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Review

Interventions to reduce emergency department utilisation: A review of reviews[☆]

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ABSTRACT

Objective: To describe policy interventions that have the objective to reduce ED use and to estimate their effectiveness.**Methods:** Narrative review by searching three electronic databases for scientific literature review papers published between 2010 and October 2015. The quality of the included studies was assessed with AMSTAR, and a narrative synthesis of the retrieved papers was applied.**Results:** Twenty-three included publications described six types of interventions: (1) cost sharing; (2) strengthening primary care; (3) pre-hospital diversion (including telephone triage); (4) coordination; (5) education and self-management support; (6) barriers to access emergency departments. The high number of interventions, the divergent methods used to measure outcomes and the different populations complicate their evaluation. Although approximately two-thirds of the primary studies showed reductions in ED use for most interventions the evidence showed contradictory results.**Conclusion:** Despite numerous publications, evidence about the effectiveness of interventions that aim to reduce ED use remains insufficient. Studies on more homogeneous patient groups with a clearly described intervention and control group are needed to determine for which specific target group what type of intervention is most successful and how the intervention should be designed. The effective use of ED services in general is a complex and multi-factorial problem that requires integrated interventions that will have to be adapted to the specific context of a country with a feedback system to monitor its (un-)intended consequences. Yet, the co-location of GP posts and emergency departments seems together with the introduction of telephone triage systems the preferred interventions to reduce inappropriate ED visits while case-management might reduce the number of ED attendances by frequent ED users.© 2016 The Author(s). Published by Elsevier Ireland Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).[☆] Open Access for this article is made possible by a collaboration between Health Policy and The European Observatory on Health Systems and Policies.

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1. Introduction

In most high-income countries, the number of visits to hospital emergency departments (EDs) has increased considerably over recent years [1]. This concerns the healthcare community, as well as the society at large since it causes undesirable situations and outcomes. A widely cited consequence is that many EDs experience overcrowding with associated long waiting times,

patient dissatisfaction, over-stressed healthcare professionals, safety and efficiency problems [2–5]. In their search for solutions policymakers' attention is mostly focused on particular groups. A first group are the so-called inappropriate ED visits: the ED attendances for conditions that do not require urgent attention or specialised input. Although there is considerable debate about the concept of 'inappropriateness', prevalence estimates in the international literature mostly vary between 20 and 40% [1,6]. These ED visits are considered as inappropriate because they may divert ED resources from time-sensitive and life-threatening situations (e.g. stroke, acute myocardial infarction, major trauma) to minor health problems potentially resulting in unsafe situations. Furthermore, inappropriate ED visits may also compromise the efficient use of healthcare resources in the knowledge that primary care is cheaper than emergency care services for patients with non-urgent problems because of lower labour costs and lower prescriptions of medical imaging and laboratory tests [7]. Finally, when patients replace primary care with ED visits there is a lack of continuity and follow-up [8].

A second particular group is that of older persons, especially the very old (i.e. >85 years). Elderly patients are the fastest growing group at EDs [9]. The higher ED use amongst older persons can be explained by underlying factors such as multiple chronic conditions, falls, functional decline in combination with lack of support, deprivation, etc. Although a large proportion of older adults require hospital care at the time they present to the ED, the extent to which visits could be avoided, either through early prevention or access to alternative settings, is less clear [9]. The same arguments hold for non-elderly patients with (multiple) chronic conditions.

A third particular group that gains policymakers' attention is that of the frequent ED users [10]. Although different thresholds for defining frequent ED users exist in the literature (e.g. threshold of 3–10 ED visits within a period of 12 months), it is estimated that between 1 to 5% of the overall ED population are frequent users [11]. Despite being a marginal proportion of total ED patient population, it is well described in the international literature that frequent ED users have complex healthcare needs (e.g. exacerbations of patients with chronic conditions, frail elderly, substance abusers, nursing home residents) that are not optimally managed within the context of the ED (or other healthcare) setting [11].

The reasons for the increase in (sometimes inappropriate) ED use are multifaceted and include mostly factors related to patient characteristics and demographic/societal changes such as the ageing population, increasing prevalence of chronic conditions, the changes in households characterised by increasing loneliness and lack of family support [6]. But also other factors can cause an increasing demand or explain a high use of ED resources. Examples are risk aversion (e.g. patients perceive their symptoms as severe enough to attend the ED; patients that think they are better off in a high-tech environment) and the easy access to specialised care. Indeed, the perception exists that EDs are convenient 'one-stop shops' that provide 'total care' with relevant diagnostics, delivered by a specialist team trained in emergency medicine [12]. A well-known exam-

ple of the latter phenomenon can be observed amongst young children where the general practitioner (GP) is bypassed to get direct access to a paediatrician [6,13].

Besides factors contributing to an increased demand also supply-side factors are mentioned in the literature (e.g. lack of access to primary care services, inconvenient primary care out-of-hours services) [6]. Yet, in spite of investments in most countries to improve these supply factors, ED use continued to rise. Therefore, it is assumed that further improvements in these supply factors could, at best, result in curbing the rise in ED visits or in a more efficient allocation of the available resources.

The aim of this study was to analyse the evidence about effectiveness of interventions to reduce (the rise in) ED utilization based on a narrative review of systematic reviews. This entails a wide variety of interventions such as: healthcare education and self-management interventions; measures that limit access to the ED (e.g. gatekeeping, cost sharing); measures that strengthen primary care (e.g. GP supply; extended out-of-hours openings) or alternative care settings (e.g. walk-in centres) to improve access; interventions to strengthen continuity of care between hospital care and community care (e.g. case-management).

2. Materials and methods

2.1. Search strategy

An exploratory search showed that several reviews exist on this subject. Based on this exploratory search it was assessed that the existing reviews might be a good source to get insight into the current state of affairs without necessitating to search for primary studies. Therefore, it was decided to perform a review of reviews. Reviews were identified through a systematic literature search in three databases (MEDLINE-Ovid, Embase and Cochrane library reviews). The databases were searched in October 2015 with the following restrictions: language (English, French, Dutch); date limits (from 2005 to October 2015). In each database, a search was performed using the following search terms: [triage OR emergency care OR emergency department(s) OR emergency unit(s) OR emergency rooms(s) OR emergency crowding OR emergency overcrowding OR emergencies OR emergency medical services OR crowding] AND [emergency use OR emergency visit OR emergency attendance OR emergency admission OR emergency readmission OR urgent use OR urgent visit OR urgent readmission OR unscheduled use OR unscheduled visit OR unscheduled attendance OR unscheduled admission OR unscheduled readmission OR unplanned use OR unplanned visit OR unplanned attendance OR unplanned admission OR unplanned readmission] AND [meta analysis OR review OR search].

MeSH headings and wildcards were used in the MEDLINE-Ovid search to encompass synonyms to the search terms. We used the singular and plural forms. The MEDLINE-Ovid search was replicated for Embase and the Cochrane library reviews. All reference lists of included studies were hand-searched for additional potential relevant studies.

