Differences between recorded diagnoses of patients of an emergency department and office-hours primary care doctors: a register-based study in a Finnish town

Mika Lehto\textsuperscript{a,b}, Katri Mustonen\textsuperscript{b}, Marko Raina\textsuperscript{a} and Timo Kauppila\textsuperscript{b,c,d}

\textsuperscript{a}City of Vantaa, Vantaa, Finland; \textsuperscript{b}Department of General Practice, University of Helsinki, Helsinki, Finland; \textsuperscript{c}Department of Oral and Maxillofacial Diseases, Head and Neck Center, University of Helsinki, Helsinki, Finland; \textsuperscript{d}Department of General Practice, University of Tampere, Tampere, Finland

\textbf{ABSTRACT}

To determine the extent to which it is possible to provide continuity of primary care for those who visit Emergency Departments (EDs) we studied how recorded diagnoses in primary care differ, depending on whether the patient is met in an ED or a primary care office-hours practice. In the present, 12-year follow-up study a report generator of the Electronic Health Record-system provided monthly figures for the number of different recorded diagnoses using the International Classification of Diagnoses (10\textsuperscript{th} edition, ICD-10) and the total number of ED doctors and office-hour visits to General Practitioners (GPs). The 20 most common diagnoses covered 48.1\% of the visits with recorded diagnoses to the office hour GPs and 45.9\% of the visits to the doctors of the ED. Of these 20 diagnoses, 10 were common in both systems. These 10 diagnoses constituted about 30\% of the diagnoses given by ED doctors. Furthermore, five out of the six most common diagnoses were the same in the ED and office-hours practices. The doctors in EDs and office-hour GPs treat quite similar patient material. This may provide organisational ways to reorganise the work of primary care and to guarantee continuity of care for those who may benefit from it.

\textbf{Introduction}

Continuity of care has been reported to be essential for the successful treatment of older patients in primary care [1,2]. Continuity of care has been suggested to be one of the main tools with which primary care supports the welfare of its patients [3]. Continuity of care seldom occurs if treatment is strongly based on EDs [4–6].

\textbf{Background}

There are patients whose diagnoses should be treatable in primary care without emergency facilities and who benefit if their health problems are treated with continuity of care by their primary health care provider [6,7]. To optimise the functions of primary care, attention should be paid to putative qualitative differences and similarities in the contents of the work, including diagnostics, of primary care office-hours general practitioners (GPs) and doctors in primary care EDs, both of which take care of unselected patients [8,9]. Modern electronic health records (EHR) require the recording of diagnoses into the system, and this allows us to study how recorded diagnoses in primary care differ, depending on whether the patient is met in an ED or in an office-hours practice. The information obtained provides some relevant insight into the issue of how patient groups differ between EDs and office-hours primary care. Knowing the extent to which cases diagnosed in EDs are treatable in primary care may allow us to plan cooperation between these two partners and enhance the continuity of care in primary health care [6,7].

\textbf{Methods}

The present work is a retrospective longitudinal quasi-experimental study in the primary health care of the fourth largest city in Finland. This study was performed in the primary care ED-system (described in detail earlier in 8 and 9) and office-hours GP practices in Vantaa city, where in 2008 there were about 200,000 inhabitants. Finnish primary health care is mostly non-profit, and municipalities, which fund this activity with taxes, also maintain the electronic health record systems.

\textbf{CONTACT} Timo Kauppila, timo.kauppila@fimnet.fi, timo.kauppila@helsinki.fi Department of General Practice, University of Helsinki, Tukholmankatu 8 B, Helsinki 00014, Finland

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Office-hour activities are performed in municipal health centres. From 2002 to 2011 Vantaa followed a so-called “own doctor system” where every inhabitant of Vantaa had a named personal primary care GP in his/her own health centre. Between 2012 and 2014, this personal GP was provided only to those who were over 75 years old, or to patients who had a recorded diagnosis of chronic disease or had visited a primary care physician more than three times during the preceding year. The ED system had two departments. The first evaluation was usually performed by the primary care ED system and if treatment in secondary care was necessary the patients were referred to the ED of the university clinic of Helsinki University (HUS) in the Peijas or Meilahti hospitals. Thus, the low acuity patients came first to the primary care ED system of the city of Vantaa. The diagnostic equipment in the primary care ED in Vantaa was almost at the level of the adjacent secondary care ED (Peijas) which meant that the primary care physicians had abundant possibilities to make diagnoses in the EDs. Both office-hours medical officers and outsourced physicians who were all primary care physicians served as staff in the ED. As a complementary, profit-driven system there is a well-equipped but expensive private primary health care system which is not equally available to all Finnish citizens. It is funded by insurances, employers (occupational health) or patients’ own money and it takes care of a small part of the population [9].

The data of all patient visits to the physicians of Vantaa primary care ED and office-hours practices were obtained from the Graphic Finstar EHR system (GFS, Logica LTD, Helsinki, Finland). GFS provided a specific place in the EHR where the appropriate diagnosis codes of the 10th version of the International Classification of Diseases (ICD-10) could be entered during the patients’ visits to the doctors of the ED and GPs. The system assisted the doctors in finding a proper diagnosis code or allowed the doctor to use the right code for the desired diagnosis directly, as described in detail earlier [10,11].

