.14) PCT 2 1.11, (1.06,1.17) per quartile increase in income domain score. | | |
|---|---|---|---|---|---|---|---|
| **Dusheiko** 2011b UK

Cross-sectional | 8,223 English family practices from 2001/2002 to 2006/2007 | Data from the QOF incentive scheme related to diabetes care i.e QOF quality indicators for monitoring & controlling HbA1c levels were related to 4 types of diabetes EA. Data were expressed as IRR (95% CI) | | | | | Moderate compared to poor QOF quality indicators for diabetes with EAs (-) 1.9% (1.1–2.6%)

Moderate compared to good QoF quality indicators for diabetes with EAs (#)

Moderate compared with good QoF indicators with hypoglycaemic |

							admissions (#)
Duffy 2012 UK Cross-sectional	An acute hospital trust serving Dundee, Scotland between 1996 & 1997	Scottish Morbidity Record 1 data which provides EA data related to general practice and patient variables. The three variables of high & low deprivation & age were expressed as t-ratios and used for modelling		No. of partners with MRCGP (#) List size (#) No. of partners (#) Average list per partner (#)	High rate of deprivation (+) 2.00 Low rate of deprivation (-) 2.90 Greater age (+) 2.29 R2 of 42.1% t- statistic of overall model (F[3,29] = 7.04; P = 0.001).		
Guliiford 2002 UK Cross-sectional	99 health authorities in England in 1999	Health outcomes including hospital admissions for acute conditions. These were related to number of GPs per 10,000 population with confounders of deprivation, ethnic origin, social class & long term illness Data expressed as mean changes	Increase in GP supply (-) -14.4, (-21.4,-7.4)				

		(95% CI)					
Hossain 2009 USA Cross-sectional	Health care data from south Carolina ages 18+	To explore the related latent constructs associated with 12 ambulatory care sensitive conditions using cluster detection tools to identify counties that have a higher probability of hospitalization for each adult condition.	Less access to PHC (+)				
Hull 2000 UK Cross-sectional	Paediatric data in East London & City Health authority, including all 164 practices in the inner-city boroughs of Hackney, Newham, Tower Hamlets, and the City of London for the year to 31 March 1996.	The effect of practice variations on Paediatric acute admissions, & A&E attendances, for discrete age and sex bands The practice was the unit of analysis. Preliminary uni-variate analysis followed by for each outcome variable two linear multiple regression models one including all of the explanatory			Children ≤1yr Health visitor hours/1000 children aged under 5 years (-) Separate data given by gender (male/female) & age (≤1yrs, >1-≤2yrs, >2-≤5yrs) -0.006 (-0.008, -0.003) p<0.001 -0.008 (-0.012,-0.005) p<0.001 -0.006 (-0.009 ,-0.003) p<0.001 No data presume NS -0.007 (-0.009, -0.005) p<0.001 No data presume NS		

		variables & the second a stepwise method with backward elimination of variables using a significance level of 0.05. Data expressed as regression coefficients (95% CI)			Other demographic data but not consistent across ages		
Kronman 2008 USA	National random sample of 78,356 Medicare beneficiaries aged 66+ who died in 2001. Non-whites were over-sampled. All subjects with complete Medicare data for 18months prior to death were retained.	To explore associations between primary care & hospital utilization at the end of life. Retrospective analysis of Medicare data related hospital use during the final 6 mths of life & the number of primary care physician visits in the 12 preceding months. Multivariate cluster analysis adjusted for the effects of demographics, comorbidities, & geography in end-			Greater number of primary care visits for end of life congestive heart failure & COPD patients (-) OR=0.82, p<0.001 OR=0.81, P=0.02 respectively		

		of-life healthcare use. Data expressed as adjusted OR (95% CI)					
Magan 2011 Spain Cross-sectional	Individuals aged 65yrs plus in 34 health districts in the region of Madrid, Spain between 2001-2003	Used hospital discharge data to obtain hospitalisations for ambulatory care sensitive conditions (ACSH) and compare to population socioeconomic factors PHC characteristics Data expressed as age- and sex-adjusted Rate-R were calculated (95% CI, pvalue)	High versus low physician supply (#)	Increased physician workload (+) 1.066 (1.041,1.091 P<0.001)	Being male vs female (+) *65-74yrs* 21.95 vs. 10.26 *75-84yrs* 46.29 vs.22.33 ≥*85yrs* 74.77 vs.52.27 p<0.05 for all University education (-) 0.961 (0.951,0.971, p<0.001) Higher mean income (-) 0.349 (0.243, 0.503 p<0.05) for >$12,700 mean available income Accessibility & type of heating indicator (-) 0.979 (0.964,0.994, P<0.05)		
Majeed 2000 UK	66 primary care groups in London with a total list of	Data from NHS Executive and DoH: population		Increased % female GP principals (-)	Unable to work due to health (+) 0.46 p<0.01		

| Cross-sectional | 8.0 million | estimates, hospital admissions, mortality, census data, benefits data and practice characteristics. Univariate correlation was determined between admission rates (emergency data presented separately) & possible explanatory factors. Data expressed as Pearson's correlation coefficient & p value | | -0.41 p<0.05 Increased % of GPs who were approved trainers or course organisers (-)

-0.25 & -0.21 respectively p<0.05

These associations were weaker than the patient factors | Unemployed (+) 0.38 p<0.01

Household headed by someone in unskilled socioeconomic grp (+) 0.51 p<0.01

Household with no car or with no heating (+)

0.25

Overcrowded households (+)

0.21

Pensioners living alone (+) 0.05

Single parent households (+) 0.23

People over 18 or with education above A levels (-) -0.41

Working age people who are students (-) -0.26 | | |

Study	Population	Methods					
						Receiving benefits (+) 0.25 to 0.68 depending on benefit type	
Menec 2006 Canada Cross-sectional	Survey of older adults aged 67 or over living in the province of Manitoba (n=1863)	Data linked between survey (aging in Manitoba) & health care use database from 1971, 1976 & 1983. Data expressed as OR 95% CI				High continuity of care (-) OR 0.67 (0.51,0.9)	
Nolan 2011 Ireland Cross-sectional	58 (2 private) acute hospital in Ireland with a coverage rate of 95%	Hospital In-patient Enquiry (HIPE) discharge data for 1999-2004 to relate it to enhanced access to GP services for the over 70s after July 2001	Enhanced access to free GP services for the over 70s (#)				
Purdy 2011a UK Cross-sectional	8169 general practices in England during 2005-6	Univariate analysis & multiple regression of HES routine population data for asthma & COPD patients and primary care data. Data expressed		Smaller practice size (+) 0.992 (0.987,0.997, p<0.001) NS for COPD Single-handed	Deprivation (+) 1.723 (1.536,1.932,) 1.631 (1.536–1.733) Between least & most deprived p<0.001 for both		Increased clinical QOF score for COPD (#) NS for asthma 0.976 (0.960–0.992 p= 0.004) for COPD Diagnosis of