2.2. In- and exclusion criteria

Articles were included if they fulfilled the following criteria:

- Interventions focusing on reducing the rise in ED visits;
- At least the primary outcome of the meta-review was included in the review: ED utilization (e.g. ED visits);
- Review articles without a restriction in the type of primary studies that were included in the review. Furthermore, the search strategy has to be reported and at least two databases were searched (of which one is Medline);
- We sought for systematic reviews published since 2005, but due to the large amount of references and the limited time to perform this study, it was decided to restrict the inclusion criteria further to systematic reviews dating from 2010 or more recent.

Articles were excluded if they fulfilled at least one of the following criteria:

- Studies focusing on disease-specific conditions;
- Studies focusing on primary studies conducted in low and middle income countries [14];
- Studies focusing on healthcare professionals (e.g. staff experiences);
- Interventions restricted to medical treatments (e.g. effect medication treatment; surgical procedures); medication reviews and interventions focusing on medication to ensure a smooth transition between hospital and community care, quality indicators, innovations within the ED to deal with low-acuity patients (e.g. fast-track; workforce innovations);
- Primary studies;
- Reviews focusing on literature about one particular country.

In- and exclusion criteria were tested on a set of 100 references by one reviewer (KV) and discussed with a second reviewer (CV), after which some small modifications were made.

2.3. Selection

Next, all titles/abstracts of references were screened by the same reviewer (KV). Full-text articles of possible relevant references were obtained and again screened on inclusion criteria by one researcher (KV); in case of doubt a second reviewer (CV) was asked to check the study on inclusion criteria.

2.4. Quality assessment

Included systematic reviews were methodologically assessed with AMSTAR [15] by one reviewer (KV). AMSTAR is a tool to assess the methodological quality of systematic reviews including binned items (e.g. 'a priori' design provided; characteristics of the included studies provided). For each item a score of '1' or '0' is assigned. The sum-score indicates the overall quality being poor (AMSTAR-scores below

Table 1
Obtained studies per database.

Database	N hits
Ovid_MEDLINE	729
Embase	773
Cochrane_reviews	21
Total	1523
After deduplication	1202

5), moderately (AMSTAR-scores of 5–7) or well (AMSTAR scores of 8 or above) [15].

2.5. Data collection and processing

The following data were abstracted from all eligible studies: search date, searched databases, type and number of included studies, analysis and funding. Next to this, from each systematic review, a description of the target population and interventions was extracted together with the type of study designs and reported outcomes for the respective interventions. Also the conclusions from each review as stated by the authors were extracted.

Data from the systematic reviews were extracted and categorised along different axes:

- Target population included in the systematic review (age groups and description of sub-categories such as frequent ED users);
- Type of intervention (supply primary care; access hours primary care; telephone services; other primary care interventions; coordination (case-management; coordination, other than case-management); education and self-management support; gatekeeping; barrier (other); cost sharing; pre-hospital diversion);
- Type of designs of the included studies (systematic review; RCT; controlled trial; observational study);
- Country;
- Type of outcome.

Data analysis and synthesis were descriptive, along the above axes.

3. Results

3.1. Search and inclusion

Table 1 shows the number of hits obtained in the three databases. All 1202 references were checked on title/abstract by one researcher (KV) to see if they fulfilled the inclusion criteria. By further restricting the date limit to 2010 instead of 2005, 19 potentially relevant reviews were excluded.

Seventy-seven reviews were possibly relevant (and one additional reference was found via hand-searching). The 78 obtained full-text systematic reviews were then screened on inclusion criteria and 23 references [2,11,16–36] were retained. Inclusion flow of the full-text assessment of the possibly relevant systematic reviews is depicted in Fig. 1.

Table 2

Summary of included systematic reviews.

Study	Search until	AMSTAR	Number of studies	Target population	Supply primary care	Access hours primary care	Other primary care interventions	Telephone services	Pre-hospital diversion-other	Case-management	Coordination (other)	Education & self-management support	Gatekeeping	Barrier (other)	Cost sharing
Althaus et al. [16]	June 2010	8	11	Adult frequent ED users						+	± ^a				
Bahr et al. [17]	February 2013	6	19	Adult hospitalised patients				± ^b							
Crocker et al. [19]	December 2011	7	3	Adults				NS ^c							
Fan et al. [20]	January 2014	6	36	General elderly population							± ^d				
Flores-Mateo et al. [2]	February 2012	8	48	General adult population	+	±		NS ^e				±	±		+
Franek et al. [21]	January 15, 2012	8	11	Adults with general chronic conditions								NS			
Health Quality Ontario [22]	April 2012	6	11	Adults with general chronic conditions							± ^f				
Health Quality Ontario [23]	December 2011	6	23	Adults with general chronic conditions							+ ^g				
Huntley et al. [24]	October 2012	8	48	Patients (general)	± ^h	±					+ ⁱ				
Ismail et al. [25]	August 2011	7	34	General population		±	± ^j	± ^k							
Jackson et al. [26]	June 2012	8	19	Patient populations representing multiple diseases			± ^l								
Karam et al. [27]	June 2012	6	3	Older patients with an ambulatory ED contact							± ^m				
Katz et al. [28]	December 2010	6	13	ED patients (general)							± ⁿ				
Kumar et al. [29]	April 2011	6	12	Adult frequent ED users						+					
Lidal et al. [18]	June 2012	N/A	/	Acute care patients (general)				/ ^o							
Lohwthian et al. [30]	December 2013	8	9	Elderly discharged from ED							NS ^p				
Morgan et al. [31]	January 2013	7	39	General		±			+			± ^q	±	±	+
Rennke et al. [32]	September 2012	8	57	Adult general patients							± ^r				
Sinha et al. [33]	December 2010	6	18	Non-institutionalised elderly						± ^s					

Soril et al. [11]	January 2015	7	17	General adult frequent ED user population	+	± ^t
Stall et al. [34]	March 2014	7	9	Community-dwelling older adults		± ^u
Tohira et al. [35]	October 2012	9	13	General population (calling for ambulance transport)	± ^v	
Tricco et al. [36]	May 2014	8	50	Adult frequent users of the healthcare system	NS	± ^w

Legend: + in favour of intervention: ED use decreases; – in favour of control: ED use increases; ± mixed study results; NS non-significant results.

^a Case-management light (e.g. individual care planning).

^b Post-discharge telephone call (hospital based).

^c Post-discharge telephone call (primary care based).

^d Community-based > hospital-based interventions (both including, for instance, case-management).

^e Telephone consultation for primary care patients during out-of-hours.

^f Tools and systems for electronic health information exchange that facilitate provider–provider communication.

^g Relational continuity of care interventions: ongoing relationship between care provider and patient.

^h Mixed results but in general positive for US, Canada (not for Europe where primary care is already more developed).

ⁱ Continuity of care.

^j Walk-in and community health centres; emergency nurse practitioners in residential care.

^k Telephone triage.

^l Patient-centered medical home.

^m Interventions classified with an increasing level of intensity as ‘referral (assessment and recommendations)’; ‘programme (on-going support for patient after discharge from ED)’ and ‘integrated (care facilitator imbedded in individual care plan)’. The latter is most beneficial.

ⁿ ED-based care coordination (development of post ED treatment plan).

^o Validated triage system in the pre-hospital setting.

