Development of The Use of Primary Health Care Emergency Departments After Interventions Aimed At Decreasing Overcrowding: A Longitudinal Follow-up Study

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Abstract

Background: This study, conducted in a Finnish city, examined whether decreasing emergency department (ED) services in an overcrowded primary care ED and corresponding direction to office-hours primary care would modify service usage for specific gender, age or diagnosis groups.

Methods: This was an observational retrospective study carried out by gradually decreasing ED services in primary care. The interventions aimed at decreasing use of EDs were a) application of ABCDE-triage combined with public guidance on the proper use of EDs, b) closure of a minor supplementary ED, and finally, c) application of “reverse triage” with enhanced direction of the public to office-hours services and away from the remaining ED The annual number of visits to office-hours primary care GPs in different gender, age and diagnosis groups (International Classification of Diseases (ICD-10) were recorded during a 13-year follow-up period.

Results: The total number of monthly visits to EDs decreased slowly over the whole study period. This decrease was similar in women and men. The decrease was stronger in the youngest age groups (0-19 years). GPs treated decreasing proportions of ICD-10 groups. Recorded infectious diseases (Groups A and J, and especially diagnoses related to infections of respiratory airways) tended to decrease. However, visits due to injuries and symptomatic diagnoses increased.

Conclusion: Decreasing services in a primary health care ED with the described interventions seemed to reduce the use of services by young people. The three interventions mentioned above had the effect of making the primary care ED under study appear to function more like a standard ED driven by specialized health care.

Introduction

Overcrowding of Emergency Departments (EDs) is common in several countries and therefore health authorities have tried to remedy the problem in several ways [1]. In the city of Vantaa, due to constant overcrowding of primary care EDs the health authorities initiated three different actions to guide non-urgent patients away from the local primary care ED during the years 2004-2008. The actions were: application of ABCDE-triage combined with public guidance on the proper use of EDs [2], closure of a minor supplementary ED [3], and, finally, application of “reverse triage” with enhanced guiding of the public to office-hours services and away from the remaining ED [4]. The strategy was that those patients who did not require doctor services in EDs would be guided to office-hours GPs in the local primary care by the primary care system itself [5].

This strategy did not work as planned: patients were not directed to office-hours physicians [5]. Therefore it became important to study which patient groups in the ED were most affected by these reductions. In this longitudinal follow-up study, we examined how this decrease in ED services impacted on the access of different gender, age and diagnosis groups to the ED.

Methods

Setting and design

The present study is a retrospective longitudinal follow-up study. It was performed in the primary health care of the fourth largest city of Finland. In Vantaa there were about 210,000 inhabitants in 2014. Visits to primary care EDs were studied. As everywhere in Finland, primary care is maintained by municipalities and funded with taxes. The ED system had two departments: The primary care ED system which usually performed first evaluation and the ED of the university clinic of Helsinki University (HUS) in the Peijas or Meilahti hospitals. The latter was consulted with a referral in treatment in secondary care was considered necessary. Thus, the primary care ED system of the city of Vantaa evaluated always first possible low acuity patients [2–4].

The register keepers (the social and health authorities of Vantaa) and the scientific ethical board of Vantaa City (TUTKE) granted permission (VD/8059/13.00.00/2016) to carry out the study. This study was implemented using the patient information system and anonymized patient data, thus without identifying the patients or physicians. According to Finnish law regarding register studies (https://rekisteritutkimus.wordpress.com/luvat-ja-tietosuoja/), the study participants did not need to sign a Statement of Informed Consent because the study was retrospective, anonymized, based on patient information charts, and the investigators did not contact the participants.

ED interventions

Three different interventions were initiated in the primary care ED system of Vantaa. Strategically, they were planned simultaneously but carried out gradually by the administration of the primary care of the city of Vantaa. First, an ABCDE-triage system combined with public guidance on the proper use of EDs was introduced in the main primary care ED of the city of Vantaa on 1.1.2004 [2]. This intervention has been described in detail before [2] and it led to a situation where those patients who judged by themselves that their condition did not require emergency actions did not arrive at the ED when they realised that they would be forced to wait a long time to see a doctor. Secondly, a small suburban supplementary ED was closed in the western part of Vantaa [3]. This intervention has been described in detail before [3] and, consequently, those patients who judged by themselves that it was not worth the extra burden of travelling to the remaining ED to get their health problem treated immediately in emergency did not appear in the ED at all. Thirdly and finally, a tight “reverse triage”, based on ABCDE-categorization was introduced in the remaining primary care ED [4]. This intervention has been described in detail before [4] and it led to a situation, where those patients who judged by themselves that their health issue did not require emergency actions did not arrive at the ED. In practice, these interventions led to a situation where the amount of doctor visits in the primary care ED system decreased by almost 50% [2–5].

