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Effectiveness of Interventions Targeting Frequent Users of Emergency Departments: A Systematic Review

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UNIVERSITE DE LAUSANNE - FACULTE DE BIOLOGIE ET DE MEDECINE

Policlinique Médicale Universitaire
Unité des Populations Vulnérables

**Effectiveness of Interventions Targeting Frequent Users
of Emergency Departments: A Systematic Review**

THESE

préparée sous la direction du Docteur Patrick Bodenmann

et présentée à la Faculté de biologie et de médecine de
l'Université de Lausanne pour l'obtention du grade de

DOCTEUR EN MEDECINE

par

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Emergency Departments: A systematic Review*

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*pour Le Doyen
de la Faculté de Biologie et de Médecine*



*Madame le Professeur Stephanie Clarke
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Effectiveness of Interventions Targeting Frequent Users of Emergency Departments: A Systematic Review

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Study objective: Frequent users of emergency departments (EDs) are a relatively small group of vulnerable patients accounting for a disproportionately high number of ED visits. Our objective is to perform a systematic review of the type and effectiveness of interventions to reduce the number of ED visits by frequent users.

Methods: We searched MEDLINE, EMBASE, CINAHL, PsychINFO, the Cochrane Library, and ISI Web of Science for randomized controlled trials, nonrandomized controlled trials, interrupted time series, and controlled and noncontrolled before-and-after studies describing interventions targeting adult frequent users of EDs. Primary outcome of interest was the reduction in ED use. We also explored costs analyses and various clinical (alcohol and drug use, psychiatric symptoms, mortality) and social (homelessness, insurance status, social security support) outcomes.

Results: We included 11 studies (3 randomized controlled trials, 2 controlled and 6 noncontrolled before-and-after studies). Heterogeneity in both study designs and definitions of frequent users precluded meta-analyses of the results. The most studied intervention was case management (n=7). Only 1 of 3 randomized controlled trials showed a significant reduction in ED use compared with usual care. Six of the 8 before-and-after studies reported a significant reduction in ED use, and 1 study showed a significant increase. ED cost reductions were demonstrated in 3 studies. Social outcomes such as reduction of homelessness were favorable in 3 of 3 studies, and clinical outcomes trended toward positive results in 2 of 3 studies.

Conclusion: Interventions targeting frequent users may reduce ED use. Case management, the most frequently described intervention, reduced ED costs and seemed to improve social and clinical outcomes. It appears to be beneficial to patients and justifiable for hospitals to implement case management for frequent users in the framework of a clear and consensual definition of frequent users and standardized outcome measures. [Ann Emerg Med. 2011;58:41-52.]

A [podcast](http://www.annemergmed.com) for this article is available at www.annemergmed.com.

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INTRODUCTION

Background

Frequent use of hospital emergency departments (EDs) by specific patient subgroups has been reported in several countries, irrespective of the details of the health care system in use.¹⁻⁸ Frequent users are patients who use EDs on multiple occasions. Definitions and visit number thresholds vary across studies; according to Locker et al,⁹ a frequency of more than 4 attendances per year corresponds to nonrandom events, and use of this threshold may improve comparisons between studies.

Frequent users represent a relatively small group of patients accounting for a disproportionately high number of visits to

hospital EDs.¹⁰⁻¹² For more than 30 years, this patient group has been the focus of interest and concern in emergency medicine and health policy for at least 4 reasons.¹³⁻¹⁵ First, the high number of visits leads to concerns about their appropriateness.^{16,17} In the context of chronically crowded EDs¹⁸ not designed to provide longitudinal patient care over repeated visits,^{19,20} frequent users are often considered time-consuming “illegitimate” users of ED resources.^{21,22} This impression of frequent users has the potential to negatively influence the quality of care that they receive.^{23,24} Second, frequent use of EDs generates high health care costs.^{25,26} Third, frequent users are often vulnerable individuals²⁷: compared with infrequent or nonusers of EDs, they are more likely to be of low socioeconomic status,^{28,29} isolated, and living alone.^{3,30,31} They

are also more likely to report chronic medical conditions,^{28,32-34} have a higher mortality rate,^{35,36} and consume more health care resources.^{28,37} Fourth, it is unclear why some patients overuse EDs.³⁸ Although some studies point to the lack of a primary care physician,^{39,40} other reports show that the majority of frequent users have a primary care provider.^{26,28,29,41} Other possible reasons include unmet medical and nonmedical needs⁴² or the attractiveness of free ED care.³⁷

Importance

In this context, ED teams have attempted to develop interventions aimed at reducing the number of ED visits by frequent users and at responding to their medical and psychosocial needs. Several primary studies have assessed the effect of specific interventions on the use of EDs by adult frequent users. However, no clear consensus exists on the optimal intervention and what effect may be expected from any interventions that are implemented. To address these questions, we have conducted a systematic review.

Goals of This Investigation

The purpose of our systematic review was to critically evaluate experimental and observational studies describing interventions targeting frequent users of hospital EDs. The primary outcome of interest was the reduction in ED use. We also explored cost analyses and various clinical (alcohol and drug use, psychiatric symptoms, mortality) and social (homelessness, insurance status, social security support, basic financial needs, need for a primary care practitioner) outcomes. The use of ambulatory care services and satisfaction of patients or staff were also examined.