^p Community transition strategies (e.g. GP liaison, telephone follow-up).

^q Greatest reductions by education interventions (but also some null findings).

^r Pre-, post-discharge and bridging interventions (some of these interventions also include self-management support and case-management).

^s Evidence that case-management is effective when evidence-based, nurse-led, inter-professional approach is followed.

^t Information sharing (mixed), individualised care planning (no effect).

^u Home-based primary care programmes provided by the regular primary care provider.

^v Pre-hospital practitioners (ambulance transport).

^w Care coordination by case-management, team changes (e.g. routine home visits by healthcare provider other than GP), self-management, clinical information systems. Effect for sub-population of the elderly.

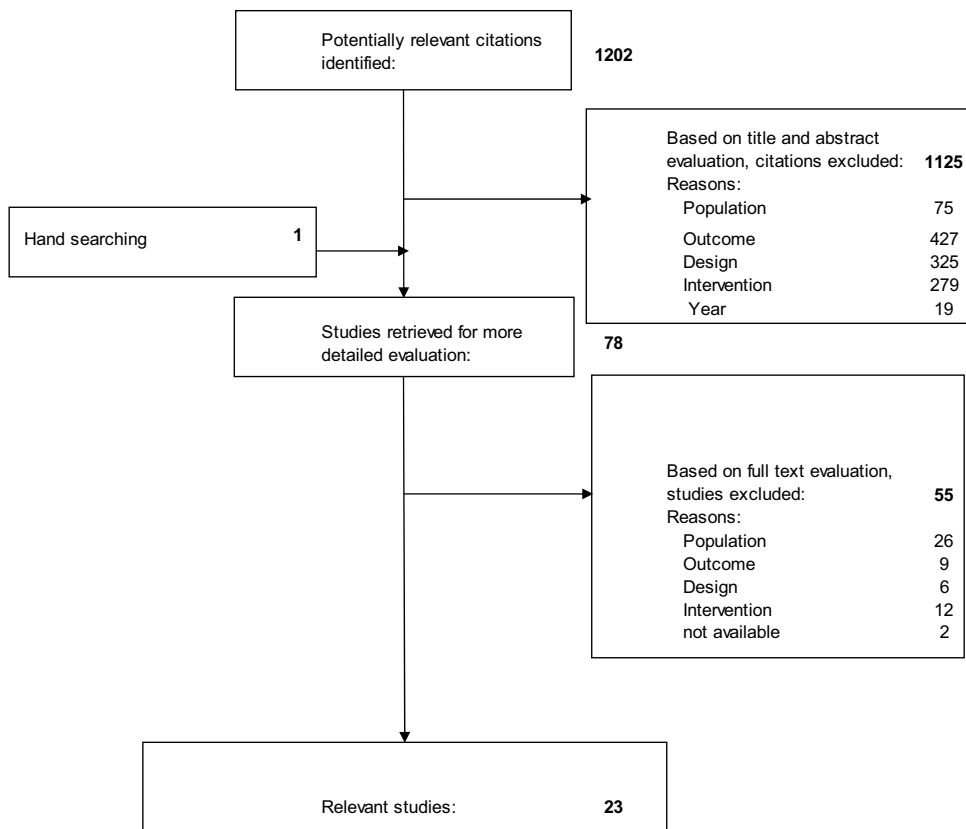


Fig. 1. Flow chart.

3.2. Methodological assessment

In Table 2, the number of met AMSTAR-criteria per included systematic review is shown. An overview per criterion is appended as an online Supplementary table. The number of criteria met varied from 6 to 9. The included reviews can be considered as moderately or well performed systematic reviews.

3.3. Type of target populations and interventions included in systematic reviews

All reviews considered mixed populations since reviews that focused on a particular disease group like chronic obstructive pulmonary disease (COPD), chronic heart failure or diabetes were excluded. Yet, some reviews focused on specific target groups: four on frequent ED users [11,16,29,36]; five on elderly [20,27,30,33,34] and three on patients with various chronic conditions [21–23].

The scope of included interventions was different for all reviews. Several reviews focused only on one intervention type. Nine reviews focused on coordination interventions [20,22–24,27,28,30,32,34] and two on case-management [29,33]. Althaus et al. [16], Soril et al. [11] and Tricco et al. [36] focused on coordination and case-management (which is of course one specific type of care coordination). The focus on care coordination and case-management is especially seen when the reviews are designed for spe-

cific populations such as frequent ED users [11,16,29,36] and elderly [20,27,30,34] patients with chronic conditions [22,23].

Further, three reviews evaluated only telephone services [17–19]; one review evaluated education and self-management (focus on patients with chronic conditions [21]); another review evaluated the patient-centred medical home (other primary care) [26]; and yet another review evaluated pre-hospital diversion [35]. Three reviews had a large scope [2,25,31].

3.4. Effectiveness of increasing the supply of and access to primary care

A distinction can be made between interventions that aim to increase the supply of primary care (e.g. investments in additional primary care centres) and interventions aiming to increase the access hours of primary care services (e.g. out-of-hours availability).

- Supply of primary care services: In two reviews [2,24] evidence about increased primary care supply (increasing number of primary care centres or primary care physicians or physician density) was evaluated. Studies from different study settings were included (United States or US, Canada, Spain, Sweden, Brazil). The conclusion about the evidence on the association between increasing the supply of primary care and lower ED visits

was not univocal. While one of the reviews [2] concluded that there is clear evidence for an association, this conclusion was not confirmed in another review [24]. The latter review stated that such an association could only be observed in the US communities that have poor coverage of primary care services.

- Access hours primary care: Increasing the access hours of primary care, especially during out-of-hours periods, was subject of evaluation in four reviews [2,24,25,31] including primary studies from a variety of countries: Belgium, Canada, Denmark, Ireland, United Kingdom or UK, US, Spain, and the Netherlands. Overall, studies [2,24,25,31] that focused on interventions aimed at increasing access hours of primary care services showed a mixed picture regarding the reduction in ED visits. The review of Huntley et al. [24], for instance, included eight studies on the association between increased access hours of primary care and ED visits. Five (US: 4; UK: 1) studies indicated that increased access to primary care (e.g. longer opening hours, more appointment slots) reduced ED visits. Another study in the Netherlands showed that co-locating a GP out-of-hours practice and the ED, reduced ED visits. One longitudinal study conducted in the UK has shown, however, that co-location has increased ED use. In a Danish study, it was shown that replacing out-of-hours care from local GPs by telephone triage and GPs in a central regional triage centre increased (but not statistically significant) ED visits. In a Spanish study, increased out-of-hours accessibility did not affect ED visits [24]. Of the ten studies included in the review of Morgan et al. [31] about increased primary care access, three examined interventions that expanded capacity through new centres, while the other studies involved existing physician practices expanding appointments and/or hours of care. Four studies found significant decreases in the use of the ED after increases in non-ED capacity (9–54%), while five were non-significant and one found an increase of 21%. Similar findings were reported by Flores-Mateo et al. [2] and Ismail et al. [25].
- Other interventions to strengthen primary care: The review of Ismail et al. [25] included also other primary care interventions such as walk-in centres (nurse-led services handling low acuity presentations in the UK), community centres (serving medically uninsured or rural populations with limited primary care access in the US) and an emergency nurse practitioner in residential care. The review reported mixed results regarding the effectiveness on ED use reduction. The review of Jackson et al. [26] focused on a particular intervention type, the patient-centred medical home (PCMH). These primary care centres are (1) team-based care, (2) having at least 2 of 4 elements focused on how to improve the entire organisation of care (enhanced access, coordinated care, comprehensiveness, systems-based approach to improving quality and safety), (3) a sustained partnership, and (4) having an intervention that involves structural changes to the traditional practice. All studies that were included in the review by Jackson et al. about the impact of patient-centred medical homes on ED use, were conducted in the US. The included randomised clinical trials (n = 3) found no effect on ED use (combined RR,

0.93 [CI, 0.72–1.20]) while three observational studies found small to moderately decreased inpatient and ED use [26].

