

Scandinavian Journal of Primary Health Care

ISSN: 0281-3432 (Print) 1502-7724 (Online) Journal homepage: informahealthcare.com/journals/ipri20

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To cite this article: Jarmo Kantonen, Robert Lloyd, Juho Mattila, Timo Kauppila & Ricardo Menezes (2015) Impact of an ABCDE team triage process combined with public guidance on the division of work in an emergency department, Scandinavian Journal of Primary Health Care, 33:2, 74-81, DOI: 10.3109/02813432.2015.1041825

To link to this article: https://doi.org/10.3109/02813432.2015.1041825

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Published online: 13 May 2015.

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Scandinavian Journal of Primary Health Care, 2015; 33: 74–81

ORIGINAL ARTICLE

Impact of an ABCDE team triage process combined with public guidance on the division of work in an emergency department

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Abstract

Objective. To study the effects of applying an emergency department (ED) triage system, combined with extensive publicity in local media about the "right" use of emergency services, on the division of work between ED nurses and general practitioners (GPs). *Design.* An observational and quasi-experimental study based on before–after comparisons. *Setting.* Implementation of the ABCDE triage system in a Finnish combined ED where secondary care is adjacent, and in a traditional primary care ED where secondary care is located elsewhere. *Subjects.* GPs and nurses from two different primary care EDs. *Main outcome measures.* Numbers of monthly visits to different professional groups before and after intervention in the studied primary care EDs and numbers of monthly visits to doctors in the local secondary care ED. *Results.* The beginning of the triage process increased temporarily the number of independent consultations and patient record entries by ED nurses in both types of studied primary care EDs and reduced the number of patient visits to a doctor compared with previous years but had no effect on doctor visits in the adjacent secondary care ED. No further decrease in the number of nurse or GP visits was observed by inhibiting the entrance of non-urgent patients. *Conclusion.* The ABCDE triage system combined with public guidance may reduce non-urgent patient visits to doctors in different kinds of primary care EDs without increasing visits in the secondary care ED. However, the additional work to implement the ABCDE system is mainly directed to nurses, which may pose a challenge for staffing.

Key Words: *Emergency department, Finland, general practice, patient grouping, primary care, reverse triage, triage*

Introduction

Non-urgent visits to emergency departments (EDs) may cause unintended significant problems such as use of ED for non-urgent matters, crowding, and long waiting times [1–4] while simultaneously requiring resources that are supposed to be used for patients with urgent needs. Urgent treatment is compromised if the ED is too crowded [5]. Internationally, most countries separate primary care and EDs and provide ED services as secondary care functions [6,7] but in Finland primary care and GPs are also involved in ED functions [7–10]. These primary care EDs are easily accessible, which has led to crowding and overuse of these facilities [8].

As an attempt to provide immediate treatment for those patients in primary health care ED who need it the most, a face-to-face triage system [7,9,10] was developed in Finland. This type of triage has been reported to reduce visits to doctors in primary care EDs where secondary care EDs are available in the same facilities without increasing the workload of primary care doctors in office hours [7,10]. There are thus no data regarding who treats these ED patients who do not end up with primary care doctors or where such treatment is provided.

The primary aim of this study was to determine whether the implementation of such ABCDE triage combined with public guidance altered the division

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(Received 10 November 2013; accepted 13 March 2015)

ISSN 0281-3432 print/ISSN 1502-7724 online
DOI: 10.3109/02813432.2015.1041825

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How applying a triage system (ABCDE triage) alters workload in a primary care emergency department (ED) is not known.

- The beginning of ABCDE triage may increase the workload of nurses and decrease the workload of primary care doctors. The use of secondary care ED was not altered by the triage performed in primary care ED.
- Applying ABCDE triage may alter the assignment of patients into the non-urgent patient group.
- Statistical process control (SPC) methods are useful when studying and analysing changes in primary care settings over time.

of work between the main professional groups (ED nurses and GPs) in the two different types of primary care EDs, the first type having secondary care services and full laboratory and X-ray facilities available and the other, a more traditional setting, devoid of these resources. Different statistical approaches were used to describe putative changes thoroughly. Second, an attempt was made to describe the diagnoses of those patients in a primary care ED who were not supposed to need emergency services, and to study whether application of this type of triage alters diagnoses in this patient group.