Primary and secondary measures

The report generator of the Graphic Finstar patient chart system (GFS, Logica LTD, Helsinki, Finland) provided yearly figures for the number of ED visits in different gender and age groups (0-19, 20-64 and 65+ years). This was the main measure for analysis in the present study. The other measure from the patient chart was the rate of change (in number or proportion/year) of different ICD-10 (International Classification of Diseases 10th edition) diagnoses [6] recorded. An accuracy of initial letter (main ICD-10 groups) or three first digits of the ICD-10 diagnoses was applied for data collection. The twenty most common diagnoses in the emergency services were studied in detail.

Statistical analyses

The rates and the directions of change in numbers of all studied parameters, i.e. the rates of development in different patient groups, were analyzed using regression analysis followed by t-test (GLM procedure of SigmaPlot 10.0 Statistical Software, Systat Software Inc., Richmond, CA, USA) [7–9]. Thus, the GLM allowed us to count the mean slope (cofactor a) of the development of the amount of physician visits (visits/year) and its standard error of the mean (SEM) during the follow-up. The comparisons with t-test were then performed to determine whether there were statistically significant changes in these mean slopes. Comparisons with one-way Analysis of Variance (ANOVA followed by Bonferroni method as a post hoc test) were performed between the slopes of different age and gender study groups to detect whether these groups differed from each other. Analogously, the rate of change in number and proportions (change in number or %/year) of different ICD-10 diagnoses were counted. Analogously, the comparisons with t-test were performed to determine whether there were statistically significant changes in these mean slopes. P value <0.05 was considered as statistically significant.

Results

Effect of age

The decrease in the rate of visits to the ED was -25.3 ± 2.3 visits/1000 persons/year (mean±SEM.: p<0.001, t-test) in females aged 0-19 and did not differ statistically from the respective rate of males in the same age group (-24,8±2.2: p<0.001). The decrease was higher in the two youngest groups and it differed (p<0.001, ANOVA) from the respective rates of decrease (all p<0.001, t-test) of females aged 20-64 (-17.2±1.5), 65+ (-14.2±1.6) and males aged 20-64 (-14.0±1.1) or 65+ (-11.4±1.6). There were no differences in these rates between the female and male age groups 20-64 or 65+ (see Figures 1 and 2).

Change in diagnostics

During the follow-up of the interventions the recorded proportions of ED visits related to infections (main ICD-10 groups A and B), respiratory diseases (group J) and musculoskeletal diseases (group J) decreased (Table 1). In line with this general observation regarding the decrease in infectious diseases, both the recorded proportions and absolute numbers of visits related to Acute upper respiratory infections of multiple and unspecified sites, Suppurative and unspecified otitis media, Acute bronchitis, Acute tonsillitis, Conjunctivitis, and Acute sinusitis decreased (Tables 2 and 3).

Table 1
Development of the proportions of main ICD-10 diagnosis groups in 2002-2014 in primary care EDs. The arrows show the direction of the observed change.