3.5. Effectiveness of telephone services

Different types of telephone services are described in the literature. A first type of telephone calls are the follow-up calls post-discharge performed by hospital staff or primary care staff to “determine how they were doing” (e.g. answering patient questions, asking about symptoms, clarifying areas of patient education, reviewing medications, assist in scheduling outpatient appointments and rescheduling missed appointments, and assess barriers to keeping appointments) [17,19]. A second type of telephone calls are telephone consultations or advice services (e.g. telephone consultation for primary care patients seeking medical help out-of-hours) [2,25]. A third type of telephone calls are the telephone triage services where patients are prioritised by the use of a validated triage system in the pre-hospital setting via a telephone triage-assessment [18]. Only the study by Flores-Mateo et al. [2] reported the countries in which the telephone services were evaluated: US, Denmark and UK.

Although Ismail et al. [25] reported mixed results for the effect of validated pre-hospital telephone triage systems on ED use, there is in fact a lack of evidence in this domain that is clearly understudied [18]. The evidence about the effect of telephone consultations (e.g. post-discharge telephone calls) is contradictory. Bahr et al. [17] reported mixed findings for hospital-based interventions while null findings were reported in the reviews that focused on primary care based interventions [2,19]. The authors of the latter review stated that “*this system, in reality, delays the visit rather than resolving the problem*” [2].

3.6. Effectiveness of various pre-hospital interventions

The evidence about pre-hospital interventions such as pre-hospital practitioners providing care at the scene or referring the patient to an alternative healthcare service is limited but promising. Transport of low-acuity patients towards other care settings than the ED (e.g. minor injury units) was evaluated in the review of Morgan et al. [31] and significant decreases in ED use ranged from 3% to 7% in one US- and one UK-based study [31]. The review of Tohira et al. [35] evaluated pre-hospital practitioners providing care at the scene and/or referring a patient to an alternative healthcare service. These practitioners are all able to provide care at the scene and discharge patients on site without referral to other clinicians [35]. This differs from the standard emergency medical service in most countries, where patients are transported to the ED. The review included studies from New-Zeeland (n = 3), Canada (n = 11) and the UK (n = 9). All included studies found that the introduction of these new roles was less likely than conventional ambulance staff to transfer patients to the emergency department (but with high variations in effect sizes: 1.6–50 times less likely). In addition, it should be noted that there was no conclusive evidence about the impact of these roles on subsequent ED attendance since

some studies reported increases in ED visits while others found no difference [35].

3.7. Coordination of care

The most prominent intervention that aims to reduce ED visits by improving coordination is case-management. In this section, we first describe case-management and then describe evidence about other coordination interventions.

- **Case-management:** Although case-management is not uniformly defined across studies, common elements return such as: interdisciplinary approach of individual care planning based on a thorough assessment and aimed to guide the patient throughout his care process which often transcends the traditional care boundaries between hospital and community care. The role of case-manager is often assigned to a dedicated person, most often a nurse. Soril et al. [11], for instance, defined case-management as “*comprehensive, interdisciplinary approach taken to assess, plan, personalize, and guide an individual’s health services to promote improved patient and health system outcomes. A single point of contact (e.g. an individual described as either a case manager, care manager, or ED consultant) is assigned to the patient with as task to broke access and guide the patient through their customized care process, which may extend beyond the normal continuum of the ED and inpatient care, into the community.*”

It is an intervention that is studied in a wide variety of countries with different types of healthcare systems. The most recent review [11], for instance, included studies from the United States (n=5); Australia (n=2); New-Zeeland; Sweden; Canada; Scotland; Taiwan with the evaluation of case-management as an intervention to reduce ED visits amongst frequent ED users. Other reviews [16,33,36] also included studies from the UK, Israel and South-Africa. Although randomised clinical trials were (especially in the review that focused on non-institutionalised elderly [33]) included in all reviews [11,16,29,33,36], most included studies were observational studies. The targeted populations were either frequent ED users [11,16,29,36] or elderly [33].

Evidence suggests that case-management could reduce ED use but additional investigation is needed to determine what specific aspects of case-management are most successful and cost effective [11,16,29,33,36]. Sinha et al., for instance, reported that case-management interventions were more effective when they were “*evidence-based*”; “*nurse-led*” and when they followed an “*inter-professional approach*” [33]. In general, the breadth of resources and intensity of intervention (e.g. frequency of follow-up; availability of psychosocial services; the aggressiveness of outreach) seem to correlate with better results.

- **Other coordination activities:** A wide range of other coordination interventions (e.g. individual care planning, post-discharge telephone calls; relational continuity of care), often including one or more case-management components, were studied with mixed results within the general population [28,32] as well as in the pop-

ulation of frequent ED users [11,16,36], chronic care patients [22] and elderly [20,27,30,34]. Coordination interventions that are more intense, multi-layered and incorporate strong linkages to the longer-term primary and community care services are more successful than single interventions (e.g. individual care planning) or solely hospital-based interventions. For the chronic care patients [23] there seems to be a relationship with relational continuity of care (same care provider), an effect that was also confirmed in a review in the general population [24].

3.8. Patient education and self-management support

Three reviews focused on educational interventions targeting patients [2,21,31]. The reviews of Flores-Mateo et al. [2] and Morgan et al. [31] focus on educational interventions in general whereas Franek [21] focus on educational interventions in patients with chronic conditions. The educational interventions analysed in the first two reviews include interventions such as information booklets; monthly group meetings with educational components; teaching patients how to use the health-care system and providing counselling in social/emotional issues; self-management support [2,31]. Evidence from Australia [2] and the US [2,31] is available.

Although evidence about the effect of educational interventions is contradictory, a large number of studies showed that they have potentially a large impact on ED use [2,31]. The educational interventions seem not to be successful when they are implemented as stand-alone (i.e. the intention being merely to educate patients regarding overall health service utilisation). A large well-conducted RCT included in the review of Flores-Mateo et al. [2] did, for instance, not report statistically significant results. It concerned a stand-alone educational intervention (i.e. an information booklet). The authors stated that “*educational interventions seem more effective when they are introduced as a part of a multi-faceted intervention*”.