Materials and methods

Setting and intervention

The present work is an observational and quasi-experimental study and it is based on before–after comparisons. The study was performed in the city of Espoo, Finland which is the second largest city in Finland (230 000 inhabitants) and located just southwest of Helsinki, the capital city. The study population consisted of ED staff serving unselected primary care patients in the two different types of primary care EDs located in Jorvi and Puolarmetsä Hospitals, in the city of Espoo. Because secondary health care is also provided in the ED at Jorvi Hospital it is defined as a 'combined ED'. It is equipped with out-of-hours laboratory and X-ray facilities, and primary care ED is carried out there only out of office hours. As a comparison, the ED in Puolarmetsä Hospital resembles a traditional Finnish primary health care out-of-hours unit, does not provide specialist care, and the laboratory and X-ray facilities are available only during office hours. Puolarmetsä ED was not open during the night but only in the evenings and at weekends. The health authorities of Espoo and HUCH endorsed this study and its purpose. The intervention, ABCDE triage, is based on the flowing assessment protocol: A (patient directly to secondary care), B (to be examined within 10 minutes), C (to be examined within 1 hour), D (to be examined within 2 hours), and E (no need for immediate medical treatment). In this system, all patients who are transported to the ED by ambulance are directly triaged by secondary health care ED nurses consulting secondary health care ED doctors. Patients arriving by other means than ambulance end up being directed to a primary health care ED nurse for ABCDE triage. The ABCDE triage [7,9,10] was performed by experienced ED nurses in the front line as described previously [7,10].

The ABCDE triage was combined with public guidance as described in detail earlier [10]. Briefly, the impact of introducing the ABCDE triage tool in emergency services was enhanced by increasing simultaneously the education of the staff in EDs and the publicity concerning the issue. A discussion was also raised in the media around these services and information was delivered to both professionals and the public outside EDs. The main message to the public was that those who require immediate medical help should come to EDs but EDs are not overflow services of office-hours services. Guidelines were written for the staff regarding triage. The staff also received training and encouragement by the project workers and leaders. The training was arranged for public health care staff inside EDs and in office-hours services. Altogether 60 nurses were trained in four four-hour seminars in primary care EDs to perform the triage. The general public was informed of the project through the media, and all the information focused on the transparency of the system. Necessary data were also available via the Internet, and both the public and staff had access to the internet pages of the campaign (http://www.hus.fi/default.asp?path = 1,32,660,546,570,4384,6950,6956,11437). All related material was available on this page. Local print media, radio, and bulletins were also used. About 30 articles were published in both national and local newspapers. Posters and leaflets about the project were delivered to the patients in EDs and in office-hours services. The aim of the project group was to publish as much information as possible related to the changes to keep the population, all organisations associated with the project, and the staff fully informed. The objective of this information campaign was to guide non-acute patients (group E) directly to appropriate daytime services.

Data extraction

The primary care data were obtained from the electronic health records of Espoo primary health care (Effica patient chart system) and Jorvi secondary

health care ED (Helsinki University Central Hospital, HUCH; Musti and Oberon patient chart systems). In Espoo, the follow-up was performed between March 2004 and April 2008. The main outcome measure, the number of monthly visits to doctors and nurses, was scored in both primary care EDs before (March 2004–February 2007, control period) and after implementation of the ABCDE triage system combined with public guidance (March 2007 till the end of the follow-up period in April 2008).