		as Rel.rate (95% CI,p value) asthma followed by COPD data.		practices (+) 1.079 (1.010,1.154 p= 0.025) NS for COPD FTE GP per 10000 population (#) Training practice (-) NS for asthma 0.977 (0.955, 1.000 p=0.005) for COPD Proximity to ED (+) 0.988 (0.983, 0.993) 0.992 (0.989–0.995) p<0.001 for both Urban dwelling (vs. rural) (+) 0.840 (0.765 2 0.922) 0.825 (0.776–0.887) p<0.001 for both	Increased asthma/COPD prevalence (+) 1.049 (1.031,1.066,) 1.234 (1.203–1.267) p<0.001 for both Higher smoking rates in asthma/COPD patients (+) 1.007 (1.000,1.013,p=0.033) 1.012 (1.010–1.014, p<0.001)		asthma by spirometry (-) 0.997 (0.995, 0.999) p=0.009 Asthmatics who received a review (#)
Purdy 2011b	80,377 EAs for angina & 62,373	HES provided EA data in England		Increased proximity to ED department	Deprivation (+) 1.018(1.009,1.028)		Higher overall clinical QOF score

UK Cross-sectional	EAs for MI for individuals aged ≥45 yrs. from all general practices England for 12mth (Apr '05 to Mar '06	adjusted for age & gender. IRR (95%, p value)for general practices were calculated & adjusted for confounding variables in a multiple regression Poisson model.		for angina (+) 0.972 (0.958,0.986) p<0.001 NS for MI Training practices for MI (-) 0.954 (0.930,0.980) p<0.001 NS for angina Higher numbers of general practitioners per registered population for MI (-) 0.981(0.965,0.998) p=0.021 NS for angina Practice Size effect on CHD admissions (#)	(MI) & 1.084 (1.052,1.117) p<0.001 for both Practice prevalence of CHD and smoking (+) 1.083(1.060,1.106) (MI) & 1.074(1.048,1.101) (angina) P<0.001 for both Urban dwelling (+) For angina patients p<0.001 NS for MI patients Presence of Pneumonia, CHF, COPD, asthma, and angina (+)		for angina (-) 0.984(0.969,0.999) P=0.039 Condition-specific quality markers for MI (#)
Ricketts 2001 USA "Small area analysis"	Primary care market areas in North Carolina Data were reported by North Carolina Medical Database Commission for all discharges from North Carolina hospitals (Oct '93-	Rates of ACSCs admissions were age-sex adjusted The adjustments included age-limited diagnoses. Cluster rates were calculated for two groups: < and >65yrs of age.	Health insurance coverage (-) is postulated but not proven by model. Authors state that almost complete Medicare insurance coverage in the	PC physician supply (#) Presence of subsidised community clinic (#)	per greater capita income (-) -0.000403, p>0.003 non-white (+) 0.045278 p>0.008 the latter two in the <65yrs grp only		

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	Sep '94) 117,444 (16.87%) were for ACSCs.		over 65yrs protects against access issues of the <65yrs.				
Rizza 2007 Italy Cross-sectional	520 patients admitted to medical wards (Cardiology, Internal Medicine, Pneumology, Geriatrics) of a non-teaching acute care hospital in Catanzaro April-July 2005 (492 patients agreed to participate)	Data from reviewing patient charts and by interviewing patients. A multivariate logistic regression analysis was performed to identify characteristics independently associated with preventable hospitalization Data expressed as OR (95% CI, p value)		Greater no. of patients for each PC physician (+) 2.25 (1.62,3.13, p < 0.001)	Greater age (+) 1.03 (1.01,1.05, p=0.027) Being male (+) 0.52 (0.31–0.87, p=0.013) No. of hospital admissions in previous year (+) 1.76 (1.06,2.93 p= 0.03) With a lower no. of PCP accesses & medical visits in previous year (+) 0.52 (0.3,0.93, p=0.027) less satisfaction with PCP health services (+) 0.34 (0.2,0.58,p<0.001) worse self-reported health status (+)		

					0.53 (0.31,0.89, p=0.017) shorter length of hospital stay (+) 0.95 (0.91,0.99, p=0.011) these outcomes were consistent across heart, respiratory & diabetic disease		
Saxena 2006 UK Cross sectional	All 31 primary care trusts in London with a (7 million patients) in 2001 focusing on Age-standardized AEs for asthma, diabetes, HF, hypertension and COPD.	Cross sectional analysis at primary care trusts level using routine data from multiple sources the census, Department for Environment, Transport & the region's Index of Multiple Deprivation, Office for National Statistics, DOH, PCTs & HES. Data expressed as regression coefficients (95% CI, p values)		Total number of GPs in practice (#) Practices with higher list sizes (#) % GP with >2,500 patients (#) Specialist services for diabetes (#) Specialist services for asthma (#) Prescription services for all conditions studied (#)	Underlying mortality for COPD patients (+) 4.74 (2.27,7.21 p≤0.05) Deprivation (+) signif. for asthma & COPD 1.32 (0.57,2.08) & 4.00 (2.25,5.75) p≤0.05 for both Lone parenthood with diabetes (+) 26.95 (5.52,48.87) Percentage of elderly living alone with asthma, hypertension, COPD. (+) -36.90 (51.94,21.84)		

					-9.63 (-17.77,1.49) -53.30 (91.11,15.48) respectively		
Solberg 2004 USA Cross-sectional	~7000 patients with diabetes, 3800 with CHD & 6000 with depression who received all of their care in 500-physician multi-specialty medical group between 1999 and 2001	Multilevel regression analysis of health plan administrative data to determine rates of inpatient admissions and various types of outpatient encounters. Data expressed as numbers & %.	Implementation of open access primary care (#)			Improved continuity of primary health care (#)	

Index ACSC =ambulatory care sensitive condition(s);GP =general practitioner;CHD= coronary artery disease; COPD= Chronic obstructive pulmonary disease
DOH= Department of Health; DSR=directly standardised rates; EA =emergency admissions ;ED= estimate of difference ; FP family physician; HES= Hospital Episode Statistics; HF= heart failure;HR= hazard ratio; HMO health maintenance organisation; IRR=Incident rate ratio; Rate R =rate ratio; Rel.rate =relative rate; RR = risk ratio; IMU Index of Medical Underservice; IMD index of multiple deprivation;NS= not statistically significant; OR=odds ratio; PEDs Paediatrics emergency departments ; PCT=primary care trust; PR –=prevalence rate; QoF – Quality and outcomes framework; 95% CI Confidence intervals

Table 3b: Summary of features of primary care that influence unplanned hospital admissions.