ICD-10	Contents of diagnosis group	Rate of change (mean±SEM, %/year)	p-value
A	Intestinal infectious diseases, bacterial infections and viral infections of central nervous system	-0,0540±0,0235	**0,042↓**
B	Other infections	-0,0337±0,00515	**<0,001↓**
C	Malignant neoplasms	0,0136±0,00419	**0,008↑**
D	Other neoplasms and Carcinoma in situ	0,00538±0,00309	n.s.
E	Endocrine nutritional and metabolic diseases	0,0514±0,00555	**<0,001↑**
F	Mental and behavioural disorders	0,443±0,0434	**<0,001↑**
G	Diseases of the nervous systems	0,0449±0,0174	**0,026↑**
H	Diseases of the eye and the adnexa, and the ear and mastoid process	-0,721±0,0631	**<0,001↓**
I	Diseases of the circulatory system	0,210±0,0427	**<0,001↑**
J	Diseases of the respiratory system	-1,708±0,159	**<0,001↓**
K	Diseases of the digestive system	0,0597±0,0250	**0,036↑**
L	Diseases of the skin and subcutaneous tissue	0,00245±0,0248	n.s.
M	Diseases of the musculoskeletal system and connective tissue	-0,203±0,0443	**<0,001↓**
N	Diseases of genitourinary system	0,166±0,0226	**<0,001↑**
O	Pregnancy, childbirth and puerperium	-0,00530±0,00227	**0,039↓**
P	Certain conditions originating in the perinatal period	-0,000391±0,000469	n.s.
Q	Congenital malformations, deformations and chromosomal abnormalities	-0,000793±0,000637	n.s.
R	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	1,050±0,0958	**<0,001↑**
S	Injury, poisoning and certain other consequences of external causes, single body region	0,451±0,0914	**<0,001↑**
T	Injuries to multiple or unspecified body regions as well as poisoning and certain other consequences of external causes.	0,0647±0,0345	n.s.
V	Transport accidents	0,0122±0,00669	n.s.

ICD-10	Contents of diagnosis group	Rate of change (mean±SEM, %/year)	p-value
W	Other external causes of accidental injury	0,0529±0,00916	**<0,001↑**
X	Exposure to burning substances and related threads, venomous animals and plants, noxious substances and forces of nature. Intentional self-harm and assault	0,0349±0,00621	**<0,001↑**
Y	Events of undetermined intent, legal interventions and operations of war, complications of medical care, sequelae of external causes of morbidity and mortality	0,0122±0,00464	**0,024↑**
Z	Factors influencing health status and contact with health services	0,0513±0,0189	**0,020↑**

Table 2
Development of the proportions of the twenty most common ICD-10 diagnoses in 2002-2014 in primary care EDs. The arrows show the direction of the observed change.

ICD-10 code	Name of diagnosis	Rate of change (mean±SEM, %/year)	p-value
J06	Acute upper respiratory infections of multiple and unspecified sites	-0,00618±0,000740	**<0,001↓**
R10	Abdominal and pelvic pain	0,00312±0,000284	**<0,001↑**
H66	Suppurative and unspecified otitis media	-0,00430±0,000305	**<0,001↓**
M54	Dorsalgia	-0,00195±0,000175	**<0,001↓**
S01	Open wound of head	0,000880±0,000246	**0,004↑**
J20	Acute bronchitis	0,00365±0,000362	**<0,001↑**
A09	Other gastroenteritis and colitis of infectious and unspecified origin	-0,00101±0,000133	**<0,001↓**
F10	Mental and behavioural disorder due to use of alcohol	0,00261±0,000257	**<0,001↑**
R07	Pain in throat and chest	0,00148±0,000106	**<0,001↑**
S93	Dislocation, sprain and strain of joints and ligaments at ankle and foot level	-0,000614±0,000156	**0,002↓**
S61	Open wound of wrist and hand	-0,0000183±0,000186	n.s.
N30	Cystitis	0,000297±0,000108	**0,019↑**
J03	Acute tonsillitis	-0,00270±0,000243	**<0,001↓**
H10	Conjunctivitis	-0,00156±0,000294	**<0,001↓**
J01	Acute sinusitis	-0,00284±0,000324	**<0,001↓**
M79	Other soft tissue disorders, not elsewhere classified	0,00159±0,000177	**<0,001↑**
S06	Intracranial injury	0,0000570±0,000116	n.s.
R53	Malaise and fatigue	0,00169±0,000160	**<0,001↑**
R06	Abnormalities of breathing	0,000741±0,000164	**<0,001↑**
S52	Fracture of forearm	0,00108±0,000236	**<0,001↑**

Table 3
Development of the absolute values of the twenty most common ICD-10 diagnoses in 2002-2014 in primary care EDs. The arrows show the direction of the observed change.