Implementation of the ABCDE triage system combined with public guidance started on 1 March 2007. From 1 March to 30 September 2007 patients triaged to group E were able to stay and wait if they wanted to see the doctor even though the triage nurse had explained to the patient that his/her case was not an emergency issue. From 1 October 2007 group E patients were no longer placed on the doctor's list. They were diverted to their own health centre in office hours and given home care guidance if needed. This process to block non-urgent patients' access to doctors resembles "reverse triage" [11], which has been developed as a tool for secondary care EDs to make decisions on patient flows in exceptional emergency situations.

Primary and secondary outcomes

The main outcome measure, the number of monthly visits to doctors and nurses, was scored in both primary care EDs before and after implementation of the ABCDE triage system combined with public guidance (March 2007–September 2007). It was thus continued over the next phase of intervention when E patients were no longer allowed to stay in ED but directed to their own home or to the office-hours primary care services (from October 2007) till the end of the follow-up time (end of April 2008).

To detect secondary outcomes, putative ABCDE triage induced changes in assessment of patients to group E. The monthly frequencies of causes to consult nurses in EDs before and after the intervention were recorded with ICPC-2 (Finnish International Classification of Primary Care, 2nd ed., 2010, http://www.kuntaliitto.fi) codes in Puolarmetsä primary care emergency service. They were collected from the patient charts of Espoo primary care for periods before (March–August 2006) and after (March–August 2007) the transfer to the triage system and compared. The 10 most common reasons for patient visits were analysed in this way.

To compare the criteria for allocating patients to group E in the two different types of EDs, a sample of ICPC-2 data on the most common reasons for visits of patients assessed by a triage nurse to group E were simultaneously recorded from the patient charts of the Puolarmetsä and Jorvi nurses. The follow-up period in this secondary outcome was after the implementation of triage (March–December 2007).

Main and secondary statistics

Enumerative statistics were employed to determine whether the aggregated data from 2004 and 2006 differed significantly from the post-intervention status. Since the triage system was introduced at the beginning of March 2007, the number of patient visits since the introduction of the system was compared with the number of patient visits in the respective months of the years before the intervention. The numbers of monthly visits were initially compared using one-way repeated measures analysis of variance followed by the use of Bonferroni's test for detecting the effects of significant systematic monthly variation [7,10].

The data were also evaluated by using analytic statistical methods (i.e. to look at data changes over time), with Statistical Process Control (SPC) tools (e.g. the XmR chart) [12]. Once the intervention(s) were put in place, the performance of the dependent variable was compared with the baseline performance (March 2004–February 2007). The SPC tests were used to determine if the process performance demonstrated common cause or special cause variation [12,13]. Specifically, three statistical tests were applied to the data: (a) a shift in the data demonstrated by eight or more consecutive data points above or below the mean centreline on the control chart, (b) a statistical trend in the data which is defined as six consecutive data points constantly increasing or decreasing, not counting values that are repeated in the sequence, and (c) a data point that exceeds the upper or lower control limits on the control chart (i.e. a data point that exceeds 3 sigma).

The frequencies of ICPC diagnoses were compared by using the paired-samples t-test or chi-squared test, when appropriate.

Results

After introduction of the ABCDE triage system combined with public guidance the number of patients' record entries made by ED nurses increased at both EDs (RM ANOVA, $p < 0.001$, Table I, and Figure 1A, and $p < 0.001$, Table I and Figure 1B). Diverting the E group did not seem to increase further the number of record entries by ED nurses (Table I).

Respectively, the number of patient visits to doctors at both EDs ($p < 0.001$, Figure 1C, Table I, and $p < 0.001$, Table I, Figure 1D) declined. Diverting

Table I. Number of monthly recorded patient visits to nurses and doctors of the studied EDs before and after triage.