Features which **REDUCE** unplanned hospital admissions

Access	Practice factors	Patient factors	Continuity of care	Quality of care
Increase in GP supply [Guliiford, UK] Higher practitioner/ patient ratio (MI patients) [Purdy 2011b,UK, Basu,USA]	Female GP principals [Majeed, UK] GP trainers within practice [Majeed,UK][Purdy2011a,UK] [Purdy 2011b UK] Course provision within practice [Purdy 2011a,UK] Greater distance from hospital [Carlsen, Norway] Health visitor hours /100 children under 5 [Hull, UK] No. of PC visits at the end of life for COPD & congestive heart failure [Kronman, USA]	Higher % of children & adolescents [Carlsen, Norway] Being male [Rizza, Italy] Being female with cancer or CHD [Downing, UK] Higher education [Carlsen, Norway] University education [Magan, Spain] People >18yrs & >A levels education [Majeed, UK] Working age people who are students [Majeed, UK] Higher income [Magan, Spain] Greater income in the 60yrs old [Magan, Spain] Accessibility & type of	Getting appointment with own GP [Bankart ,UK] High continuity of care [Menec, Canada]	Primary care quality score of high glycaemic control (>60yrs)[Bottle, UK] Moderate compared to poor QoL indicators for diabetes [Dusheiko, UK] High quality scores for angina (Purdy 2011b, UK) Diagnosis of asthma by spirometry [Purdy 2011a, UK]

		heating in home [Magan, Spain]		
		Low rate of deprivation [Duffy, UK]		
		Higher clinical domains for cancer [Downing, UK]		
		Patient satisfaction with Physician [Carlsen, Norway]		
		Private vs. Medicaid insurance [Basu,USA]		

Features which **INCREASE** unplanned hospital admissions

Access	Practice factors	Patient factors	Continuity of care	Quality of care
Less primary care access [Hossain, USA]	**Large practice size [Bankart, UK]** **Smaller practice size [Purdy 2011a, UK]**	**Greater age [Bankart, UK; Duffy UK; Rizza, Italy, Basu, USA]** **Greater age & educated [Magan, Spain]**		
Increased primary care practitioner workload [Magan, Spain] **Greater % of patients to physicians [Rizza, Italy]**	**Shorter distance from hospital [Bankart,UK] [Carlsen, Norway]**	**Being female [Carlsen,Norway]** **Being male [Magan, Spain; Rizza, Italy, Basu, USA]**		
	Higher scores in additional services [Downing, UK]	**Not white & <65yrs [Ricketts, USA]** **Black or Hispanic [Basu, USA]** **White ethnicity [Bankart,**		

		UK]		
		Deprivation (5) [Bankart, UK; Downing UK; Duffy, UK;Purdy2011a, UK;Purdy 2011b, UK;Saxena, UK;		
		Deprivation & the prevalence of asthma/COPD [Saxena, UK]		
		Lower Socioeconomic status [Bottle 2008]		
		Children on Medicaid & low CoC [Christakis, USA]		
		Unable to work due to health or unemployed [Majeed, UK]		
		Household headed by someone in unskilled socioeconomic grp [Majeed, UK]		
		No car [Majeed, UK]		
		No heating [Majeed, UK]		
		Overcrowded households [Majeed, UK]		
		Away from coastline [Carlsen, Norway]		

		Older & alone [Majeed, UK] **Percentage of elderly living alone with asthma, hypertension,COPD [Saxena 2006]** **Single parent households [Majeed, UK]** **Urban dwelling Purdy 2011 a&b, UK]**		
		CHD [Downing, UK] **CHD & smoking [Purdy 2011b,UK]** **Angina [Ricketts, USA]** **Presence of Pneumonia, CHF, COPD, asthma, and angina [Purdy 2011b, UK]** **Prevalence of asthma & COPD [Ricketts, USA]** **Smoking rates with asthma & COPD [Purdy2011a, UK]** **Pneumonia [Ricketts, USA]** **Underlying mortality [Carlsen, Norway]** **Underlying mortality in COPD patients [Saxena, UK]**		

		Less satisfaction with service [Rizza, Italy] **Worse self-reported health [Rizza, Italy]**		
		No. of hosp ádmission last yr [Rizza, Italy] **Lower primary care use in last yr [Rizza, Italy]** **Shorter length of hospital stay [Rizza, Italy]**		

Features which **NO EFFECT** on unplanned hospital admissions

Access	Practice factors	Patient factors	Continuity of care	Quality of care
Physician density [Carlsen, Norway] **FTE GP per 10,000 pop [Purdy 2011a, UK]** **Average list per partner [Duffy,UK]** **% GPs with >2500 patients [Saxena,UK]** **Enhanced access to free GP services for the over 70s [Nolan, IRE]** **Implementation of open access primary care**	**No. of partners with MRCGP [Duffy, UK]** **Share of salaried physicians [Carlsen, Norway]** **No. of partners [Duffy,UK]** **PC physician supply [Magan, Spain]** **Total no of Gps in practice [Saxena, UK]** **Practice size effect on CHD admissions [Ricketts, USA]**	**Patient's satisfaction with telephone access, being able to get appointment within 48hrs, booking appointment in advance [Bankart, UK]**	**Improved continuity of care [Solberg,USA]**	**Practice performance (QOF, clinical & organisational points) [Bankart, UK]** **Organisational domain scores e.g. education for patients, clinical management (Downing,UK)** **Moderate vs. good QoF indicators for diabetes [Dusheiko, UK]** **Moderate vs. good QoF indicators with hypoglycaemic admissions [Dusheiko,UK]**

[Solberg, USA] **Presence of subsidised community clinic [Ricketts, USA]**	**Practices with higher list sizes [Saxena, UK]** **Prescription services for all conditions studied [Saxena, UK]** **Diabetes/asthma specialist services for [Saxena, UK]**			**Increased clinical QoF score for COPD [Purdy 2011a,UK]** **Asthmatics who have received a review [Purdy 2011a,UK]** **Condition specific quality markers for CHD [Purdy 2011b,UK]**

Table 4: qualitative & self-reported surveys

Study/date/ country	Aim	Methods (includ Sampling)	Participants (include no.) & location	Findings	Authors' conclusions
Adult patients' studies					
Gerard 2005 UK	To investigate patients' strength of preferences / attributes/ characteristics associated with delivery of emergency PC services available during usual GP surgery hours and to investigate the trade-offs between attributes	A discrete choice experiment A self-complete questionnaire was given to NHS Direct callers and adult attenders at A&E, GP services and the NHS Walk-in Centre Regression analysis of results.	607questionnaires were distributed, 432 (71%) were useable. Response rates: 0% was from postal survey of NHS Direct callers and between 81% and 96% from the remainder 52% female 80% 18-45yrs 87% white	All predictor of preference were statistically significant. These were 'being kept informed about waiting time' (most important) 'quality of the consultation', 'having a consultation with a nurse', 'having a consultation with a doctor' 'contacting the service in person'. Respondents were prepared to wait an extra 68 min to have a consultation with a doctor,but an extra 2 h 9 min for information about expected waiting time. There were no measurable preference differences between patients surveyed at	This study showed that local solutions for reforming emergency PC during hours when the GP surgery is open should take account of the strength of patient preferences.