The review of Franek [21] focused on self-management support promoting skills such as problem solving, decision making, resource utilisation, patient-provider relationship, and/or taking action. More in particular the Stanford Chronic Disease Self-Management Program (CDSMP) was evaluated. This is a community-based self-management support programme based on social cognitive theory that states that successful behaviour change requires confidence in one’s ability to carry out an action (i.e. self-efficacy) and the expectation that a specific goal will be achieved (i.e. outcome expectancy) [21]. The studies evaluating the impact of educational interventions on ED visits were conducted in the US (n=4) and China. Meta-analysis showed no significant difference between the Stanford Chronic Disease Self-Management Program and usual care (SMD, -0.05; 95% CI, -0.18, 0.09; P=0.49) [21].

3.9. Gatekeeping

Two types of gatekeeping methods: were included within the scope of reviews. The first type is the allocation of a gatekeeping role to GPs which is implemented in sev-

eral healthcare systems (e.g. UK, Scandinavian countries). The second type concerns managed care where health maintenance organisations practice gatekeeping: a pre-authorisation for payment for the ED visit via the “managed care gatekeeper” was required. This is a model adopted in the US but with no standardised triage criteria and with various personnel functioning as the gatekeeper. The studies identified in the systematic reviews focus on this second type of gatekeeping with some beneficial effects on ED use observed. Yet, also some studies reported no effect [2,31]. All of studies included in the reviews were conducted in North-America with the exception of one gatekeeping study (Ireland) [31].

3.10. Cost sharing

Cost sharing is defined as any kind of out-of-pocket payment for healthcare services: co-payments (patients pay a flat fee for each medical service sought or product purchased), co-insurance (patients pay a fixed percentage of the cost of care) and deductibles (the amount one must pay out of pocket annually before insurance coverage begins to pay) [2,31]. The study of Flores-Mateo et al. [2] included 11 US-based studies and 1 Irish study. The review of Morgan et al. [31] included only US-based studies. The intervention in seven studies was the requirement for patient co-payment or coinsurance, and in three it was the implementation of a high deductible. Half of the studies were in Medicaid populations, while the others involved commercial insurers. All but one of the eleven US-based studies included in the review by Flores-Mateo et al. [2] and all but one of the ten studies included in the review by Morgan et al. [31] found a reduction in ED use with reductions ranging from 3% to 50%. The study conducted in the Irish setting reported that the overall ED workload remained stable, but with a slightly significant reduction in the number of patients who attended with non-emergency pathologies.

4. Discussion

4.1. Limitations of primary studies and the narrative review

The original articles included in the reviews that were withheld for this narrative review entail several limitations. A first observation is that most of the included reviews (especially the more generic reviews) included remarks on the large encountered heterogeneity in terms of patient populations studied, included interventions (and lack of clear definitions) and ways of measuring outcomes (especially costs and adverse events, if measured at all). Furthermore, heterogeneity also implies the large variety in the organisation of acute care system delivery across developed countries as well as other country specific elements (e.g. geographical differences, financing system). As such, the generalisation of results and transferability of interventions towards other care settings might be limited.

A second observation is that all reviews that included several interventions conclude that for most interventions results are mixed.

A third observation is the weak quality of the available evidence. Not only are interventions but also the other concepts (e.g. adverse outcomes, costs) ill-defined and understudied, there are also concerns about the used designs. Most studies are observational and the few quasi-experimental studies included in the reviews have serious design problems (e.g. under-powered, unclear definition intervention) and fail to adequately evaluate the long-term impact of the intervention due to restrictions in the follow-up measurements periods [25].

Also the narrative review of reviews includes several limitations. This literature review was limited to a search for information on the effectiveness of interventions to reduce ED use in systematic reviews and not directly in primary research studies. This choice was done because of the large number of published systematic reviews with one or more policy interventions with that objective. As a result of this approach, the most recent literature is possibly missed. A citation search of the included systematic reviews in Web of Science was undertaken to overcome this limitation. Key publications that resulted from this screening were included in the discussion of this review. Another major limitation is that the sifting of the literature and data extraction was undertaken by one researcher only. Furthermore, we only included reviews published between January 1st, 2010 and October 31st, 2015. Nevertheless, the included reviews covered primary studies for much larger periods (most of them from inception until date of the search, see Table 3 in Supplementary data) and some of them [21,23,25] also included reviews as a source or were building on existing reviews [31]. Therefore, we are convinced that the risk that this search strategy resulted in missing important insights from primary studies or reviews is rather low. In addition, some topics were not separately discussed in the original systematic reviews (e.g. co-location of EDs and primary care centres was mostly integrated in reviews as a method of increasing access to out-of-hours GP services without a specification of the co-location element). Nevertheless, also via a citation search for recent primary studies and some recent evaluation studies on this topic were included. We also focused on ED use as primary outcome. Looking at ED use gives only a partial picture of the interventions' effectiveness (e.g. impact on other services, patient experiences, patient safety) but is a defensible choice since controlling the ever-increasing use of EDs is a policy goal in most industrialised countries. Finally, we excluded reviews focusing on single diseases. Since the bulk of the reviews that were excluded based on this criterion concerned highly prevalent chronic conditions (e.g. diabetes; Chronic Obstructive Pulmonary Disease; asthma), we potentially miss important insights.

With these general limitations of this narrative review and the primary studies that were included in the evaluated systematic reviews in mind, we discuss below the main study results and their policy implications. We start with the solution elements for the problem area (i.e. inappropriate ED visits for non-urgent problems) with, in absolute numbers, the largest room for improvement. Then, we discuss solution elements (e.g. telephone consultations,

case-management) aimed to reduce ED visits in particular patient groups and situations.

4.2. Redirecting patients visiting EDs inappropriately towards alternative settings will require that these are accessible

Telephone triage holds the potential to alleviate the pressure on EDs by re-directing patients without urgent or specialised care needs to a more appropriate care level (e.g. GP post, scheduled primary care or self-care). Yet, there is a lack of high-quality evidence about the effect of validated pre-hospital telephone triage systems on ED use. This does not mean that the domain ‘telephone triage’ for calls related to urgent medical problems is understudied since several studies with impact on other outcomes and dimensions have been published [18]. Yet, most of these studies are retrospective and with observational designs. Nevertheless, the literature indicates that telephone triage systems are relatively accurate but that the risk for underuse (referral to a too low level of care according to the urgency level) increases with risk of urgency [38]. It has been shown that safety problems are lower when call handlers have a clinical background [39]. In addition, it has been shown that compliance rates to telephone triage decisions are generally high with rates reported between 56–98%. However, compliance rates are dependent on the type of advice. Higher compliance rates are reported for self-care and ED attendance advices compared to advice to contact primary care, potentially reflecting patient preferences for ED care [38]. A recent evaluation of a telephone triage system in England revealed that introducing a telephone triage system for unscheduled primary care problems might increase the overall workload of the emergency care system (potentially due to the absence of 24/7 care alternatives) [40]. Based on the available evidence it can be recommended to start experimenting with telephone triage pilot projects as one of the interventions to reduce the number of inappropriate ED visits. These pilot projects should take into account important lessons from the literature such as investments in call centres with clinically trained staff; monitoring of safety effects; and harmonising the telephone triage system with the entire service offer (e.g. referral agreements primary care).