	2004 (recorded entries /month)	2005 (recorded entries/month)	2006 (recorded entries /month)	After triage (recorded entries/month)	After diverting E-patients (recorded entries/month)
Jorvi primary care ED doctors	2487 ± 170	2578 ± 164	2510 ± 156	2016 ± 51***	1885 ± 250***
Jorvi primary care ED nurses	250 ± 62	298 ± 52	397 ± 43	907 ± 259***	623 ± 90***
Puolarmetsä primary care ED doctors	1545 ± 235	1649 ± 184	1596 ± 226	1206 ± 172***	1155 ± 162***
Puolarmetsä primary care ED nurses	295 ± 95	278 ± 80	245 ± 36	675 ± 153***	373 ± 66
Jorvi secondary care ED doctors	2470 ± 68	2620 ± 201	2595 ± 194	2553 ± 183	2525 ± 81

Mean± SD is shown. and ***$p < 0.001$, Bonferroni test, compared with years 2004–2006.

the E group patients from the EDs did not appear to further decrease the number of visits to the doctor but they remained at the same level as when the intervention was started. These interventions did not seem to affect visits to the doctor at the adjacent secondary care ED (see Table I).

The XmR control charts (i.e. the individual and moving range chart) showed that immediately after the introduction of the ABCDE triage system combined with public guidance, there was a sharp increase in the number of patient records entries by ED nurses in both EDs (see Figures 1A and 1B). This spike in the number of visits was followed by a decrease in the number of patient records entries by nurses followed by a period of stability that was still higher than the baseline periods for both locations. After attempts to divert E patients, variation was reduced in the numbers of monthly recorded ED nurse visits at