				different NHS entry points. Respondents <45 yrs held strong preferences how they wanted to make contact with the system, Older respondents did not to hold strong preferences, Weak evidence showed the younger group preferred accessing services via an integrated telephone system than making contact in person.	
Marco 2012	To identify factors that influence patients' decisions to seek care in ED and assesses their access to primary care.	A prospective study, conducted by standardised verbal interview by trained research assistants as a convenience sample during June & July 2009. Data collected included demographic information chief complaint & questions about access to medical care & reasons for seeking emergency care.	292 study participants (89% response rate), (52%), were >40 years old. 69% Caucasian & 58% unemployed Among employed participants, 66% of employers offered health insurance. Most participants had a primary care physician (73 %)	31% had called their PCP about the current problem. Most participants came to the ED because of convenience/location (41%) or preference for this institution (23%). Participants came to the ED, rather than their regular doctor, because they had no PCP (27%), an emergency condition (19%), or communication challenges (17%).	Convenience, location, institutional preference and access to other physicians are common factors that influence patients' decisions to seek care in ED.
Northington 2005 USA	To determine whether patients seeking ED) non-urgent care have PCPs or know of other	Cross-sectional survey in a university ED to self-referred non-urgent patients for 6 weeks	563 were approached, 314 were eligible and 279 agreed to participate.	56% had PCPs. For 66% ED was the only place they knew to go for their present problem 27% said they depended on the ED for all medical	Although most ED non urgent patients were not dependent on ED, the majority was unaware of other

	care sources & to determine why they choose EDs.		Need paper	care. Of those, 47% rated the ED better for unscheduled care. 52% thought their PCP would be more efficient & 42% thought their PCP would be cheaper.	places to go for their current health problem. Even patients with a PCP sought care in the ED because it was believed to provide better care despite its perceived greater waiting times and costs.
Rajpar 2000 UK	To determine the reasons for choosing between primary care out of hours centres and ED for patients with PC problems.	Interviews using a semi-structured approach of samples of patients attending EDs & GP out of hours centres for primary care problems. Patients were recruited using sampling on a first come basis. Interviewing took place during 12 three hour sessions (six sessions at each site) over 2 months between (Feb- April 1998).	54 patients attending ED & 48 patients attending GP cooperative were interviewed. proportion of men to women at each site was similar (48%) men at ED & 140%) men in GP cooperative; with mean age of ED attenders was 27.9 years (95%CI 10.4, 45.4) & cooperative attenders was 25.4 years (95%CI 4.8, 46.0).	62% ED attenders were unemployed vs. 41% of out of hours attenders. White people were more likely to attend ED & Asians the out of hours centre (p<0.01)& unemployed were more likely to attend ED (70% v 30%). 46.3% of ED attenders had not contacted their GP before attending; 81.3% of first time users of the out of hours centre found out about it on the day of interview. Those attending ED thought waiting times at the out of hours centre would be 6.3 hours (median) compared with a median perceived time of 2.9 hours by those	Once patients have used the GP out of hours centre they are more likely to use it again. Education should be targeted at young adults, unemployed & white people. Patients should be encouraged to contact their GP before A&E department attendance for non-life-threatening conditions.

				actually attending the out of hours centre. Actual time was actually much less.	Waiting time perception may be an important reason for choice of service.
Rocovich 2012 USA	To identify reasons contributing to self-perceived non-emergent adult ED visits during PCP office hours.	A questionnaire given to patients meeting exclusion/inclusion criteria who were triaged into an acute care or fast track part of ED during regular PCP hours (Jul-Aug 2011) . Data collected: patient demographics, insurance status, access to PCP, convenience of using ED versus PCP, and perception of severity of chief complaints.	262 meet the inclusion criteria of: Male & female adults aged >18 years, presenting to ED during regular hours & triaged with urgent or acute care level chief complaints. Exclusion criteria were patients triaged with critical care complaints, pregnant, non-English speaking persons or cognitively impaired or mentally impaired.	129 patients put themselves into non-emergent category 131 patients categorized themselves into emergent group 61.5% of non-emergent patients were single 58.3% of emergent patients were married. 59.7% were unemployed in non-emergent group, 60.3% in emergent group were employed (p<0.05 for both). No other factors were significantly different.	The only significant demographic on making the choice between PCP & ED was being single & employed with perceived non-emergent complaint. Patients without insurance and/or without a PCP were no more likely to visit the ED with a self-perceived non-emergent issue than patients with insurance and/or with an established PCP.
Childrens' studies					
Fieldston 2012 USA	To elicit & describe guardians and health professionals opinions for non-urgent,	Convenience sampling Focus groups sessions	3 grps of guardians, 2 grps of PC practitioners & one grp of paediatric emergency medicine	Guardian themes: 1) **Perceived medical need** To receive timely reassurance, worries about symptoms, especially for	Guardians concerns about perceptions of severity of their children's illness and their schedules must

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	paediatric ED visits		physicians in the West Philadelphia, area	babies & very small children **2) Systems design, accessibility & availability** Guardians said they knew about different systems but preferred ED for convenience and the perceived need for diagnostic tests & other interventions. They perceived ED to be a superior service/second opinion which overrode the fact they might have to wait. Guardians felt schedules did not fit PC physician but did note that after hours telephone access did reduce ED use. Family issues were not mentioned often. Health professional themes : 1)**System design and accessibility** HPs thought convenience /easy access was main reason for ED use for non-urgent cases followed by lack of evening/weekend PC cover and lack of obtaining timely office visits. Fixing these issues would	be considered to effectively reduce non urgent ED use which may differ from the perceptions of professionals. A need to match capacity with need by increasing accessibility to primary care & working to overcome Guardian's perception that only ED can handle acute illness or injuries.

				reduce non-urgent cases by 30-40% Other issues: access to specialists, family role modelling, ED proximity to home and lack of insurance. 2)**perceived medical need or ED services** HPs felt families could not distinguish between urgent & non-urgent complaints 3) **families' personal issues**	
Rust 2008 USA	To examine the relationship between ED visits & perceived barriers to receiving timely primary care.	The adult sample section of the National Health Interview Survey, 23 413 who reported having a usual source of medical care other than the ED and answered 5 specific questions which focused on barriers to timely access to the respondent's usual source of medical care: (1) "couldn't get through on phone"; (2) "couldn't get appointment soon enough"; (3) "waiting too long in doctor's office"; (4) "not open when you could go"; and (5) "no transportation." related to barriers were included in the analyses.	Adults 18 years or older participating in the adult sample section of the National Health Interview Survey (2005) , specifically 23 413 out of the total 30 677 who reported having a usual source of medical care other than the ED	For those reporting no access barriers, 1 in 5 adults visited an ED at least once during the preceding year. For those reporting ≥1 barriers, the proportion was 1 in 3. Four of the five barriers was independently associated with ED use, adjusting for socioeconomic and health-related factors: (1) OR 1.27; 95% CI, 1.02, 1.59; (2) OR, 1.45; 95% CI, 1.21-1.75; (3) OR, 1.20; 95% CI, 1.02,1.41; (4) OR, 1.24; 95% CI, 0.99,1.55); & (5) OR, 1.88; 95% CI, 1.50,2.35).	The benefits of having a usual source of medical care are diminished by barriers that limit effective and timely access to such care.