MATERIALS AND METHODS

Study Design

The protocol (Appendix E1, available online at <http://www.annemergmed.com>) and extraction form were prepared according to the recommendations of the *Cochrane Handbook for Systematic Reviews of Interventions*.⁴³ The reporting of this systematic review is based on the PRISMA statement for systematic reviews of health care interventions.⁴⁴

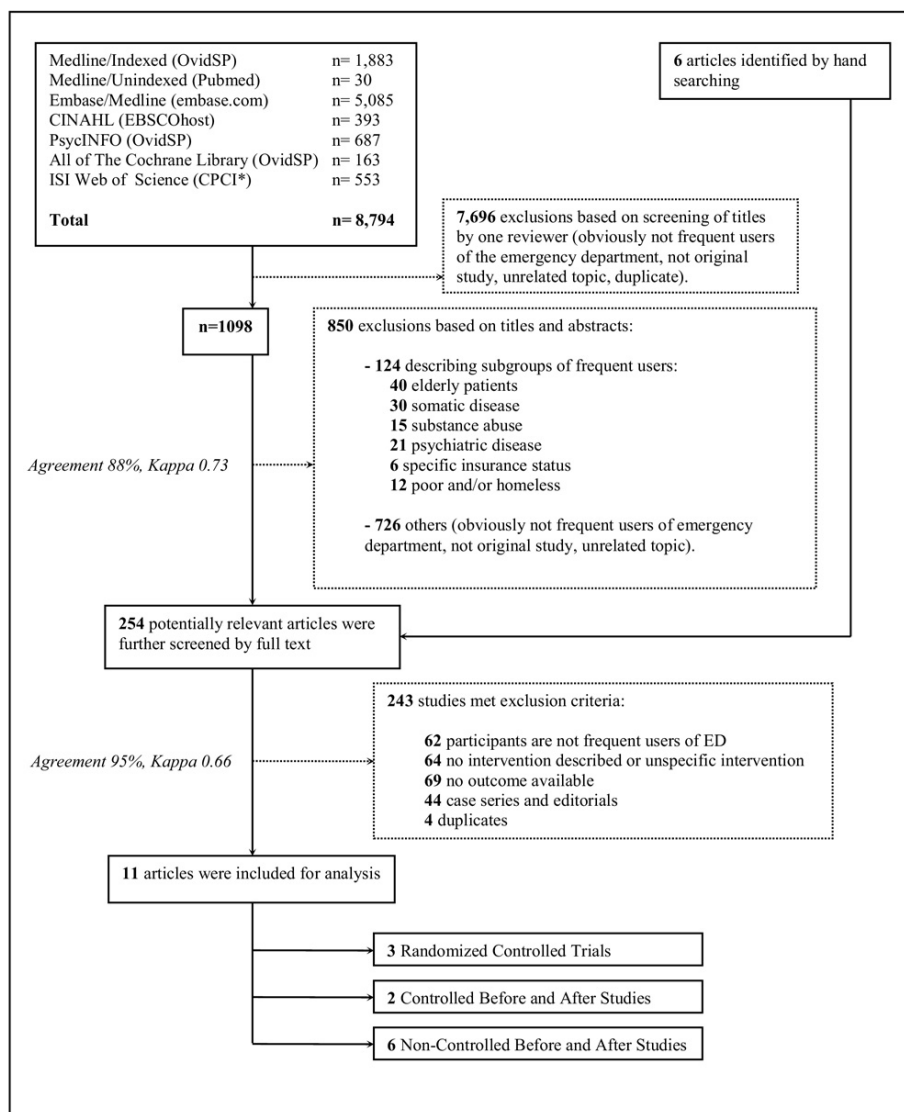
We conducted a systematic literature search (inception to June 2009) of MEDLINE, EMBASE, PsychINFO, CINAHL, the Cochrane Library, and Web of Science (Conference Proceedings Citation Index, Science, Social Science and Humanities). A verification search was performed in June 2010. The search strategy was developed with a medical librarian and included 2 main search themes ("frequent use" and "emergency department") combined using the Boolean operator "and." For frequent use, we combined the Medical Subject Headings (MeSH) terms "health services misuse," or "utilization review" with the following text words using the Boolean "or" operator: "frequent use," "frequent flyer," "frequent attendee," "high use," "heavy use," "repeater," "recidivist," "revolving door," "misuse," or "hyperuse." For ED, we combined 7 MeSH terms

("emergencies," "emergency medical services," "emergency service," "hospital," "emergency medicine," "emergency nursing," or "evidence-based emergency medicine") with the following text words using the Boolean "or" operator: "emergency/urgency service," "emergency/urgency room," "emergency/urgency department," "emergency/urgency unit," or "emergency/urgency ward." We also hand searched reference lists of relevant articles, abstracts of the American College of Emergency Physicians,⁴⁵ and the tables of contents of the *New England Journal of Medicine*, the *British Medical Journal*, the *Journal of the American Medical Association*, the *Annals of Internal Medicine*, *Annals of Emergency Medicine*, *Academic Emergency Medicine*, the *Emergency Medicine Journal*, the *American Journal of Emergency Medicine*, *Emergency Medicine Clinics of North America*, the *Journal of Emergency Medicine*, the *Journal of Emergency Nursing*, the *European Journal of Emergency Medicine*, and the *Revue des SAMU*. Finally, we contacted 7 experts in the field of frequent users of EDs from the United States and Sweden, identified through their peer-reviewed scientific publications.