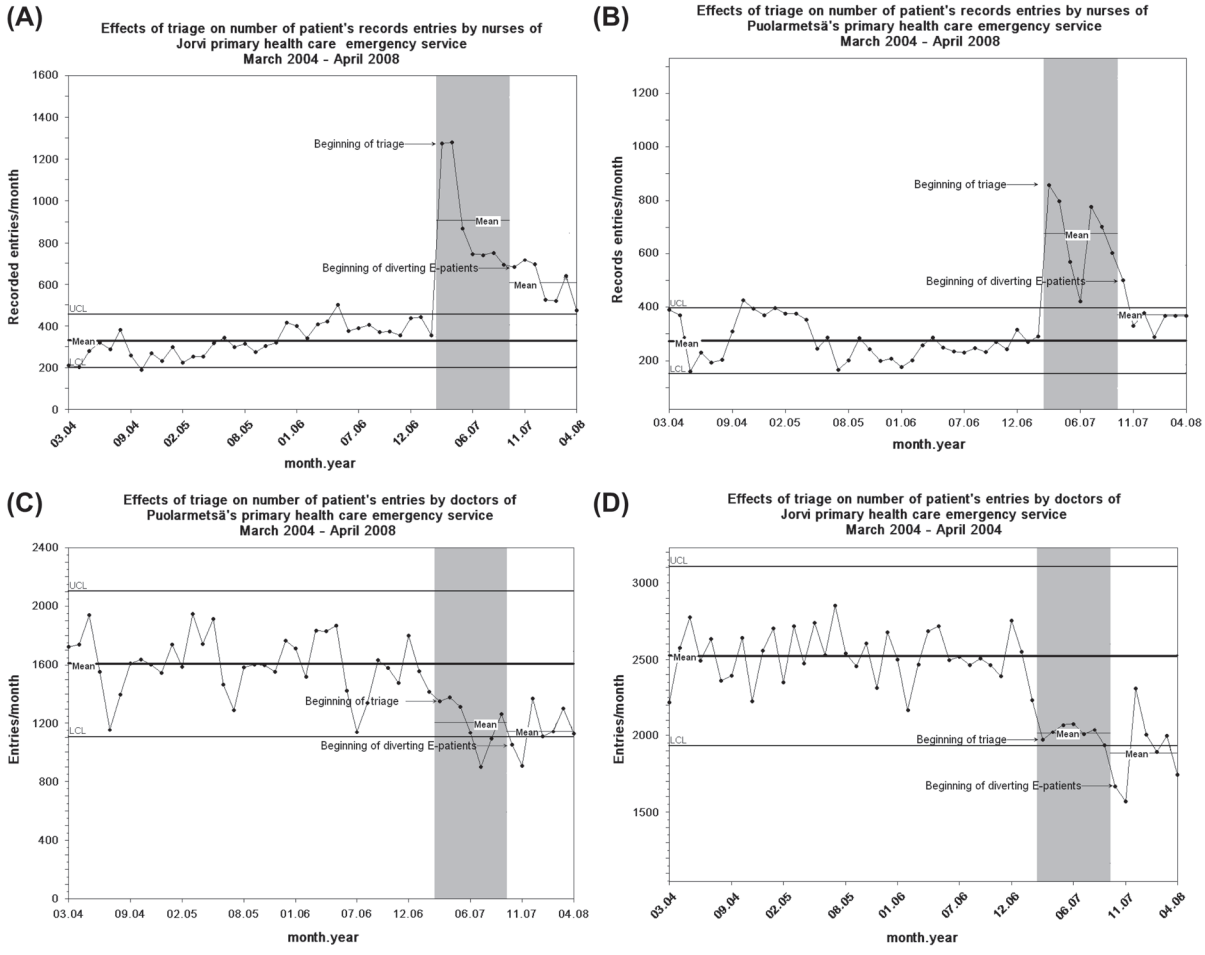


Figure 1. (A) Number of recorded monthly patient visits to nurses of Jorvi combined emergency service. Figure shows the original data in the form of an XmR chart: mean and 3 x δ (UCL) is presented. (B) Number of recorded monthly patient visits to nurses of Puolarmetsä (traditional) emergency service. (C) Number of recorded monthly patient visits to doctors of Puolarmetsä (traditional) emergency service. (D) Number of monthly recorded patient visits to doctors of Jorvi combined emergency service.

both EDs. There was no increased variation in the number of monthly GP visits at EDs (see Figures 1C and 1D) immediately after the interventions.

Implementation of the ABCDE triage combined with public guidance was associated with increases in the frequency of some the most frequently used ICPC-2 codes in the ED nurse reception at Puolarmetsä (Figure 2). Some ICPC-2 codes for patients assessed to group E were more frequent in the Jorvi ED and some others in the Puolarmetsä ED (Table II).

Discussion

The SPC charts revealed that immediately after the introduction of the ABCDE triage with public guidance there was a sharp increase in the number of recorded patient entries by ED nurses followed by an abrupt decrease and, despite attempts to divert E patients, the rate settled down gradually to levels that were still a bit higher than those observed during the baseline period (see Figures 1A and B). The variation was reduced in numbers of monthly recorded nurse visits for both EDs at those time points. There was no increased variation in the number of monthly GP visits (see Figures 1C and D) immediately after intervention although there was a clear decrease in the number of visits in both systems. Thus, the present interventions increased workload, which was acutely "buffered" by ED nurse work, and changed the functions of both EDs in an ED nurse work-driven direction, possibly permanently. Simultaneously, monthly visits to doctors in the adjacent Jorvi hospital secondary care ED did not increase, suggesting that the ABCDE triage may be useful in reducing overuse of doctor resources in various types of EDs. Nevertheless, the total number of visits to the studied primary care EDs did not decrease. This is in line with a hypothesis that EDs have "customers of their own" and that those patients are not likely to use ordinary daytime primary health care services [4].