This study was carried out directly from the patient register without identifying the patients or ED doctors. The register keepers (the 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.

The report generator of the GFS-system provided monthly figures for the number of different recorded diagnoses and the total number of ED doctor and GP visits. This made it possible to calculate percentages for the recording of diagnoses without identifying individual doctors or patients. For analysis, the ICD-10-diagnoses were collected to an accuracy of three digits. Distributions of the primary diagnoses recorded in the ED system and office-hours practices were the main outcome for analysis in the present study. The 20 most common diagnoses were analysed in detail. The proportion of the visits with recorded diagnoses in both practices was the secondary outcome.

In February 2008, an electronic reminder (ER) was installed in the GFS system. After that time, the reminders were always active till the end of the follow-up period (December 2014). The GFS-system prompted the ED doctors to enter a diagnosis every time they wanted to close a case [10,11] The follow-up period started in February 2002 and ended in December 2014. In February 2015, the primary care ED was totally outsourced to Helsinki University Hospital (HUS) due to a general restructuring of the local ED system in the HUS-area.

The obtained data were analysed by comparing the recording of the diagnoses during the follow-up period. The comparisons of the proportions of the 20 most common diagnoses in EDs against office-hours practices were performed with χ²-test. The comparisons of yearly prevalence of those 10 ICD-10-diagnoses which were most common in both the ED and office-hour practices were performed using paired t-test or Wilcoxon signed rank-test. Differences in the process of recording diagnoses were studied with Two-Way ANOVA followed by Bonferroni test. P < 0.05 was considered to indicate a statistically significant difference.

Results

In the ED, there were altogether 605,000 recorded visits and 350,134 of these visits had a recorded diagnosis. In the office-hours practices, these figures were 2,473,715 and 1,527,867, respectively. Thus, during the follow-up 61.8% of the visits to the office-hours GPs and 57.8% to the doctors of the ED were marked with an ICD-10-diagnosis.

The 20 most common diagnoses covered 48.1% of the visits with recorded diagnoses in the case of the office-hour GPs, and 45.9% in the case of the doctors in the ED (Tables 1 and 2). Of these 20 ICD-10-diagnoses, acute upper respiratory infections of multiple and unspecified sites (J06), dorsalgia (M54), acute bronchitis (J20), conjunctivitis (H10), acute sinusitis (J01) and other soft tissue disorders, not elsewhere classified (M79) were more often recorded in office-hours practices (all P < 0.001, Tables 1 and 2).

Ten of the 20 most commonly recorded diagnoses from each list were found in practices of both office-hours GPs and doctors in the ED. In the ED, 104,176
Table 1. One hundred most commonly recorded diagnoses in the ED. ICD-10 codes, numbers of cases and percentage of recorded diagnoses are presented.