We identified randomized controlled trials, nonrandomized controlled trials, interrupted time series studies, and controlled and noncontrolled before-and-after studies assessing interventions targeting adult (>16 years of age) frequent users of hospital EDs. At least 1 outcome measure had to be reported to meet the inclusion criteria. The primary outcome was ED use and the secondary outcomes were costs or cost-effectiveness analyses. Other outcomes were clinical outcomes, social outcomes, health care use (other than ED), and patient and staff satisfaction. No language or publication date restrictions were imposed. We excluded studies that targeted only specific patient subgroups (Figure) to increase homogeneity and comparativeness between studies and because we were interested in interventions for patients selected on a simple and unique inclusion criterion, namely, the frequency of ED use.

Because of the large number of abstracts (>8,000), we used a 3-step selection procedure: based on the title only, 1 reviewer (F.A.) excluded obviously irrelevant articles. Two reviewers (F.A. and S.P.) then performed, independently and in duplicate, a second screen of titles and abstracts to identify articles eligible for further review according to the inclusion and exclusion criteria. Agreement between reviewers was quantified with κ statistics. Articles selected by either F.A. or S.P. were retrieved for detailed full-text examination. Abstracts that had not been published in full were analyzed the same way. Disagreements about eligibility were resolved by consensus. The full text was reviewed by a third author if discrepancies remained.

Risk of bias was assessed according to the recommendations of the Cochrane collaboration.⁴³ For randomized controlled trials and controlled before-and-after studies, we determined the adequacy of sequence generation, allocation concealment, blinding of personnel and outcome assessors, handling of incomplete outcome data, reporting of selective outcomes, evidence of other potential threats to validity, similarity of



*CPCI=Conference Proceedings Citation Index

Figure. Trial flow diagram.

baseline outcome measurements in the intervention and control groups, similarity of baseline characteristics, and protection against contamination. The Jadad score (a 5-item score assessing the methodological quality of a clinical trial) was derived and reported for the randomized controlled trials that we identified⁴⁶; however, because the nature of the intervention precluded patient and health care provider blinding, the maximum Jadad score was 3 instead of 5. For interrupted time series and noncontrolled before-and-after studies, we determined the independence of the intervention to other changes, the prespecification of the intervention shape, the risk of the intervention affecting data collection, blinding, handling of missing data, reporting of selective outcomes, the presence of

other risks of bias, the accuracy of the intervention description, the adequacy of timing of measurement and follow-up period, and the adherence to an intention-to-treat analysis. Loss to follow-up and conflicts of interest were evaluated for all types of studies.

Data Collection and Processing

Two authors (F.A. and S.P.) independently extracted data in 3 categories. Patient characteristics included age, sex, education, ethnicity, health insurance status, comorbidities, substance use, and subjective health. The interventions were characterized by components, recipients, deliverers, frequency or duration of the intervention and follow-up, and location. The outcomes

included ED use, cost and cost-effectiveness of interventions, substance use, social deprivation, subjective health, health care use, and patient or staff satisfaction. We contacted 4 authors for further information. One author provided unpublished numeric data,⁴⁷ 1 contributed a comprehensive intervention description,⁴⁸ and 1 provided details about publication status.⁴⁹ The fourth author was unable to provide subgroup analyses of the results for adult patients only, leading to exclusion of the study because of a majority of child frequent users.⁵⁰

RESULTS

Of a total of 8,794 references, 7,696 and 850 references were discarded after the title and abstract were read, respectively. We fully reviewed 248 articles and finally included a total of 11 studies in the systematic review (Figure).^{4,10,23,47-49,51-55}

Characteristics of the 11 selected studies are shown in Table 1. Three were randomized controlled trials,^{48,51,52} 2 controlled before-and-after studies,^{10,47} and 6 noncontrolled before-and-after studies.^{4,23,49,53-55} All controlled studies except 1 compared the intervention to usual care.⁴⁷ Ten studies were published in English and 1 in Swedish. The latter was translated into French by a professional medical translator so that the research team could fully analyze its content.⁵⁴ The number of participants per study ranged from 18 to 1,799, and the mean patient age ranged from 37.8 to 53.6 years. The definitions describing frequent users were as follows: greater than 3 ED visits during 12 months (n=5),^{10,49,51,53,54} greater than 4 ED visits during 12 months (n=2),^{48,55} greater than 5 ED visits during 12 months (n=1),⁴ greater than 9 ED visits during 12 months (n=1),⁵² greater than 9 ED visits during 6 months (n=1),⁴⁷ and eventually an unspecified definition of several ED visits during 12 months (n=1).²³ Studies were conducted in the United States,^{48,49,52,53,55} Sweden,^{10,51,54} Australia,⁴ Canada,²³ and the United Kingdom.⁴⁷ We found that the overall quality of the full-length, published, selected studies was moderate to low, according to multiple predefined criteria (Table 2).