ICD-10 code	Name of diagnosis	Rate of change (mean±SEM, N/year)	p-value
J06	Acute upper respiratory infections of multiple and unspecified sites	125,637±33,307	**0,003↓**
R10	Abdominal and pelvic pain	127,802±20,857	**<0,001↑**
H66	Suppurative and unspecified otitis media	0,00864±0,00162	**<0,001↓**
M54	Dorsalgia	22,176±15,721	n.s.
S01	Open wound of head	46,604±10,158	**<0,001↑**
J20	Acute bronchitis	80,484±16,028	**<0,001↓**
A09	Other gastroenteritis and colitis of infectious and unspecified origin	11,791±8,672	n.s.
F10	Mental and behavioural disorder due to use of alcohol	90,011±9,114	**<0,001↑**
R07	Pain in throat and chest	0,0147±0,00193	**<0,001↑**
S93	Dislocation, sprain and strain of joints and ligaments at ankle and foot level	2,396±5,381	n.s.
S61	Open wound of wrist and hand	13,813±5,642	**0,032↑**
N30	Cystitis	22,154±6,185	**0,004↑**
J03	Acute tonsillitis	60,918±6,996	**<0,001↓**
H10	Conjunctivitis	31,341±6,078	**<0,001↓**
J01	Acute sinusitis	67,214±11,802	**<0,001↓**
M79	Other soft tissue disorders, not elsewhere classified	55,604±8,155	**<0,001↑**
S06	Intracranial injury	12,148±5,756	n.s.
R53	Malaise and fatigue	0,0152±0,00179	**<0,001↑**
R06	Abnormalities of breathing	29,582±6,004	**<0,001↑**
S52	Fracture of forearm	39,846±8,320	**<0,001↑**

Simultaneously, there was an increase in the recorded proportions of visits related to endocrine diseases (ICD-10 group E), mental disorders (group F), circulatory system diseases (group I), genitourinary diseases (group N) and various types of injuries (groups S, T, W, X and Y). The increase in different injuries was especially remarkable in the recorded proportions and absolute numbers of visits related to Open wounds of head and Fractures of forearm (Tables 2 and 3).

The proportion of recorded symptomatic diagnoses (group R) increased strongly. This increase was seen especially in the recorded proportions and absolute numbers of visits related to Abdominal and pelvic pain, Pain in throat and chest, Malaise and fatigue and Abnormalities of breathing (Tables 2 and 3).

Discussion

The number of visits to EDs decreased during the follow-up of the interventions. This decrease was most prominent in the youngest age groups. Especially, the proportions of recorded infectious diseases (Groups A, B and J) decreased. Particularly, diagnoses related to mild infections of respiratory airways decreased. Interestingly, the effects of interventions on the prevalence of different injuries varied, although generally the proportions and absolute numbers of injuries increased. The proportions and numbers of symptomatic diagnoses increased.

The decreased rate in the use of primary care EDs in the youngest people (0-19 years) is understandable. There are earlier reports suggesting that primary health care ED services are often used by the younger age groups [10–11]. Especially low acuity visits to EDs seem to be a feature of very young age groups (<10 y) and late teenagers (18-19 years) [12]. Interestingly, social deprivation does not seem to influence this pattern of ED use [12]. The reasons for this are many. According to a survey study with ED patients, young age groups may differ in their expectations regarding the purpose of out-of-hours services and accessibility and they may have other objectives than plain clinical urgency when they seek help [13]. Furthermore, in a multicenter survey of patients from an urban health region, distance to a specific ED was the most important reason for choosing that ED suggesting that convenience factors play a significant role when deciding to use ED services [14]. There is support for this view from other studies analyzing primary care out-of-hours calls and visits concerning child patients [15] and young adults [16] as well as from qualitative studies regarding treatment of small children in out-of-hours services [17]. Altogether, previous findings have shown that if restrictions of access to primary health care EDs occur, the youngsters, who use these services a lot, reduce their ED visits more than other people.

The finding that the proportions and numbers of simple infections in the ED decreased is in line with the aims of the interventions applied [2–4]. We knew that at least about 30% of the diagnoses done in the present kind of primary care ED system and office-hours primary care were the same and that office-hours primary care might therefore have provided better continuation of treatment for these patients than the ED [18]. Furthermore, when diagnoses in EDs and primary care doctor driven emergency systems have been compared, a higher prevalence of mild infections in primary care doctor driven emergency systems and a higher prevalence of injuries in EDs have been reported [19]. This injury-focused activity in EDs has also been described elsewhere in all age groups [20, 21]. Thus, the present triplet of interventions seemed to shift the functions of the studied primary care ED towards the form of a standard specialized health care driven ED. Whether these low-acuity primary care services should then also be provided to the population out of office-hours is another question [22].