Rhodes 2012 USA	To explore factors, including the role of ED referrals, associated with specialists' willingness to accept patients covered by Medicaid & CHIP	Purposive sampling Semi structured qualitative interviews, applied until theme saturation reached. Transcripts and notes analysed in ATLAS using iterative coding process to identify patterns of responses, ensure reliability, examine discrepancies, and achieve consensus through content analysis.	26 specialists &14 primary care physicians in Cook County, Illinois, from April to September 2009 who varied in specialty type, health system affiliation, and payer mix & were identified using physician licensure data provided by the state of Illinois. This was not a random sample of physicians. Physicians were recruited from across specialty areas that the principal investigator's research suggested were in high demand, short supply, or both.	Themes identified: -Rationing by Insurance Status -Strategies for Allocating New-Patient Appointments to Children on Medicaid -Emergency Departments as Access Providers: Reasons for Appointment Success	
Salami 2012 USA	To determine the most important reasons for paediatric non urgent ED visits as perceived by caregivers,	Cross-sectional survey, with self-administered questionnaires given to caregivers, PCPs, and ED personnel.		80% of PCPs expected to be called by caregivers before ED visits, <30% of caregivers were aware of this. Reasons for non-urgent visits a) **Caregivers** a) need for medical	Misconceptions exist among caregivers, PCPs, and ED personnel on non-urgent visits Need paper

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	PCPs, and ED personnel related to non urgent ED visits.			attention outside PCP working hours b) lack of health insurance c) better hospitality in the ED. Solutions given by caregivers more PCPs with longer working hours (41%) and more EDs (31%). **PCPs and ED** a) the caregivers' lack of knowledge on what constitutes a true emergency. >70% of ED personnel and PCPs recommended caregiver education as the solution to non urgent visits.	
Maguire 2011 UK	To explore how parents navigate USC services when their child <5 years old has a feverish illness, in terms of whether services are meeting their needs and triaging in line with national guidance.	Parents were invited to participate in a telephone questionnaire supplemented by case note review. A subset participated in an in-depth interview.	220 parents participated in telephone questionnaire, & 29 parents participated in an in-depth telephone interview. Their children were 69% white, 14% Asian, 9% mixed, 6% Black & 2% other. Socioeconomic status was spread across the range.	Parents' first preference for advice in hours was to see GP) (67%) and when unavailable, NHS Direct (46%). 155 made more than one contact & 63% of the repeat contacts were initiated by a service provider. A range of factors influenced parents' use of services. Parents who reported receiving 'safety netting' advice (81%) were less	Parents know the USC service options available, Multiple contacts are being made for relatively well children, often due to repeated referrals within the system. Safety netting advice reduces re-attendances but

				70% rated at medium, 12% at high & 16% at low risk of developing serious disease.	likely to re-present to USC services than those who did not recall receiving such advice (35% vs 52%, p=0.01). Parents identified a need for accurate, consistent, written advice regarding fever and antipyretics	parents want explicit & consistent advice for appropriate home management.
GP studies						
Hammond 2009 UK	To explore inappropriate hospital and the perceived causes of inappropriate hospital admissions & length of stay of patients with long term neurological conditions.	Convenience sampling Two focus groups of four people a piece. Thematic analysis	Eight primary & secondary care clinicians working in the Derbyshire, UK	Themes identified: 1. Limited capacity of health & social care resources. 2. Poor communication between 1ry & 2ry HPs. 3) cautiousness of HPs working in the community Suggestions made by participants 1. New sub-acute care facilities 2. Introduction of auxiliary nurses to support specialist nursing staff 3. Patient held summaries of specialist consultations	Clinicians admit some admissions and lengths of stay are unnecessary. This was attributed to problems with current capacity or service structure

Table 5: Intervention or evaluation studies of specific primary health care management approaches

Study/date/ country	Study type & aim	Population & setting	Intervention	Control	Methods & data analysis	Findings
Brown 2005 USA	Pre and post study. To determine whether primary care patients with perceived inappropriate high healthcare utilization would require fewer emergency or inpatient services whilst enrolled in a weekly multidisciplinary clinic	20 patients referred by their PCPs or by an inpatient care coordinator due to high levels of "inappropriate" HA, ED visits, frequent outpatient visits, or frequent telephone calls.	An internist, psychiatrist-internist, nurse practitioner, pharmacist, and social worker staffed the Primary Intensive Care (PIC) Clinic at the 4-h weekly clinic session and pre-clinic conference. Clinic sessions included 1.longer appointment times than usual for evaluation interviews for an initial 2–3 sessions, 2. multidisciplinary assessment& follow-up, including provision for mental health services, 3. frequent visits (weekly initially) 4. 24-h availability of a team member.	None	The primary outcome measures were cost and utilization of hospital and emergency room services. These measures included number of hospitalizations, number of ED visits, and hospital hospital cost per month averaged over the period of enrolment (5–12 months) compared to the matched period prior to enrolment.	Patients in PIC clinic had signif. lower hospital admissions (2.5± SD 3.5 vs. 0.9 ± 1.6; p=0.02) & ED use (6.9± 12.2vs. 4.9 vs.9.0;p=0.05) matched pre-enrolment time period, The total hospital cost differences did not reach stat. significance ($18,177± $15,303 vs. $13,602 ±$13,365; NS)
Bynum	Comparison study	2,468 residents	**Model one:**	None	Data collected	Residents in the