The most-tested intervention was case management (n=7),^{4,23,47-49,53,55} referring to coordination of health services on behalf of the patient by multidisciplinary teams composed of nurses, social workers, and physicians. Coordination tasks were allocated to a case manager, who guided the patient through the care process and provided social support. The locus of intervention was generally not limited to the hospital, often extending to the community. The team's availability was limited to weekdays and during the daytime. The case management intervention described by Shumway et al⁴⁸ and Okin et al⁵⁵ included crisis intervention, supportive therapy, assistance in obtaining stable housing and income entitlements, linkage to medical care providers, referral to substance abuse services, and ongoing assertive community outreach. In the study by Skinner et al,⁴⁷ case management involved the review of the individual patient's case by a multidisciplinary team and the setting of a formal care plan. In the study by Wassmer et al,⁴⁹ the intervention was described as empowerment and education about medical and social services by a coordination team. For

the study by Phillips et al,⁴ case management was defined as an integrated approach within the hospital and the community, and services were provided by a multidisciplinary team. Lee and Davenport⁵³ described a collaborative process for assessing plans and implementing, coordinating, monitoring, and evaluating options and services required to meet an individual's health needs. Pope et al²³ characterized their intervention as a difficult case management committee, meeting monthly, evaluating needs, and coordinating care. The remaining selected studies (n=4)^{10,51,52,54} tested other kinds of interventions. Spillane et al⁵² described an intervention that was not designated as case management; however, the study components were similar to those described in case management interventions, including individualized care plans made available to ED personnel, social worker or psychiatric evaluation, provision of an appointment with a primary care practitioner, and multidisciplinary case conferences. In 2 studies, the intervention was based on a less comprehensive approach than case management: Olsson et al⁵⁴ described an intervention based on the evaluation of coordination needs and establishment of a care plan by the patient and their chosen coordination group. Andren and Rosenqvist¹⁰ reported an intervention based on social worker evaluation and basic help. Hansagi et al⁵¹ tested the provision of a printout of the case notes from the patient's last 3 visits to the emergency physician.

Detailed and semiquantitative assessments of the study results are described in Tables 1 and 3, respectively.

All 11 selected studies reported comparisons of ED use in the intervention and control groups (or before-and-after intervention); 7 studies showed a reduction in ED use,^{10,23,47-49,54,55} 1 demonstrated an increase in ED use,⁴ and 3 revealed no significant changes.⁵¹⁻⁵³ Five of the 7 studies with a reduction in ED use tested case management as defined above,^{23,47-49,55} 1 tested a social worker support intervention,¹⁰ and 1 tested the setting of a coordination care plan.⁵⁴ The study with an increase in ED use tested case management.⁴ The 3 studies with no change in ED use tested case management,⁵³ a case management-like intervention,⁵² or the provision of case notes to emergency physicians.⁵¹ The magnitude of decrease or increase was documented in 5 studies (Table 1); the effect of intervention on ED use was large in all these studies, with a decrease or increase in the mean or median number of ED visits, ranging from 28% to 75%.

Cost analysis was performed in 3 studies^{48,49,55}; all 3 evaluations were based on the perspective of the hospital and showed a reduction in ED costs either in the intervention group⁴⁸ or after intervention for the 2 noncontrolled before-and-after studies.^{49,55} Case management was the tested intervention in all 3 studies and cost of the intervention was not included in ED costs. In the randomized controlled trial conducted by Shumway et al,⁴⁸ total hospital costs were similar in the case management and the usual care groups when the costs of the intervention were considered. Compared with usual care, case management was described as more cost-effective

Table 1. Description of main reported outcomes and corresponding results.