This was a retrospective study considering primary care EDs. As this study was purely register-based the subjects were not aware of their participation in the study. The present result reflects real clinical activity in this respect. As a confounding factor, electronic reminders were introduced in the electronic patient information system in 2008 to enhance recording of diagnoses and that may have altered the observed proportions of different diagnoses during the present study [23]. For example, this intervention explains at least partially the observed increase in symptomatic diagnoses (IDC-10 group R) during this study [24]. As a limitation, we should have been able to compare our results to a control city with a similar office-hours primary health care, demography and size. This would have strengthened our conclusions. However, such data from another city were not available for comparison. Data about possible changes in patient material or changes in ways to manage practices and diseases were not available. These factors have a considerable effect on changes in the number of visits to GPs. Data concerning these putative changes could have been obtained if we had had access to the patient information of individual patients. Unfortunately, that access we were unable to obtain.

Conclusions

Decreasing services in a primary health care ED with the described interventions seemed to reduce the use of services by young people (0-19y). Especially visits due to respiratory diseases and mild infections were reduced but visits due to injuries increased. The present triplet of interventions seemed to make the primary care ED in this study look more like a standard ED driven by specialized health care.

Abbreviations

ANOVA: analysis of variance; ED: Emergency Department; SEM; standard error of mean; ICD-10: International Classification of Diseases 10th edition

Declarations

Ethics approval and consent to participate

This study obtained ethics approval from the register keepers (the social and health authorities of Vantaa) and the scientific ethical board of Vantaa City (TUTKE, permission VD/8059/13.00.00/2016) with Good Clinical Practice (Declaration of Helsinki). Informed consent was waived by this Committee.

Consent for publication

Not Applicable. (All data was recorded anonymously and does not allow any inference to the participating persons.)

Competing interests

None declared.

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Authors' contributions

ML-K, AMH, OR and TK conceived the study design. KM and MR extracted data for analyses. ML-K, ML and TK conducted the data analyses. ML-K, AMH, OR and TK wrote the first version of manuscript and all authors contributed to the writing. All authors read approve the final manuscript.

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Availability of data and materials

The data for the study is obtained from electronic patient chart system of Vantaa (Grqphic Finstar); the authors do not have permission to share data.