2011 USA	Comparison of 2 models of primary care in 4 different continuing care retirement communities.	continuing care retirement communities located in the Midwest, Mid-Atlantic & New England Mean age 85yrs White ethnicity 67% female	physicians & 2 part-time nurse practitioners delivered clinical care only at that site, covered all settings within it, provided all after-hours coverage. **Model 2:** used in 3 communities, on-site primary care physician hours limited; the same physicians also had independent practices outside community; after-hours calls were covered by all members of the practices, including physicians who did not practice on site.		from : telephone interviews with staff at each site and the national corporate office information from US census data about the location Medicare claims data for residents to assess use of ambulatory, inpatient, and emergency care & place of death. The results were adjusted for demographic characteristic but not for severity or type of illness.	first model had 2-3 x fewer (all) hospitalizations and ED visits. Emergency department visits 0.16,first model) 0.58, 0.60 ,0.31(second model) , p<0.001
Coleman 2001 USA	RCT To determine whether primary care group visits reduce ED use in chronically ill older adults.	295 older adults ≥60 years of age with frequent utilization of outpatient services and one or more chronic illnesses in	Monthly group visits (generally 8 to 12 patients) with a primary care physician, nurse, and pharmacist held in 19	Group comprised of participants who had the same PC physician over the 2 yrs	ED visits, hospitalization & primary care visits. An intention-to-	Patients in the intervention group attended 10.6 group visits & had fewer ED visits (0.65 vs. 1.08 visits; p =0.005) &

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		in Denver, Colorado.	physician practices. Visits emphasized self-management of chronic illness, peer support, and regular contact with the primary care team.	of this trial	treat analysis Adjusted differences in the proportion of patients in each grp was calculated using logistic regression. No costs or cost analysis	less ED visits (34.9 vs. 52.4%; p =0.003) than controls. Differences remained statistically significant after controlling for demographic factors, comorbid conditions, functional status, and prior utilization. Adjusted mean difference in visits was -0.42 visits (95% CI, -0.13, -0.72), & adjusted RR for any ED visit was 0.64 (95% CI, 0.44, 0.86).
Gilfillan 2010 USA	Pre & post study To evaluate the ability of a medical home model to improve the efficiency of care for Medicare beneficiaries.	Four yrs of claims data for Medicare patients at 11 intervention sites & 75 control groups located in rural north-eastern & central Pennsylvania from Jan '05,- Dec 31,' 08, & paid through	Proven Health Navigator (PHN), an intensive multidimensional medical home model that addresses patient-centred primary care team practice, integrated	None	Observational study using regression modelling based on pre & post intervention data & a propensity-selected control cohort. hospital admission & readmission	PHN was associated with 18% (p <0.01) cumulative reduction in inpatient admissions & 36% (p= 0.02) cumulative reduction in readmissions

		Jun, '09	population management, micro-delivery systems, quality outcomes program, & value reimbursement system		rates,& the total cost of care. Regression modelling was used to calculate predicted rates Actual results were compared with predicted results to compute changes attributable to PHN	across the total population over the study period. The intervention reduced costs by 7% but this was NS
Lisk **2012** **UK**	Before & after study To determine if increased geriatrician input into nursing homes reduces emergency hospital admissions	1954 admission episodes to Trust (April '06 -March '09 3 nursing homes had the highest number of multiple admissions	Four strategies to reduce hospital admissions were used at these nursing homes for 3 months. An alert was also sent to the geriatrician if one of the residents was admitted so that their discharge from hospital could be expedited. The project was then extended for another 4 months with 6 nursing homes.	None	Analysis using Chi square was performed	Geriatrician input into nursing homes had a significant impact on admissions from nursing homes $(x2(2) = 6.261, p < 0.05)$. The second part of the project also showed significant impact on admissions $(x2(2) = 12.552, p < 0.05)$. Length of stay in hospital for the residents was reduced.
Murnik 2006 USA	Controlled study To determine if an enhanced	756 patients who have are uninsured &	"The Primary Care Dispatch," an	Control patients were randomly	Data from UNMHED database was	Patients referred to family medicine through web site

	scheduling system for follow-up care that assigns patients to a family medicine home can decrease ED use.	unassigned to primary care identified through a University of New Mexico Hospital Emergency Department (UNMH-ED) database. Predominantly used for indigent self-pay patients who are uninsured and have not qualified for Medicaid or County Indigent Assistance programs.	appointment scheduling & referral service which links the UNMH-ED to family medicine clinics within the Community Access Program for Central New Mexico (CAP-NM) safety net provider organizations via the Internet. Trained discharge clerks schedule follow-up appointments for patients 24 hrs a day, 7 days a week. Any UNMH-ED discharged patient with no primary care provider were referred to 1/15 CAP-NM-affiliated clinics. The Internet site offers access to reserved appointments, usually within 1–2 days of the ED visit and scheduled at clinic	chosen from the group of all self-pay non-CAP patients in the same age strata as the CAP participants seen in the ED on that same day.	compared to control patients in relation to the no. of ED visits in previous yr. Data were divided into four strata based on the no. of ED visits by the patients in previous yr. Annualized rates for return visits to the ED within each stratum. Rate ratios were calculated comparing CAP patients rates of return to controls An estimate of the reduction in ED utilization for 1,000 patient-years calculated No costs or cost	showed a significant 31% reduction in subsequent ED visits compared to controls. Estimated visits using CAP rate 1,130 using control rate 1,648 (Per 1,000 Patient-Years)

		most accessible from patient's home/workplace.		analysis	
Sledge 2006 USA	RCT to determine if a clinic-based ambulatory case management intervention, PIC would reduce hospital use & total cost &/or improve health outcomes among PC patients with a recent history of high use of inpatient services**.**	Current patients with ≥2 hospital admissions per year in the 12–18 mths prior to recruitment in an urban PC clinic in the north-eastern USA.	PIC consisted of two components: comprehensive interdisciplinary medical & psychosocial assessment & follow-up ambulatory case management for 1 yr.	Control patients had usual care directed by their PC provider.	Health care use including hospital admissions , function, & a medication adherence scale were measured at baseline & at 12 mths.	There were no significant differences comparing no. of admissions or ED use pre & post enrollment within groups or the 12 mths followup results post intervention between groups. No difference in costs pre & post intervention & between intervention & control p=0.82
Sommers 2000 USA	"Controlled cohort study" [but it was randomised at practitioner level] To examine the impact of an interdisciplinary practice intervention involving a primary care physician, nurse & social worker for community-dwelling seniors with chronic conditions	18 PCP were recruited from the San Francisco bay area and comprised of 13 internists and 5 family practitioners (median age 52 yrs, & 14 yrs in practice) who were randomised to the intervention or control	Office–based intervention involving a team of practitioner, a nurse with geriatric training, and a masters level social worker. The intervention comprised of defined activities for the patient. The nurse or social	Care as usual from the primary health care physician	Relevant outcomes No. of hospital admissions per patient No. of patients with 1 or more readmissions within 60 days No. of patient who have 1 or	543 patients were involved. Hospital admissions per person per yr OR 0.63 (0.41,0.96) P=0.03 ≥1 readmissions within 60 days OR 0.23