Source (Location)	Study Design	Type of Intervention	Type of Outcome	Outcomes Reported	Period, mo	Results					
						Exposed	Controls	Effect of Intervention			
Shumway et al, ⁴⁸ 2008 (USA)	RCT	Case management	ED use	No. of ED visits (mean)	24 F/U	NR	NR	Reduction in mean No. of ED visits ($P<.01$)			
			Other health care use	Use of other hospital services	24 F/U	NR	NR	NS			
				No. of medical inpatient admissions	24 F/U	NR	NR	NS			
			Cost	No. of medical inpatient days	24 F/U	NR	NR	NS			
				ED cost	24 F/U	NR	NR	Reduction of ED costs ($P<.01$)			
			Clinical	Problem alcohol use	24 F/U	NR	NR	Reduction in problem alcohol use ($P=.04$)			
				Social	Psychiatric symptoms	24 F/U	NR	NR	NS		
			Level of homelessness		24 F/U	NR	NR	Reduction of level of homelessness ($P<.01$)			
			Lack of health insurance		24 F/U	NR	NR	Reduction of lack of health insurance ($P<.02$)			
			Lack of social security income support		24 F/U	NR	NR	Reduction of lack of social security income support ($P<.01$)			
	Unmet basic financial needs	24 F/U	NR	NR	NS						
Hansagi et al, ⁵¹ 2008 (Sweden)	RCT	Provision of case notes from patient's last 3 visits to emergency physician	ED use	No. of ED visits (mean)	12 before 12 F/U	6.2 4.0	6.0 3.9	NS			
			Other health care use	No. of visits to PCP (mean)	12 before 12 F/U	4.7 4.8	5.0 4.6	NS			
				No. of visits to specialists	12 before 12 F/U	13.0 10.9	13.3 10.7	NS			
			Other	outpatient clinic physician (mean)	12 before 12 F/U	10.9 13.6	10.7 13.7	NS			
				No. of days in hospital (mean)	12 before 12 F/U	13.6 13.2	13.7 14.1	NS			
			Emergency physicians satisfaction	12 F/U			82% judged the printout case notes to be useful (based only on a subgroup of 57 patients)				
Spillane et al, ⁵² 1997 (USA)	RCT	Case management like	ED use	No. of ED visits to the university hospital (median) (range)	12 before 12 F/U	13 (10–31) 6 (1–65)	14 (10–41) 7 (1–72)	NS NS			
			Other health care use	No. of visits to the community hospitals (median) (range)	12 before 12 F/U	1.5 (0–33) 2 (0–135)	3 (0–22) 2 (0–38)	NS NS			
				Clinical	No. of patients who died (total No. of patients in the group)	12 F/U	1 (27)	2 (25)	NR		
			Skinner et al, ⁴⁷ 2009 (UK)	CBA	Case management	ED use	Total No. of ED visits	6 before vs 6 F/U	NR	NR	Decrease of 31% of total No. of ED visits
						No. of ED visits (median)		NR	NR	Decrease of the median No. of ED visits from 12 to 6	
			No. of patients whose No. of ED visits felt (%)			23 (64%)	18 (85%)	Higher No. of patients showing a reduction in ED use in control group than in intervention group. Statistical significance NR.			

Table 1. Continued.

Source (Location)	Study Design	Type of Intervention	Type of Outcome	Outcomes Reported	Period, mo	Results		Effect of Intervention				
						Exposed	Controls					
Andren et al, ¹⁰ 1985 (Sweden)	CBA	Counseling on use of health care and social system by a social worker	ED use	No. of patients defined as frequent users	12 before 12 F/U	20 4	20 14	Reduction of the No. of patients defined as frequent users ($P<.01$)				
Wassmer et al, ⁴⁹ 2008 (USA)	NCBA	Case management	ED use	No. of ED visits (mean)	12 F/U	NR		Significant reduction of mean No. of ED visits				
				No. of ED overnight stay (mean)	12 F/U	NR		Significant reduction of mean No. of ED overnight stay				
				Cost	Total ED charges past 12 mo (mean)	12 F/U	NR		Significant reduction of total ED charges			
Phillips et al, ⁴ 2006 (Australia)	NCBA	Case management	ED use	No. of ED visits (mean)	12 before 12 F/U	10.2 13.0		Increase of 28% of No. of ED visits ($P=.055$)				
				No. of non-university hospital ED visits (mean)	12 before 12 F/U	5.2 6.7		NS				
				No. of ED overnight observation (mean)	12 before 12 F/U	1.3 3.4		Increase of 166% of No. of ED overnight observation ($P=.025$)				
				Other health care use	No. of inpatient admissions (mean)	12 before 12 F/U	18.4 15.5		NS			
					Primary care engagement	12 before 12 F/U	2.6 3.1		Increase of 19% of primary care engagement ($P=.003$)			
					Community care engagement	12 before 12 F/U	2.1 3.2		Increase of 52% of community care engagement ($P<.001$)			
				Clinical	Drug and alcohol use	12 before 12 F/U	68.3% 58.9%		NS			
				Social	Housing status score (mean)	12 before 12 F/U	3.6 4.1		Increase of 14% of mean housing status score ($P=.007$)			
				Lee et al, ⁵³ 2006 (USA)	NCBA	Case management	ED use	No. of ED visits (mean)	5 before 5 F/U	8.9 8.3		NS
				Olsson et al, ⁵⁴ 2004 (Sweden)	NCBA	Evaluation of the needs, choice by the patient of a coordination group, care plan	ED use	No. of ED visits (mean)	12 before 12 F/U	7.0 3.3		Decrease of 53% of mean No. of ED visits ($P<.005$)
Other health care use	No. of PCP visits (mean)	12 before 12 F/U	5.0 8.2						NS			
	Proportion of satisfied patients	12 before 12 F/U	61% 83%						NS			
Pope et al, ²³ 2000 (Canada)	NCBA	Case management	ED use	No. of ED visits (median)	12 before 12 F/U	26.5 6.5		Decrease in median number of ED visits ($P<.001$)				
Okin et al, ⁵⁵ 2000 (USA)	NCBA	Case management	ED use	No. of ED visits (median)	12 before 12 F/U	15 9		Median pre-post change: reduction of 5 visits ($P<.01$)				
				Other health care use	No. of medical outpatient visits (median)	12 before 12 F/U	2 4		Median pre-post change: increase of 1 visit ($P<.01$)			
					No. of medical inpatient days	12 before 12 F/U	5 2		NS			
					Cost	Total cost/patient, \$	12 before 12 F/U	21,022 14,910		Median pre-post change: decrease of 2,406 ($P=.06$)		
				ED cost/patient, \$		12 before 12 F/U	4,124 2,195		Median pre-post change: decrease of 1,082 ($P<.01$)			

Table 1. Continued.