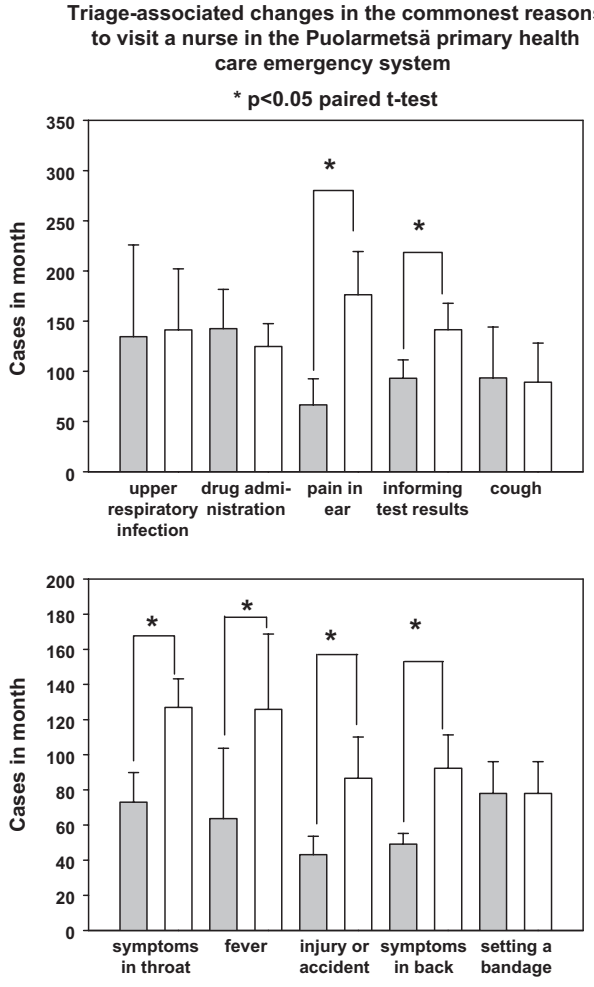


Figure 2. Monthly numbers of the most common reasons for patient visits to Puolarmetsä (traditional) emergency service nurses for periods before (March–August 2006; grey bars) and after (March–August 2007; white bars) transfer to the triage system.

The present data suggest that seven months was enough time for patients to adapt themselves to implementation of ABCDE triage in the studied EDs. Diverting group E patients [11] seems to have stabilized the observed effects of the triage process by decreasing variation rather than altering the magnitude of the effect. Redirecting work from doctors to nurses may theoretically result in financial savings [14,15] especially if the doctor's salary is based on the number of patient contacts [16], as was the case in both EDs. Because it has been shown that in many EDs across the world the triage process has been successfully run by experienced ED nurses [17–19] the present interventions may also be performed without compromising the quality of care and efficiency of work. In various other primary care settings, the quality of care does not necessarily decrease when specific tasks are directed to specially trained nurses [14,15,20]. However, further studies regarding safety must be conducted before widespread implementation of the present intervention is recommended.

Implementation of the ABCDE triage combined with public guidance was associated with a change in the ED nurses' assessment of who is triaged to class E. After the intervention, small traumas, fever, and throat and ear symptoms were more often treated by the nurses who clearly took more independent responsibility for the patients than before. The reasons for the E-group patients to visit the two EDs also resembled those reported to be low acuity among self-referred patients in secondary EDs [21]. In the two different EDs the patients assessed to E-groups also seemed to be a bit different.

After applying the ABCDE triage combined with public guidance, increased workload was thus acutely

Table II. Distribution of ICPC-2 diagnoses in group E patients after implementing the ABCDE-triage.