4.3. Providing alternatives outside the ED: design elements of the intervention are key to successfully reduce inappropriate ED visits

Another set of policy measure aiming to reduce inappropriate ED visits concern several interventions that try to strengthen primary care. Overall, studies that focused on interventions aimed at increasing out-of-hours primary care services did not show a reduction in ED visits. Most of the included studies were performed in countries with already a strong primary health care system in place. The conclusion on the evidence about the association between increasing the supply of primary care (e.g. number of GPs and primary care centres) and lower ED visits was not univocal. Despite the mixed results presented in this narrative review of reviews, a recent study [41] found clear

associations between the strength of primary care and ED use based on a European survey of GPs and patients. Variables measuring primary care access (e.g. opening hours, the nearness of a general practice and home visiting) were clearly associated with reduced ED visits. Moreover, people who think it is easy to get primary care during out-of-office hours visited the ED less often. It should be noted that this study is based on the perceived, rather than on the actual situation. Nevertheless, the perception of the available care alternatives has an important impact on actual use. The results of this European review are also in line with the conclusions of a recent review that found evidence for the association between primary care and avoidable hospitalisations [42].

Although the evaluation of the evidence included in the reviews was not conclusive and the quality of the evidence base is weak, there are indications that a co-location at the ED of GP-practices for out-of-hours care with one emergency care access point has the potential to reduce ED visits. Especially in health systems with high rates of self-referrals presenting to the ED with complaints that do not require urgent or specialised input, this model should be considered to get patients to a more appropriate care level. In such an integrated access point, it is determined by a triage whether patients will be seen by a GP or by a physician in the ED. A recent study with the co-location of an urgent care centre (staffed by GPs and not nurse-led walk-in clinics which were previously evaluated as having no impact on ED use) with an ED showed that the majority of patients visiting the urgent care centre were treated at the centre without a same-day referral to the ED or other specialist care setting. Yet, the absolute number of patients referred to the co-located ED still remains high [43]. Patients went to the urgent care centre because of its superior access (24/7 availability) compared to regular GP care [44] or as an alternative to the ED [43,45]. Also in the Netherlands [46,47] this model is becoming the standard. An evaluation compared usual practice (GPs and EDs working at close distance but separately) with this integrated model for out-of-hours. In the latter model patients are allocated to the GP or ED and are assigned a level of urgency based on a triage performed by a nurse in the joint triage area. For patients who contact the centre by phone, a triage by a trained medical assistant is done [47]. As such patients do not choose themselves who they contact. After triage, GPs and EDs each have their own department. The study compared the care in six regions with having a usual care model (n = 58 620) or an “intervention” (n = 63 441) and found that fewer patients attend EDs (27.6% versus 21.6%) and more patients go to GPs. Moreover, the proportion of patients with non-urgent problems that visit the GP is higher in the regions with the intervention model. Especially more patients with mild trauma are visiting the GP within the intervention regions [47]. Also a study from Switzerland [48] confirms the potential of GP practices co-located at the ED to reduce ED visits.

Also intuitively a collaboration between GPs and EDs in the form of one centre makes sense. GPs and EDs each have their own department, while they share one combined entrance and a joint triage area [47]. This single “front door” may reduce confusion for the public and the com-

mon triage area allows more efficient streaming between ED and primary care. It should be noted that this model is substantially different from hiring GPs to work in the ED as this entails the risk that GPs adapt their practice to the emergency physicians practice and start to prescribe more exams and tests. The model of one centre has the benefit that both parties preserve their own identity, philosophy, and specialism [47].

4.4. Cost sharing proven to be successful in the US but no firm policy recommendations for other healthcare settings can be made

Although some positive findings are reported, results are not generalisable since the vast majority of these studies were conducted in the US which has a specific context regarding financial accessibility [2,31]. Nevertheless, since cost sharing is one of the interventions with the greatest number of studies showing reductions in ED use [2,31], Flores-Mateo et al. state that “Apparently, people who should go to the ED are not deterred by co-payments, whereas at least some of those who should not be using the ED are deterred.” A major limitation of the included primary studies is that the impact of cost sharing in vulnerable populations (e.g. low purchasing power and deprived socioeconomic groups) is understudied.

In any case, several reviews stipulated that it is important that increasing access points for acute care (e.g. by the instalment of urgent care centres, telephone triage) may unmask latent demand that, if not accommodated by alternative care settings, might result in more inappropriate ED visits. Cost savings across the urgent care sector as a whole may be negated by the additional cost of providing new services; in addition, there is a risk of service duplication with disruption to continuity of care because of provider proliferation [25].

4.5. Patient sensibilisation via tailored interventions, the impact of mass media campaigns is less clear

Although evidence about the effect of educational interventions is contradictory, a large number of studies showed that it has potentially a large impact on ED use [2,31]. Morgan et al. [31] further indicate that although educational interventions are difficult to standardise they have the potential to reduce overall healthcare use (and not only ED use) especially when they are introduced as a part of a multi-faceted intervention [2,31]. In this review no single review included studies evaluating the reduction of ED visits as a result of mass media campaigns. Yet, evidence from other related areas (e.g. impact of awareness campaigns for stroke symptoms to delay the time between onset of symptoms and care seeking behaviour) suggests the potential of public information campaigns, on the understanding that these campaigns aim to bring patients with time-sensitive conditions faster to the ED [49].

4.6. Interventions for specific target groups might help but do not concern the bulk of (inappropriate) ED visits

Some reviews focused on specific target groups such as frequent ED users, elderly and patients with various chronic conditions. These studies focused mainly on care coordination and case-management. Case-management is the most-described intervention to reduce ED utilisation amongst frequent ED users (no uniform definition used). Case-management can be upstream (e.g. to prevent hospital admission for chronic conditions by a good follow-up by primary care) or downstream the ED (e.g. better coordination of care with the community for patients that were identified as frequent ED users). Evidence suggests that case-management could reduce ED use but additional investigation is needed to determine what specific aspects of case-management are most successful and cost effective [11,16,29]. Nevertheless, case-management can be considered as worth implementing in hospital EDs in the context of a proper local evaluation setting. Tailoring of interventions (e.g. identifying gaps in the current supply of services by evaluating prevalent risk factors of frequent ED users) and models of care, rather than standardisation of care, may prove to be most effective at reducing high ED utilisation. Case-management models designed to address the special care needs of the elderly (not limited to frequent users) has also proven to be successful. Yet, it should be noted that these policies alone will not solve the increase in the ED visits, because these particular patient groups are on themselves not the largest proportion of the problem.

4.7. Telephone consultations: no evidence for beneficial effects on the ED workload in the long-run

The evidence about the effect of telephone consultations (e.g. pre- and post-discharge telephone calls) is contradictory and there are indications (e.g. increased re-visits) that telephone consultations in reality rather delay than resolve the problem [2,17,19]. A recent large scale clustered randomised trial testing telephone triage and consulting in the management of same-day GP consultation requests brings circumstantial evidence. The trial showed that telephone consultation shifts the workload from face-to-face to telephone contacts and increases the number of primary care contacts within 28 days of the initial consultation. Telephone consultation appears to be safe, to have a negative impact on patient satisfaction and a negligible impact on ED admissions (small not statistically significant increase in the intervention group). The benefits of telephone consultation might increase when it is focused on specific target groups such as those with long-term conditions [50–52].