Source (Location)	Study Design	Type of Intervention	Type of Outcome	Outcomes Reported	Period, mo	Results			
						Exposed	Controls	Effect of Intervention	
				Medical outpatient cost/patient, \$	12 before 12 F/U	476 612		NS	
		Clinical		Problem alcohol use	12 before 12 F/U	37 29		Reduction of 22% of problem alcohol use ($P=.05$)	
				Problem drug use	12 before 12 F/U	27 20		Reduction of 26% of problem drug use ($P=.05$)	
			Social		Homelessness	12 before 12 F/U	35 15		Reduction of 57% of homelessness ($P<.01$)
					Needs of PCP	12 before 12 F/U	39 10		Reduction of 74% of needs of PCP ($P<.01$)

RCT, Randomized controlled trial; F/U, follow-up; NR, not reported or only reported in detail for subgroups; NS, not significant; PCP, primary care practitioner/physician; CBA, controlled before and after; NCBS, noncontrolled before and after.

because it brought an improvement in clinical and social outcomes without additional costs overall. In 2 before-and-after studies, the reduction in hospital costs was larger than the cost of the case management team^{49,55}; the intervention was therefore described as cost saving from the hospital perspective. Okin et al⁵⁵ reported a median reduction per patient of US \$2,406 (95% confidence interval -\$6,361 to -\$430; $P=.06$) after intervention (from \$21,022 to \$14,910) for all hospital services costs and a median reduction in ED costs per patient of US \$1,938 (95% confidence interval -\$2,459 to -\$1,013; $P<.01$), from \$4,124 to \$2,195. The magnitude of effect was evaluated in only 1 study, with the potential cost savings at US \$10 million per year for the 157 patients enrolled for 2 years.⁴⁹

Three of the 11 studies reported clinical outcomes, and each of these tested case management.^{4,48,55} Although one study demonstrated a significant reduction both in alcohol use (-22%; $P=.05$) and drug use (-26%; $P=.05$) 12 months after intervention,⁵⁵ another study identified a reduction in alcohol use but no difference in psychiatric symptoms 24 months after intervention.⁴⁸ The third study did not uncover differences in either drug or alcohol use.⁴ Social outcomes were reported in the same 3 studies. One study demonstrated a significant reduction in homelessness (-57%; $P<.01$).⁵⁵ One study documented significant reductions in level of homelessness, lack of health insurance, and lack of social security income support,⁴⁸ and the third study reported a significant increase in the mean housing status score (14%; $P=.007$).⁴

Use of ambulatory care was evaluated in 6 studies,^{4,48,51,52,54,55} but only 2 studies confirmed a benefit of the intervention. One study reported an increase in primary care (19%; $P=.003$) and community care engagement (52%; $P<.001$),⁴ whereas another described a significant increase in the median number of medical outpatient visits (+1; $P<.01$) and a significant reduction in the number of patients lacking a primary care practitioner (-74%; $P<.01$).⁵⁵ None of the 4 studies assessing hospitalization identified significant differences.^{4,48,51,55} Finally, although one study reported no

significant difference in patient satisfaction before and after the intervention,⁵⁴ another revealed high physician satisfaction.⁵¹

LIMITATIONS

Our systematic review has some limitations. First, we included study designs other than randomized controlled trials (namely, controlled and uncontrolled before-and-after studies). This strategy was chosen a priori because we recognized that few pertinent randomized controlled trials have been published, possibly reflecting the ethical and practical difficulties in the implementation of randomized controlled trials evaluating complex interventions for vulnerable populations. Second, we have included 2 studies from the same group of authors.^{48,55} The study by Okin et al⁵⁵ can be considered a pilot study for the study by Shumway et al.⁴⁸ However, the conclusions of the 2 studies are complementary and certainly distinct studies, given that they had design differences, were analyzed separately, enrolled different patients, and were performed on different dates. Third, the heterogeneity in the selected studies in terms of design, definition of frequent users, intervention type, outcomes, and outcome measurement prevented us from performing quantitative meta-analyses. Fourth, publication bias could not be assessed with a funnel plot or a sensitivity analysis because we did not perform a meta-analysis. Our multiple-source search strategy reduces the risk of publication bias, but we cannot exclude it completely. Fifth, the quality of the included studies on the whole was moderate and sample sizes were small ($n<65$) in all but 3 studies. Sixth, our results apply only to adult frequent users of the ED. Finally, we decided to include only studies in which frequent use of the ED represented the main inclusion criterion. This approach led to the exclusion of studies in which frequent use was the outcome measure of an intervention designed for a specific patient subgroup (chronically ill homeless,⁵⁶ low-income uninsured,⁵⁷ the elderly, or individuals presenting with a chronic disease⁵⁸ such as sickle cell anemia or diabetes⁵⁹). This selection criterion reduced the number of included studies but increased the

Table 2. Description of study quality criteria.