ICPC code		JORVI ED	PUOLARMETSÄ ED	ICPC code		JORVI ED	PUOLARMETSÄ ED
R	RESPIRATORY	88	255***	S	SKIN		
R05	Cough	22	39	S18	Laceration/cut	14	
R21	Throat Symptom/ Complaint	21	53	S19	Skin injury other		7
R29	Respiratory Symptom/ Complaint other		9	S29	Skin symptom/ complaint other		9
R74	Upper respiratory infection acute	24	120	D	DIGESTIVE	55	34***
R75	Sinusitis acute/chronic		11	D01	Abdominal pain/ cramps general	7	7
R97	Allergic rhinitis		10	D10	Vomiting	13	
L	MUSCULOSKELETAL	80	111	D11	Diarrhoea	16	8
L01	Neck symptom/ Complaint	8		H	EAR	12	55***
L02	Back symptom/ Complaint	20	41	H01	Ear pain/Earache	6	30
L05	Flank/Axilla Symptom/ Complaint	6		H27	Fear of ear disease		8
L08	Shoulder Symptom/ Complaint		6	F	EYE	8	49***
L09	Arm symptom/Complaint		6	F02	Red eye		14
L14	Leg/Thigh Symptom/ Complaint	7		F29	Eye symptom/ Complaint other	6	14
L15	Knee symptom/ Complaint		12	F73	Eye infection/ Inflammation other		8
L16	Ankle symptom/ Complaint		6	-	PROCESS CODES	11	33
L17	Foot/Toe Symptom/ Complaint	7	12	P	PSYCHOLOGICAL	30	8***
A	GENERAL AND UNSPECIFIED	77	91	P15	Chronic alcohol abuse	9	
A02	Chills	7		P16	Acute alcohol abuse	5	
A03	Fever	40	63	N	NEUROLOGICAL	19	10**
A29	General Symptom/ Complaint, other	9	8	N01	Headache		8
A80	Trauma/Injury NOS		7	U	UROLOGICAL	11	14
S	SKIN	42	81	U01	Pain during urination		6
S08	Skin colour change		8	X	FEMALE GENITAL	8	6
S09	Infected finger/toe		8	K	CARDIOVASCULAR	5	4
S10	Boil/carbuncle		6	W	PREGNANCY, CHILDBEARING, FAMILY PLANNING	2	3
S11	Skin infection post-traumatic		6	Z	SOCIAL PROBLEMS	2	1
S16	Bruise/contusion	4		Y	MALE GENITAL	1	0
					TOTAL	431	723

"buffered" by ED nurse work. This phenomenon, e.g. delivering increased workload to cheaper staff, has already earlier been used deliberately in health care [14–16]. Increased workload should be taken into consideration when any similar intervention is applied elsewhere by, for example, increasing nurse resources. This "buffering" effect of ED nurse work was easier to observe from the XmR chart than from mean and aggregated statistics. Without XmR charts the finding that in Puolarmetsä ED the final level of ED nurse entries ended up actually on a higher level than before intervention would not have been observed from enumerative statistics. While the descriptive statistical analysis indicated that there were statistically significant differences between two aggregated points in time, they failed to answer critical questions from a quality improvement perspective: (1) Have the processes demonstrated statistical changes over time? and (2) If changes have been detected, were they sustained over time? The aggregated data here provided little insight into the underlying data and the related variation in these data and therefore analytical

methods were applied [22]. The SPC methods provide the preferred approach to determining whether a change in the process performance had actually occurred and when it occurred [23,24]. While SPC methods have been applied to industrial and manufacturing sectors since the early 1900s [23,24], healthcare research aimed at improving quality and safety has been using SPC for about 20 years [12,13,24–26].

It is hard to judge whether or not to recommend the use of ABCDE triage combined with public guidance in EDs. Administration of primary care may be interested in this intervention due to cost savings produced by decreased use of doctor resources in the cost area of emergency services [16,27]. On the other hand, there seems to be an association between introducing this type of "reverse triage" and increased use of expensive complementary private sector doctors' services [7,27]. In Finland, private services are mainly available for wealthy people [28] and increasing their use is not necessarily a desired goal in public health care trying to serve equally the whole population. We have no properly collected data concerning the opinions of the staff in primary care or the public which uses the ED services and actually also pays for these via taxes, regarding the present intervention. Thus, further studies are needed to make recommendations as to when this type of intervention is appropriate to use.

Conclusions

The present ABCDE triage system combined with public guidance may help to reduce non-urgent patient visits to doctors in primary care emergency departments without increasing visits to the secondary care ED. However, it probably causes additional work for ED nurses because they clearly take more independent responsibility for the patients than before. Applying the ABCDE triage may also alter assessment of patients into group E.

Acknowledgements

The authors wish to thank Drs Jane Roessner, Tuula Heinänen, Gareth Parry, Michael Horwood, and professor Maaret Castren for their valuable comments. They also wish to express their gratitude to the two unknown referees who clearly improved the manuscript with their comments. This work was funded by the City of Espoo and HUS.

Declaration of interest

There are no conflicts of interest in connection with the paper. The authors alone are responsible for the content and writing of the paper.

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