			worker did a home visit and took history. This was the discussed in the light of the FP's knowledge of patient & a risk reduction plan written. This was discussed with patient & family. Nurse or Social worker monitored patient via visits, calls & small grp sessions etc. at least every 6 wks. . Cases were discussed at least once a month within team. Follow up was one year		more ED visits	(0.08-0.84) P=0.03 ED visits p=0.77 no RR reported Subtracting implementation costs net savings for each patient was $90 for the study period of one year.
Stewart 2010 Canada	Controlled study To evaluate a new program, Integrating Physician Services in the Home (IPSITH), to integrate family practice and home care for acutely ill patients.	Eighty-two patients were enrolled consecutively. The IPSITH family physicians determined their patients' eligibility for the program. All patients deemed eligible with acute or complex	Included usual care providers plus the patients' family physicians, the IPSITH nurse practitioner, & in most cases, a family member/friend who acted as a caregiver in the home. Relationships & processes	Usual care included a case manager, who ordered Nursing& allied HP services as required. Patients receiving usual care could be admitted	ED visits & satisfaction with care. Analysis included a process evaluation of the program & an outcomes evaluation comparing IPSITH & control patients.	Controlling for symptom severity, less IPSITH patients had ED visits (3.7% versus 20.7%; p = .002)

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		conditions requiring care for an anticipated 5-10 days.	were established. A pharmacy, oxygen suppliers & diagnostic services agreed to provide their services in patients' homes, & specialists agreed to provide urgent consultation for patients upon request, Processes were established for the initial assessment, out-of-hours coverage, a record system, rapid response to crises & fast-track admissions to hospital when needed. Most medical care services were co-ordinated through the nurse practitioner. Family physicians made home visits as necessary.	to home care by family physicians or home care professionals, or as early discharges from hospital.	No costs or cost analysis	
Walker 2005 UK	Controlled study To evaluate the introduction of 'intermediate care services' to reduce EHA to hospital from the population aged 75 years or more.	Eligible population for screening were patients on the practice list who were aged 75 years or more,	Keep Well At Home (KWAH) project was a two-phase screening process, including a home visit by a	No KWAH service	ED use & admissions to hospital in the target Population. Data recorded as rate	Rates of EHA in the 9 months before screening in both grps (RR = 1.05; 95% CI 0.95,1.17),

			resident in the Borough of Hammersmith & Fulham but not in a long-stay institution & not receiving domiciliary nursing services.	community nurse. Run from Oct-1999 to Dec 2002.		ratios (RR)	Over first 37 months of project, no significant impact on either ED use (RR = 1.02; 95% CI 0.97–1.06) or EHA of elderly patients (RR = 0.98; 95% CI 0.93,1.05).
Wang 2012 USA	RCT To compared two interventions designed to improve PC engagement & reduce USC.	200 recently released prisoners who had a chronic medical condition or were older than 50 years (2005-2007)	**Transitions Clinic** consists of a PC provider with experience of caring for prisoners & a community health worker (CHW) with personal history of incarceration who had completed 6-month program & provided case management support. **Expedited PC** Participants received expedited (within 4 weeks) PC appointment with a safety-net PC clinic provider. All other	No control group	Two primary outcome measures at 12 mths: having ≥2 visits to study-assigned PC clinic & having any visits to ED that did not result in hospitalization at San fran general hospital (SFGH) 4 secondary outcomes at 12 mths: rate of ED use, having any hospitalization at SFGH, having any incarceration in San Fran county jail, & time to first	Both groups had similar rates of PC utilization (37.7 vs 47.1%; p = .18). Transitions clinic participants had lower rates of ED utilization (25 vs. 39.2%; p = .04).

| | | | | appointments were scheduled at discretion of new clinic provider (who generally do not receive formal training in caring for individuals with history of incarceration) There was no CHW. | | incarceration.

No costs or cost analysis | |

6. Appendices
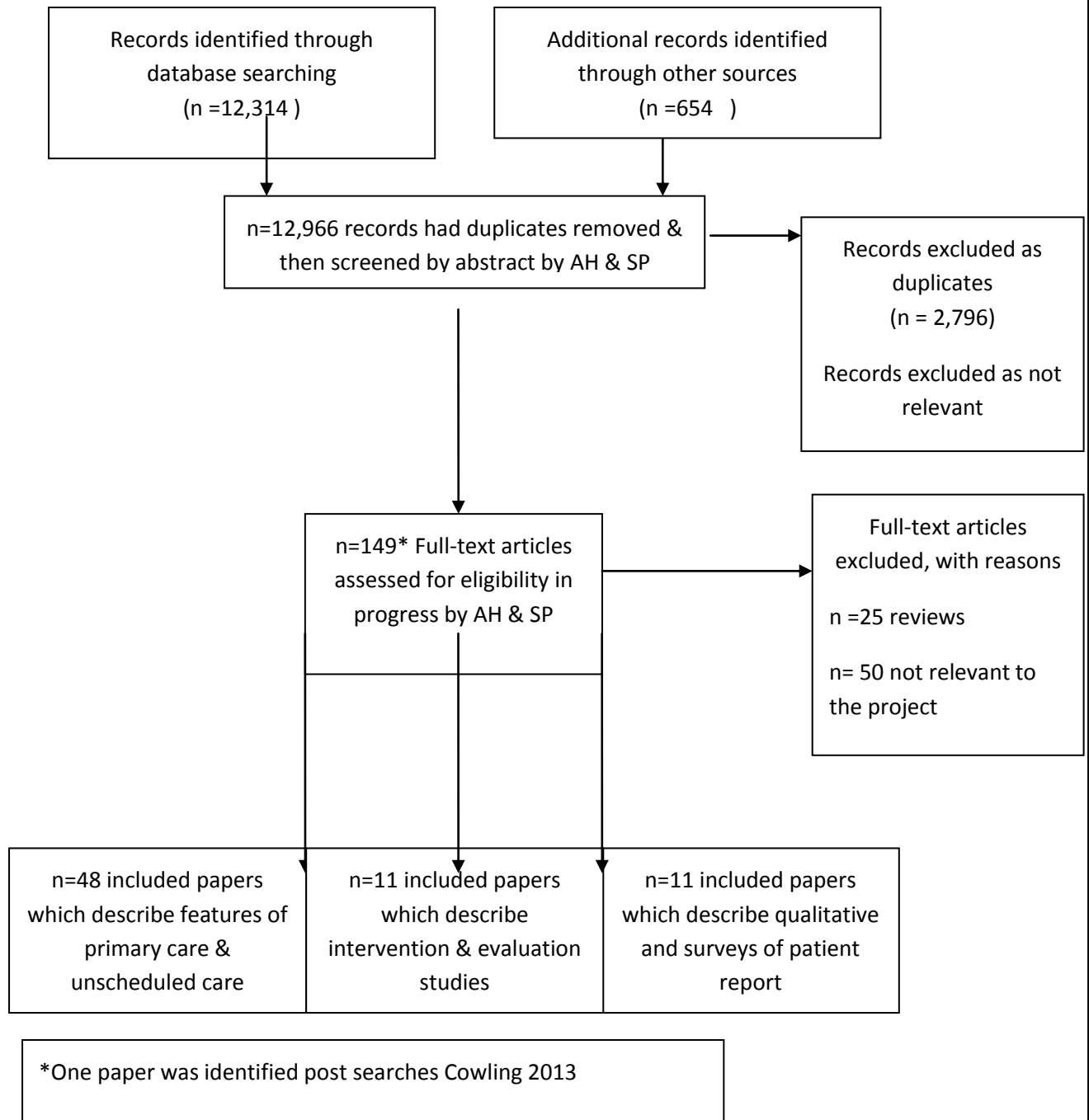
Appendix one: Parent search strategy run in Medline

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

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1   (Family physician$ or Physician, Family or Pamily Pract$ or Pract$, family).tw. (11252)