Source	Shumway et al ⁴⁸	Hansagi et al ⁵¹	Spillane et al ⁵²	Andren and Rosenqvist ¹⁰	Skinner et al ⁴⁷	Wassmer et al ⁴⁹	Phillips et al ⁴	Lee and Davenport ⁵³	Olsoon et al ⁵⁴	Pope et al ²³	Okin et al ⁵⁵
Quality criteria for RCT and CBA studies											
Total Jadad score (out of 5)	2	3	3	NA	NA						
Was the allocation sequence adequately generated?	NC	Yes	Yes	NA	NA						
Was the allocation adequately concealed?	NC	Yes	Yes	NA	NA						
Was knowledge of the allocated intervention adequately prevented during the study?	No	No	No	No	No						
Were incomplete outcome data adequately addressed?	Yes	Yes	Yes	No	Yes						
Was the study free from selective outcome reporting?	NC	NC	NC	NC	NC						
Was the study free from other risks of bias?	No	No	No	No	No						
Was baseline outcome measurement similar in the intervention and control group?	Yes	Yes	Yes	Yes	Yes						
Were baseline characteristics similar?	NC	NC	Yes	NC	NC						
Was the study adequately protected against contamination?	Yes	No	No	No	No						
Quality criteria for NCBA studies											
Was the intervention independent of other changes?						No	NC	NC	NC	NC	No
Was the shape of the intervention effect prespecified?						Yes	Yes	Yes	Yes	Yes	Yes
Was the intervention unlikely to affect data collection?						Yes	Yes	Yes	Yes	Yes	Yes
Was knowledge of the allocated interventions adequately preventing during the study?						Yes	Yes	Yes	Yes	Yes	Yes
Were incomplete outcome data adequately addressed?						NC	Yes	Yes	No	Yes	Yes
Was the study free from selective outcome reporting?						NC	NC	NC	NC	NC	NC
Was the study free from other risks of bias?						No	No	No	No	No	No
Is the intervention described accurately?						Yes	Yes	Yes	Yes	Yes	Yes
Is the timing of measurement and follow-up period adequate?						Yes	Yes	No	Yes	Yes	Yes
Is data analysis performed according to the intention-to-treat principle?						NC	No	Yes	No	Yes	Yes

NA, Not applicable; NC, not clear.

homogeneity of the results, allowing better comparisons across studies. It also offers a better understanding of what can be expected of interventions according to the criterion of frequent use only.

DISCUSSION

This systematic review identified 11 studies assessing the effectiveness of interventions targeting frequent users of hospital EDs. Most interventions were case management (n=7) or based

on partial components of case management (n=3). One study tested an intervention based on the provision to emergency physicians of patients' case notes from their last 3 visits. A reduction in the number of ED visits was observed in 7 of the 11 selected studies.

Cost analyses conducted in 3 studies have indicated that the introduction of a case management team could reduce ED costs by at least as much as the cost of the team itself.^{48,49,55} This observation is a strong argument to encourage the introduction

Table 3. Semiquantitative visual assessment of study results.

Source (Location)	Study Design	Type of Intervention	Decreased Number of ED Visits	Use of Other Health Services	Number of Days in Hospital	Reduction in ED Costs	Alcohol or Drug Use	BSI Score	Decreased Social Problems	Other Outcomes
Shumway et al, ⁴⁸ 2008 (USA)	RCT	CM	+	↔	↔	+	+	↔	+	
Hansagi et al, ⁵¹ 2008 (Sweden)	RCT	Case notes to emergency physician	↔	↔	↔	NR	NR	NR	NR	+ Staff's satisfaction
Spillane et al, ⁵² 1997 (USA)	RCT	CM-like	↔	↔	NR	NR	NR	NR	NR	? Mortality rate
Skinner et al, ⁴⁷ 2009 (UK)	CBA	CM	+	NR	NR	NR	NR	NR	NR	
Andren and Rosenqvist, ¹⁰ 1985 (Sweden)	CBA	Social worker help	+	NR	NR	NR	NR	NR	NR	
Wassmer et al, ⁴⁹ 2008 (USA)	NCBA	CM	+	NR	NR	+	NR	NR	NR	+ ED overnight stay
Phillips et al, ⁴ 2006 (Australia)	NCBA	CM	-	↔	↔	NR	↔	NR	+	- ED overnight stay
Lee et al, ⁵³ 2006 (USA)	NCBA	CM	↔	NR	NR	NR	NR	NR	NR	
Olsson et al, ⁵⁴ 2004 (Sweden)	NCBA	Needs evaluation/coordination	+	↔	NR	NR	NR	NR	NR	↔ Patients' satisfaction
Pope et al, ²³ 2000 (Canada)	NCBA	CM	+	NR	NR	NR	NR	NR	NR	
Okin et al, ⁵⁵ 2000 (USA)	NCBA	CM	+	+	↔	+	+	NR	+	

BSI, Brief Symptoms Inventory; CM, case management; +, significantly greater/improved in the intervention group (or postintervention)=in favor of the intervention; ↔, no significant difference between groups (or between pre- and postintervention); ?, no statistical significance reported; -, significantly poorer in the intervention group (or postintervention)=not in favor of the intervention.

of this type of intervention for frequent users of hospital EDs. Nevertheless, a cost analysis taking a societal perspective would be necessary to examine whether the inclusion of the additional costs for management of frequent users outside the hospital would be balanced by the additional benefits both for frequent users and society in general. We also considered other intervention outcomes essential at the individual level, such as better use of appropriate existing resources and health improvement. We were unable to confirm that the tested interventions efficiently diverted frequent users from the ED to primary care services or improved individual health. Nevertheless, that 3 individual studies reported a reduction in homelessness, an increase in insurance coverage, or a decrease in alcohol and drug consumption is promising.