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Figures

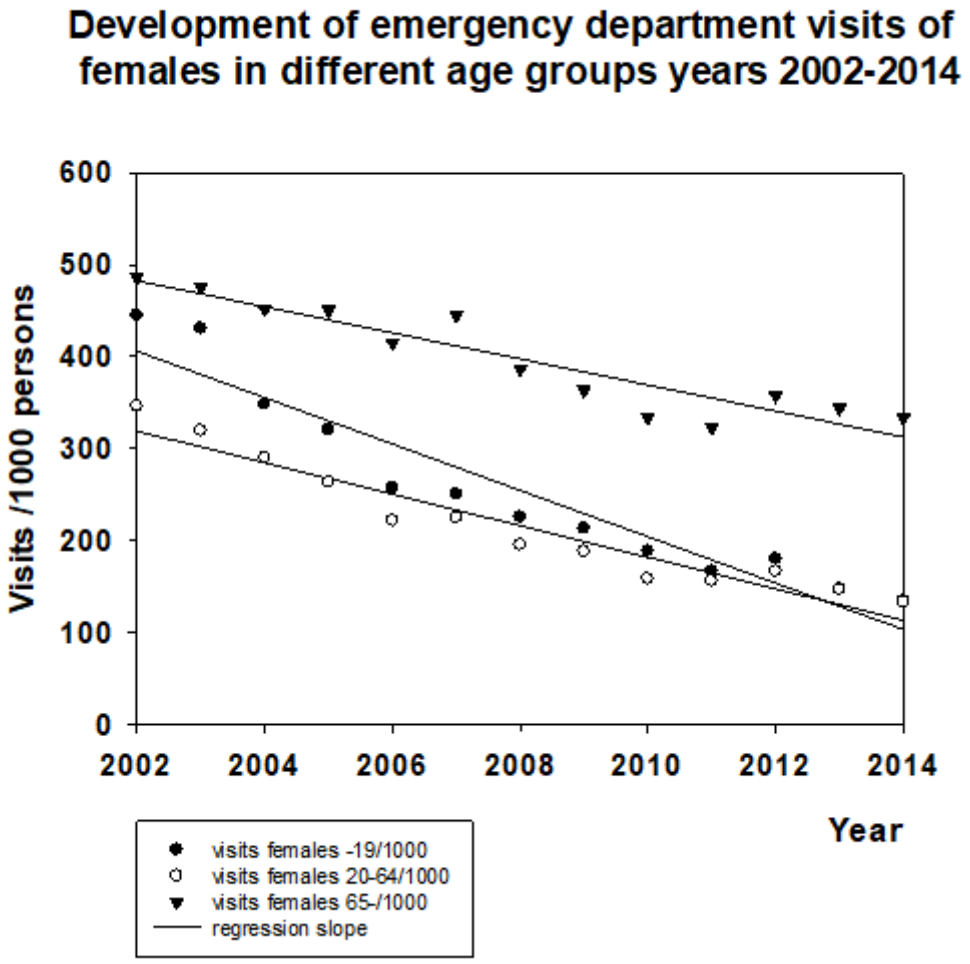

Figure 1

Development of visits of females to EDs in Vantaa 2002-2014

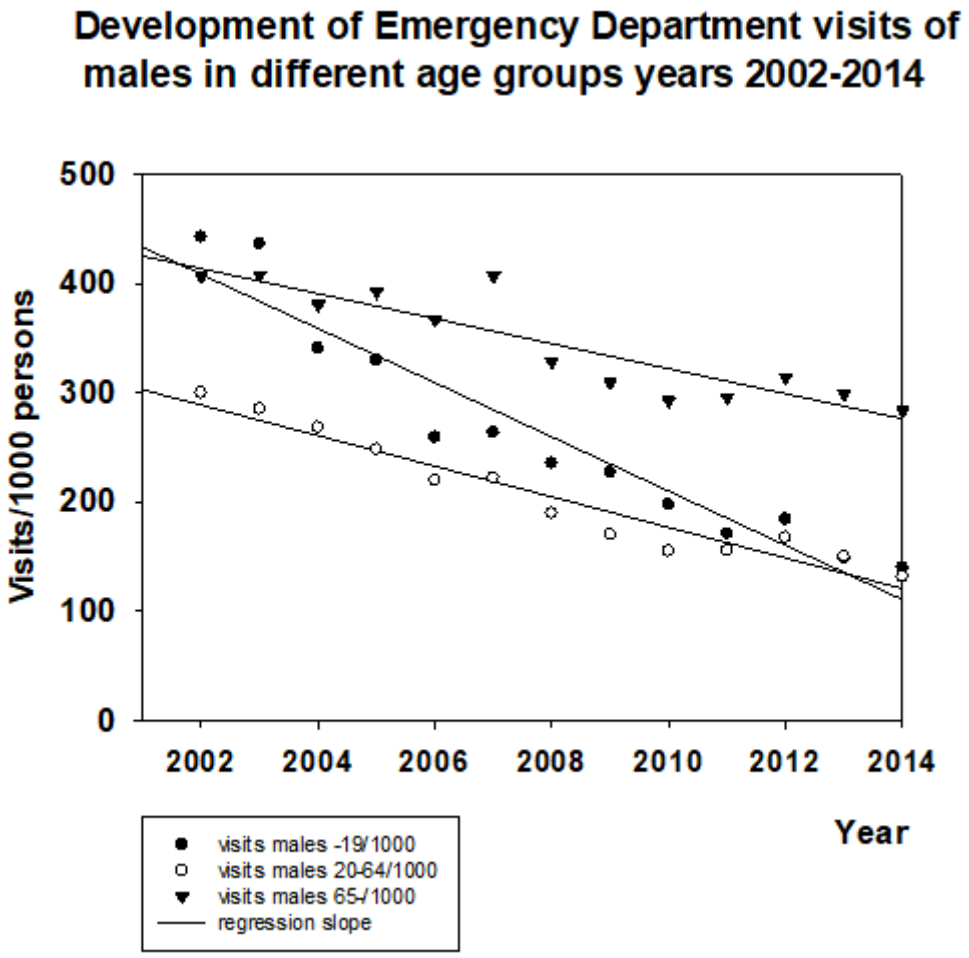

Figure 2

Development of visits of males to EDs in Vantaa 2002-2014

Supplementary Files

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- Table1.docx
- Table2.docx
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