2   (Generalist$ or General Pract$ or Pract$, general).tw. (61792)

3   (Primary care physician$ or Physician$, primary care).tw. (12752)

4   (Care, primary health or health care, primary or primary care or care, primary or primary healthcare or healthcare,primary).tw. (63133)

5   family practice.mp. or Family Practice/ (62140)

6   General practice.mp. or General Practice/ (32057)

7   primary care.mp. or Primary Health Care/ (85717)

8   emergencies/ (32805)

9   emergency medicine/ (9094)

10   Emergency treatment/ (7625)

11   emergency service, hospital/td (685)

12   emergency hospital admission*.ti,ab. (196)

13   emergency hospitali#ation.ti,ab. (144)

14   unplanned hospitali#ation.ti,ab. (56)

15   (primary care adj5 admission*).ti,ab. (109)

16   (ambulatory care adj5 admission*).ti,ab. (66)

17   (admission* adj5 emergenc*).ti,ab. (4084)

18   (Emergency Treatment adj5 admission*).ti,ab. (5)

19   ((emergency care adj5 admission*) or readmission*).mp. (11688)

20   (emergency room adj5 admission*).ti,ab. (640)

21   emergency admission*.mp. (1198)

22   emergency medical admission*.mp. (65)

23   emergency referral*.ti,ab. (116)

24   (hospital admission* adj5 emergenc*).mp. (919)

25   ED attendance.mp. (61)

26   emergency department attendance.mp. (53)

27   (accident and emergency attendance).mp. [mp=title, abstract, original title, name of substance word, subject heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (19)

28   (A and E attendance).mp. [mp=title, abstract, original title, name of substance word, subject heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (8)

29   (emergency department adj5 attendance).mp. [mp=title, abstract, original title, name of substance word, subject heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (125)

30   (ED adj5 attendance).mp. [mp=title, abstract, original title, name of substance word, subject heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (88)

31   ((accident and emergency) adj5 attendance).mp. [mp=title, abstract, original title, name of substance word, subject heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (120)

32   ((a and e) adj5 attendance).mp. [mp=title, abstract, original title, name of substance word, subject heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (79)

33   medical assessment unit.mp. (46)

34   Emergency Medical Services/ (29664)

35   ((unscheduled or unplanned or un-planned or unanticipated or unexpected) adj5 (admission* or readmission* or hospitali#ation or care)).mp. (1424)

36   or/1-7 (178967)

37   or/8-35 (92517)

38   36 and 37 (3386)

39   38 not (case report/ or case study/ or letter/ or editorial/ or expert opinion.mp.) (3018)

40   39 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. (2877)

41   limit 40 to yr="1990 -Current" (2347)

42   remove duplicates from 41 (2283)

****

Appendix two: **PRISMA flow diagram searches run September 2012**

Records identified through database searching
(n =12,314)

Additional records identified through other sources
(n =654   )

n=12,966 records had duplicates removed & then screened by abstract by AH & SP

Records excluded as duplicates
(n = 2,796)

Records excluded as not relevant

n=149* Full-text articles assessed for eligibility in progress by AH & SP

Full-text articles excluded, with reasons

n =25 reviews

n= 50 not relevant to the project

n=48 included papers which describe features of primary care & unscheduled care

n=11 included papers which describe intervention & evaluation studies

n=11 included papers which describe qualitative and surveys of patient report

*One paper was identified post searches Cowling 2013

Appendix three: List of excluded papers with reasons n=50

Papers	Reason
1. Aaraas 1998	Pre 2000
2. Abom 2000	No English version of full text
3. Altervela 2008	Specific intervention
4. Armstrong 1997	Pre 2000
5. Basu 2001	No relevant outcomes
6. Bell 2009	No relevant outcomes
7. Benger 2008	No relevant outcomes
8. Berns 1994	Pre 2000
9. Boushy 1999	Pre 2000
10. Bury 2006	Study about EMTs & GPs
11. Campbell 2001	No relevant outcomes
12. Cave 2010	Specific intervention
13. Connett 2011	Abstract not published as of Oct 2013
14. Dale 1996	Pre 2000
15. Desai 2008	No relevant outcomes
16. Dias da costa 2008	No relevant outcomes
17. Dusheiko 2011a	costs extension of Dusheiko 2011b in main paper
18. Fiorenti 2011	No relevant outcomes
19. Foster 2001	No relevant outcomes
20. Goodwin 1998 UK	Pre 2000
21. Kyle 2012	No relevant outcomes
22. Langton 2011	Abstract not published to date October 2013
23. Lisk 2011	Conference abstract -we have full paper
24. Moll Van charante 2004	No relevant outcomes
25. Murphy 1997	Pre 2000
26. Nagree 2004	No relevant outcomes
27. Ng 2012	No relevant outcomes
28. Oterino 2007a	No relevant outcomes
29. o'keefe 2011	No relevant outcomes
30. Ranmal 2010 published as Mcguire 2011	No relevant outcomes
31. Richards 2007	Not an original paper
32. Rogers 2011	No relevant outcomes
33. Rocovich 2012	No relevant outcomes
34. Salisbury 1997	Pre 2000
35. Schubert 2012	Conference abstract – no paper to date Oct 1st 2013
36. Sequist 2011	No relevant outcomes
37. Shipman 2000	No relevant outcomes
38. Smith 2001 UK	No relevant outcomes
39. Stoddart 1999	Pre 2000
40. Tierney 2003	Specific intervention
41. Thomas 2009	No relevant outcomes

42. Thomas 1993	Pre 2000
43. Thompson 1999	No relevant outcomes
44. Toth 1997	Pre 2000
45. Tourigny 2010	No relevant outcomes
46. Townsend 1999	Pre 2000
47. Tranquada 2010	No relevant outcomes
48. Van uden 2005b	No relevant outcomes
49. Van der Houtven 2008	No relevant outcomes
50. Weiss 2007	Emergency contraception

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