Without intervention, a number of frequent users of the ED become infrequent users over time. This regression to the mean of ED use may involve all measured outcomes, as described in several studies.^{9,32,60} Shumway et al⁴⁸ reported a reduction in ED use, psychosocial problems, and costs in both intervention and control groups in a randomized controlled trial. The

regression to the mean may bias outcomes measured by uncontrolled studies toward positive conclusions. Moreover, predictive methods to identify long-term frequent users, such as the algorithm developed by Billings et al,⁶¹ would allow more specific interventions and a better chance of improved outcomes.

One study reported an increase in ED use after introduction of the case management team.⁴ The authors of this study argued that involving frequent users in health services is difficult and that an increase in their use of any service (even if EDs) may be considered a sign of integration. They also suggested that the ED may be an appropriate place for frequent users to access acute care because they were commonly suitable for general practice diversion.⁶² However, the ED may not be the most appropriate source of primary health care because of the high discontinuity of care; the reinforcement of primary care services may be a better response to the complex needs of frequent users. Moreover, EDs are overextended in most developed countries, a situation that may be ameliorated if ED use were reduced by patients who might receive better care elsewhere.⁶³

Case management programs have demonstrated efficacy in the reduction in ED use for other groups of vulnerable patients. For example, Sadowski et al⁵⁶ recently documented a reduction in ED use by chronically ill homeless patients after a housing and case management program. Wetta-Hall⁵⁷ reported a significant 41% reduction in ED use by low-income uninsured patients after introduction of a collaborative community case management program. Our study supports these results and the evidence that case management may be the intervention of choice to reduce ED use not only for specific groups of vulnerable patients but also for all frequent users of EDs.

To our knowledge, this is the first systematic review concerning interventions targeting adult frequent users of the ED. We identified 2 systematic reviews about frequent ED use; one review examined the characteristics of frequent users,¹⁵ whereas one focused on interventions for elderly frequent users.⁶⁴ The first review documented the heterogeneity in patients defined as frequent users and contributed an interesting synthesis of what is known about demographics, degree of illness, and utilization patterns in these patients. The search strategy incorporated 1 database (MEDLINE), studies from the United States only were included, and no risk of bias assessment was performed. In the second review, the same problems were encountered as in the present review about heterogeneity among studies, and consequently results were presented without meta-analysis. Unlike the present review, that review did not include risk of bias assessment. McCusker et al⁶⁴ concluded that outpatient and home-based interventions were more successful at reducing the number of ED visits than hospital-based interventions. They also proposed a method to standardize the measurement of ED use by reporting the proportion of patients using the ED and, among users, the mean number of visits. In light of the results of the current systematic review, we confirm that standardized measurement of ED use is a crucial point. Because sample sizes of individual studies are usually small, it is difficult to establish the actual efficacy of interventions with statistical significance. Standardized measurements of ED use and magnitude of effect of the tested interventions would enable meta-analysis.

Should health care organizations invest in case management teams for frequent users of their EDs according to the evidence reviewed here, or should they wait for more research? The United Kingdom's Medical Research Council updated guidelines for development, evaluation, and implementation of complex interventions may help to address this challenging question.⁶⁵ We uncovered evidence to support the implementation of case management for frequent users of ED, mainly because it may reduce their ED use and improve health without additional hospital costs. Case management is a costly intervention because it is based on a multidisciplinary team involved in the long-term care of each patient. Nevertheless, case management has been tested in terms of costs and effects

relative to costs and has been proven to reduce ED costs. Implementation of case management in any specific context will need definite adjustments and local evaluation. Establishment of a trial case management intervention would permit the assessment, from the beginning, of all steps of the implementation of a case management team, leading to a clearer idea of which intervention component works best for whom. The evaluation of changes in primary health care use would be an interesting additional factor to consider. The Medical Research Council calls for randomized controlled trials with standardized outcomes measures; we confirm that this study design seems to be appropriate for the evaluation of case management for frequent users.

In conclusion, our systematic review suggests that interventions targeting frequent users of hospital EDs may be effective at reducing ED use. Case management, the most-described intervention, could reduce ED costs and may also improve social and some clinical outcomes. Case management is therefore worth implementing in hospital EDs in the framework of a proper local evaluation setting with a clear definition of frequent users (ie, more than 4 ED visits in 12 months⁹) and collecting standardized measures of frequency of ED use. Such local evaluations and analysis of influence will be essential to confirm the beneficial effect of case management or similar interventions for frequent users.

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