4.8. Workforce innovations are promising: local experiments will require monitoring of unintended effects on patient outcomes

Evidence about pre-hospital interventions such as pre-hospital practitioners providing care at the scene, referring the patient to an alternative healthcare service, employing emergency care nurse practitioners in nursing homes

is limited but promising. Yet, a major shortcoming is the lack of evidence on patient safety outcomes [31,37].

5. Conclusion

A systematic review of systematic reviews resulted in 23 studies about interventions that aimed to reduce ED utilisation in mixed study populations (single condition studies were excluded). Three reviews had a large scope while the other reviews focused on one or a limited set of interventions. Several intervention types were considered that can be classified in 6 categories: (1) cost sharing; (2) strengthening primary care (supply of primary care services; access hours primary care; other); (3) pre-hospital diversion (telephone services; telephone triage and telephone consultation; transport of patients towards other care setting than the ED); (4) coordination (case-management; other); (5) education and self-management support; (6) barriers to access emergency departments (gatekeeping; other).

The high number of interventions and methods: used to measure outcomes and the different populations complicate their evaluation. Although approximately two-thirds of the studies included in these reviews showed reductions in ED use for most interventions, the evidence showed contradictory results. As such, reducing ED use will require a broad approach that integrates several interventions adopted to the country's healthcare system and funding system. Understanding the impact of the different healthcare system characteristics will require an international comparison.

Nevertheless, it is clear that the largest room for improvement can be found in the so-called 'inappropriate ED visits'. The co-location of GP posts and emergency departments together with the introduction of telephone triage systems seem to be the preferred interventions if they are designed according to evidence-based insights. The specific target groups such as the frequent ED users and the elderly population do not represent the bulk of ED users. Nevertheless, it seems worthwhile to invest in case-management strategies to improve care coordination and prevent frequent ED attendances. In any case, every reform will require a feedback mechanism to monitor outcomes and unintended consequences. Increasing access points for urgent care, for example, may unmask latent demand. Cost savings across the urgent care sector as a whole may be negated by the additional cost of providing new services. Another example is the impact of cost-sharing interventions. Although the evidence suggests that cost sharing has an effect on ED use, it may have unintended consequences, like delaying needed care or limiting patient choice. As such, these interventions might in the long-run result in worse health outcomes and increased costs for the healthcare system. Morgan et al. [31] therefore noted that for some of the studied interventions major ethical questions should be discussed prior to their implementation.

Conflict of interest

The authors declare that there is no conflict of interest.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.healthpol.2016.10.002>.

References

- [1] Berchet C. Emergency care services: trends, drivers and interventions to manage the demand. Paris: Organisation for Economic Cooperation and Development (OECD); 2015.
- [2] Flores-Mateo G, Violan-Fors C, Carrillo-Santistevé P, Peiro S, Argimon JM. Effectiveness of organizational interventions to reduce emergency department utilization: a systematic review. *PLoS One* 2012;7:e35903 [Electronic Resource].
- [3] Hoot NR, Aronsky D. Systematic review of emergency department crowding: causes, effects, and solutions. *Annals of Emergency Medicine* 2008;52:126–36.
- [4] McHale P, Wood S, Hughes K, Bellis MA, Demnitz U, Wyke S. Who uses emergency departments inappropriately and when—a national cross-sectional study using a monitoring data system. *BMC Medicine* 2013;11:258.
- [5] Pines JM, Hilton JA, Weber EJ, Alkemade AJ, Al Shabanah H, Anderson PD, et al. International perspectives on emergency department crowding. *Academic Emergency Medicine: Official Journal of the Society for Academic Emergency Medicine* 2011;18:1358–70.
- [6] Carret ML, Fassa AC, Domingues MR. Inappropriate use of emergency services: a systematic review of prevalence and associated factors. *Cadernos de Saúde Pública* 2009;25:7–28.
- [7] Eichler K, Hess S, Chmiel C, Bögli K, Sidler P, Senn O, et al. Sustained health-economic effects after reorganisation of a Swiss hospital emergency centre: a cost comparison study. *Emergency Medicine Journal* 2014;31:818–23.
- [8] Khangura JK, Flodgren G, Perera R, Rowe BH, Shepperd S. Primary care professionals providing non-urgent care in hospital emergency departments. *The Cochrane Database of Systematic Reviews* 2012;11:CD002097.
- [9] Gruneir A, Silver MJ, Rochon PA. Emergency department use by older adults: a literature review on trends, appropriateness, and consequences of unmet health care needs. *Medical Care Research and Review* 2011;68:131–55.
- [10] van Tiel S, Rood PP, Bertoli-Avella AM, Erasmus V, Haagsma J, van Beek E, et al. Systematic review of frequent users of emergency departments in non-US hospitals: state of the art. *European Journal of Emergency Medicine: Official Journal of the European Society for Emergency Medicine* 2015;22:306–15.
- [11] Soril LJ, Leggett LE, Lorenzetti DL, Noseworthy TW, Clement FM. Reducing frequent visits to the emergency department: a systematic review of interventions. *PLoS One* 2015;10:e0123660.
- [12] Lowthian JA, Curtis AJ, Cameron PA, Stoelwinder JU, Cooke MW, McNeil JJ. Systematic review of trends in emergency department attendances: an Australian perspective. *Emergency Medicine Journal* 2011;28:373–7.
- [13] Durand AC, Gentile S, Devictor B, Palazzolo S, Vignally P, Gerbeaux P, et al. ED patients: how nonurgent are they? Systematic review of the emergency medicine literature. *American Journal of Emergency Medicine* 2011;29:333–45.
- [14] World Bank. World Bank Country and Lending Groups. <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>.

- [15] Shea BJ, Grimshaw JM, Wells GA, Boers M, Andersson N, Hamel C, et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. *BMC Medical Research Methodology* 2007;7:10.
- [16] Althaus F, Paroz S, Hugli O, Ghali WA, Daepfen JB, Peytremann-Bridevaux I, et al. Effectiveness of interventions targeting frequent users of emergency departments: a systematic review. *Annals of Emergency Medicine* 2011;58:41–52.
- [17] Bahr SJ, Solverson S, Schlidt A, Hack D, Smith JL, Ryan P. Integrated literature review of postdischarge telephone calls. *Western Journal of Nursing Research* 2014;36:84–104.
- [18] Lidal BI, Holte HH, Vist GE. Triage systems for pre-hospital emergency medical services? A systematic review (Provisional abstract). *Scandinavian Journal of Trauma Resuscitation and Emergency Medicine* 2013:28.
- [19] Crocker JB, Crocker JT, Greenwald JL. Telephone follow-up as a primary care intervention for postdischarge outcomes improvement: a systematic review. *American Journal of Medicine* 2012;125:915–21.
- [20] Fan L, Lukin W, Zhao J, Sun J, Hou XY. Interventions targeting the elderly population to reduce emergency department utilisation: a literature review. *Emergency Medicine Journal* 2015;32:738–43.
- [21] Franek J. Self-management support interventions for persons with chronic disease: an evidence-based analysis. *Ontario Health Technology Assessment Series* 2013;13:1–60.
- [22] Health Quality Ontario. Electronic tools for health information exchange: an evidence-based analysis. *Ontario Health Technology Assessment Series* 2013;13:1–76.
- [23] Health Quality Ontario. Continuity of care to optimize chronic disease management in the community setting: an evidence-based analysis. *Ontario Health Technology Assessment Series* 2013;13:1–41.
- [24] Huntley A, Lasserson D, Wye L, Morris R, Checkland K, England H, et al. Which features of primary care affect unscheduled secondary care use? A systematic review. *BMJ Open* 2014;4.
- [25] Ismail SA, Gibbons DC, Gnani S. Reducing inappropriate accident and emergency department attendances: a systematic review of primary care service interventions. *British Journal of General Practice* 2013;63:e813–20.
- [26] Jackson GL, Powers BJ, Chatterjee R, Bettger JP, Kemper AR, Hasselblad V, et al. Improving patient care. The patient centered medical home. A systematic review. *Annals of Internal Medicine* 2013;158:169–78.
- [27] Karam G, Radden Z, Berall LE, Cheng C, Gruneir A. Efficacy of emergency department-based interventions designed to reduce repeat visits and other adverse outcomes for older patients after discharge: a systematic review. *Geriatrics and Gerontology International* 2015;15:1107–17.
- [28] Katz EB, Carrier ER, Umscheid CA, Pines JM. Comparative effectiveness of care coordination interventions in the emergency department: a systematic review. *Annals of Emergency Medicine* 2012;60:12–23.
- [29] Kumar GS, Klein R. Effectiveness of case management strategies in reducing emergency department visits in frequent user patient populations: a systematic review. *Journal of Emergency Medicine* 2013;44:717–29.
- [30] Lowthian JA, McGinnes RA, Brand CA, Barker AL, Cameron PA. Discharging older patients from the emergency department effectively: a systematic review and meta-analysis. *Age and Ageing* 2015;44:761–70.
- [31] Morgan SR, Chang AM, Alqatari M, Pines JM. Non-emergency department interventions to reduce ED utilization: a systematic review. *Academic Emergency Medicine* 2013;20:969–85.
- [32] Rennke S, Nguyen OK, Shoeb MH, Magan Y, Wachter RM, Ranji SR. Hospital-initiated transitional care interventions as a patient safety strategy: a systematic review. *Annals of Internal Medicine* 2013;158:433–40.
- [33] Sinha SK, Bessman ES, Flomenbaum N, Leff B. A systematic review and qualitative analysis to inform the development of a new emergency department-based geriatric case management model. *Annals of Emergency Medicine* 2011;57:672–82.
- [34] Stall N, Nowaczynski M, Sinha SK. Systematic review of outcomes from home-based primary care programs for homebound older adults. *Journal of the American Geriatrics Society* 2014;62:2243–51.
- [35] Tohira H, Williams TA, Jacobs I, Bremner A, Finn J. The impact of new prehospital practitioners on ambulance transportation to the emergency department: a systematic review and meta-analysis. *Emergency Medicine Journal* 2014;31:e88–94.
- [36] Tricco AC, Antony J, Ivers NM, Ashoor HM, Khan PA, Blondal E, et al. Effectiveness of quality improvement strategies for coordination of care to reduce use of health care services: a systematic review and meta-analysis. *CMAJ* 2014;186:E568–78.
- [38] Turner J, Coster J, Chambers D, Cantrell A, Phung VH, Knowles E, et al. What evidence is there on the effectiveness of different models of delivering urgent care? A rapid review. School for Health and Related Research (SchHARR), University of Sheffield; Sheffield, UK; 2015.
- [39] Wheeler SQ, Greenberg ME, Mahlmeister L, Wolfe N. Safety of clinical and non-clinical decision makers in telephone triage: a narrative review. *Journal of Telemedicine and Telecare* 2015;21:305–22.
- [40] Turner J, O’Cathain A, Knowles E, Nicholl J. Impact of the urgent care telephone service NHS 111 pilot sites: a controlled before and after study. *BMJ Open* 2013;3:e003451.
- [41] van den Berg MJ, van Loenen T, Westert GP. Accessible and continuous primary care may help reduce rates of emergency department use. An international survey in 34 countries. *Family Practice* 2016;33(1).
- [42] van Loenen T, van den Berg MJ, Westert GP, Faber MJ. Organizational aspects of primary care related to avoidable hospitalization: a systematic review. *Family Practice* 2014;31:502–16.
- [43] Cowling TE, Ramzan F, Ladbrooke T, Millington H, Majeed A, Gnani S. Referral outcomes of attendances at general practitioner led urgent care centres in London, England: retrospective analysis of hospital administrative data. *Emergency Medicine Journal* 2016;33(3).
- [44] Arain M, Nicholl J, Campbell M. Patients’ experience and satisfaction with GP led walk-in centres in the UK; a cross sectional study. *BMC Health Services Research* 2013;13:142.
- [45] Arain M, Campbell MJ, Nicholl JP. Impact of a GP-led walk-in centre on NHS emergency departments. *Emergency Medicine Journal* 2015;32:295–300.
- [46] Thijssen WA, Wijnen-van Houts M, Koetsenruijter J, Giesen P, Wensing M. The impact on emergency department utilization and patient flows after integrating with a general practitioner cooperative: an observational study. *Emergency Medicine International* 2013;2013:364659.
- [47] van Gils-van Rooij ESJ, Yzermans CJ, Broekman SM, Meijboom BR, Welling GP, de Bakker DH. Out-of-hours care collaboration between general practitioners and hospital emergency departments in the Netherlands. *Family Medicine World Perspective* 2015;26:807–15.
- [48] Eichler K, Hess S, Chmiel C, Bogli K, Sidler P, Senn O, et al. Sustained health-economic effects after reorganisation of a Swiss hospital emergency centre: a cost comparison study. *Emergency Medicine Journal* 2014;31:818–23.
- [49] Mellon L, Doyle F, Rohde D, Williams D, Hickey A. Stroke warning campaigns: delivering better patient outcomes? A systematic review. *Patient Related Outcome Measures* 2015;6:61–73.
- [50] Campbell JL, Fletcher E, Britten N, Green C, Holt T, Lattimer V, et al. The clinical effectiveness and cost-effectiveness of telephone triage for managing same-day consultation requests in general practice: a cluster randomised controlled trial comparing general practitioner-led and nurse-led management systems with usual care (the ESTEEM trial). *Health Technology Assessment* 2015;19:1–212, vii–viii.
- [51] Campbell JL, Fletcher E, Britten N, Green C, Holt TA, Lattimer V, et al. Telephone triage for management of same-day consultation requests in general practice (the ESTEEM trial): a cluster-randomised controlled trial and cost-consequence analysis. *Lancet* 2014;384:1859–68.
- [52] Murdoch J, Varley A, Fletcher E, Britten N, Price L, Calitri R, et al. Implementing telephone triage in general practice: a process evaluation of a cluster randomised controlled trial. *BMC Family Practice* 2015;16:47.