| Diagnosis | ICD-10 | N  | %     | Diagnosis | ICD-10 | N  | %     |
|-----------|--------|----|-------|-----------|--------|----|-------|
| Acute upper respiratory infections of multiple and unspecified sites | J06 | 20,381 | 5.8 | Syncope and collapse | R55 | 1549 | 0.4 |
| Abdominal and pelvic pain | R10 | 16,843 | 4.8 | Pain, not elsewhere classified | R52 | 1543 | 0.4 |
| Suppurative and unspecified otitis media | H66 | 15,717 | 4.5 | Otitis externa | H60 | 1532 | 0.4 |
| Dorsalgia | M54 | 13,845 | 4.0 | Haemorrhage from respiratory passages | R04 | 1526 | 0.4 |
| Open wound of head | S01 | 9401 | 2.7 | Convulsions, not elsewhere classified | R56 | 1500 | 0.4 |
| Acute bronchitis | J20 | 9306 | 2.7 | Urticaria | L50 | 1497 | 0.4 |
| Other gastroenteritis and colitis of infectious and unspecified origin | A09 | 6917 | 2.0 | Shoulder lesions | M75 | 1462 | 0.4 |
| Mental and behavioural disorder due to use of alcohol | F10 | 6879 | 2.0 | Acute tubulo-interstitial nephritis | N10 | 1457 | 0.4 |
| Pain in throat and chest | R07 | 6520 | 1.9 | Dislocation, sprain and strain of joints and ligaments of knee | S83 | 1436 | 0.4 |
| Dislocation, sprain and strain of joints and ligaments at ankle and foot level | S93 | 6160 | 1.8 | Dislocation, sprain and strain of joints and ligaments of shoulder girdle | S43 | 1430 | 0.4 |
| Open wound of wrist and hand | S61 | 5927 | 1.7 | Viral and other specified intestinal infections | A08 | 1401 | 0.4 |
| Cystitis | N30 | 5919 | 1.7 | Cellulitis | L03 | 1398 | 0.4 |
| Acute tonsillitis | J03 | 5785 | 1.7 | Other dorsiopathies, not elsewhere classified | M53 | 1393 | 0.4 |
| Conjunctivitis | H10 | 5499 | 1.6 | Atopic dermatitis | S20 | 1371 | 0.4 |
| Acute sinusitis | J01 | 5375 | 1.5 | Other headache syndromes | G44 | 1358 | 0.4 |
| Other soft tissue disorders, not elsewhere classified | M79 | 4508 | 1.3 | Atiral fibrillation and flutter | I48 | 1260 | 0.3 |
| Intracranial injury | S06 | 4240 | 1.2 | Superficial injury of lower leg | S81 | 1206 | 0.3 |
| Malaise and fatigue | R53 | 4078 | 1.2 | Problems related to lifestyle | Z72 | 1160 | 0.3 |
| Abnormalities of breathing | R06 | 3694 | 1.1 | Other functional intestinal disorders | K59 | 1147 | 0.3 |
| Fracture of forearm | S52 | 3672 | 1.0 | Disorders of vestibular function | H81 | 1135 | 0.3 |
| Nonsuppurative otitis media | H65 | 3605 | 1.0 | Fracture of rib(s), sternum and thoracic spine | S22 | 1085 | 0.3 |
| Dizziness and giddiness | R42 | 3516 | 1.0 | Foreign body on external eye | T15 | 1066 | 0.3 |
| Urinary tract infection, site not specified | N39 | 3475 | 1.0 | Heart failure | I50 | 996 | 0.3 |
| Pneumonia, organism unspecified | J18 | 3361 | 1.0 | Angina pectoris | I20 | 992 | 0.3 |
| Headache | R51 | 3221 | 0.9 | Epilepsy | G40 | 980 | 0.3 |
| Depressive episode | F32 | 3062 | 0.9 | Schizophrenia | F20 | 939 | 0.3 |
| Fracture at wrist and hand level | S62 | 3055 | 0.9 | Open wound of ankle and foot | S91 | 936 | 0.3 |
| Maltreatment syndromes | T74 | 2888 | 0.8 | Dyspepsia | K30 | 923 | 0.3 |
| Superficial injury of wrist and hand | S60 | 2768 | 0.8 | Tachycardia, unspecified | R00 | 914 | 0.3 |
| Acute laryngitis and tracheitis | J04 | 2760 | 0.8 | Reaction to severe stress, and adjustment disorders | F43 | 913 | 0.3 |
| Erysipelas | A46 | 2669 | 0.8 | Calculus of kidney and urater | N20 | 893 | 0.3 |
| Acute pharyngitis | J02 | 2630 | 0.8 | Internal derangement of knee | M23 | 889 | 0.3 |
| Fever of other and unknown origin | R50 | 2615 | 0.7 | Superficial injury of forearm | S50 | 851 | 0.2 |
| Other anxiety disorders | F41 | 2605 | 0.7 | Phlebitis and thrombophlebitis | I80 | 843 | 0.2 |
| Dislocation of finger | S63 | 2292 | 0.7 | Open wound of forearm | S51 | 813 | 0.2 |
| Fracture of lower leg, including ankle | S82 | 2193 | 0.6 | Delirium, not induced by alcohol and other psychoactive substances | F05 | 811 | 0.2 |
| Asthma | J45 | 2024 | 0.6 | Superficial injury of abdomen, lower back and pelvis | S30 | 799 | 0.2 |
| Fracture of shoulder and upper arm | S42 | 2009 | 0.6 | Otalgia and effusion of ear | H92 | 790 | 0.2 |
| Migraine | G43 | 1919 | 0.5 | Other disorders of fluid, electrolyte and acid-base balance | E87 | 767 | 0.2 |
| Superficial injury of lower leg | S80 | 1876 | 0.5 | Oedema, not elsewhere classified | R60 | 751 | 0.2 |
| Nausea and vomiting | R11 | 1816 | 0.5 | Disturbful disease of small intestine with perforation and abscess | K57 | 742 | 0.2 |
| Adverse effects, not elsewhere classified | T78 | 1795 | 0.5 | Chronic obstructive pulmonary disease with acute lower respiratory infection | J44 | 718 | 0.2 |
| Superficial injury of ankle and foot | S90 | 1770 | 0.5 | Keratitis | H16 | 692 | 0.2 |
| Fracture of foot, except ankle | S92 | 1740 | 0.5 | Injury of Achilles tendon | S86 | 686 | 0.2 |
| Other cardiac arrhythmias | I49 | 1676 | 0.5 | Dislocation, sprain and strain of joints and ligaments at neck level | S13 | 684 | 0.2 |
| Essential (primary) hypertension | I10 | 1668 | 0.5 | Cholesterolis | K80 | 669 | 0.2 |
| Superficial injury of head | S00 | 1594 | 0.5 | Other enthesopathies | M77 | 665 | 0.2 |
| Cutaneous abscess, furuncle and carbuncle of face | L02 | 1586 | 0.5 | Haemorrhoids | I84 | 662 | 0.2 |
| Influenza with pneumonia, virus not identified | J11 | 1583 | 0.5 | Bacterial pneumonia, not elsewhere classified | J15 | 662 | 0.2 |
| Cough | R05 | 1559 | 0.4 | Superficial injury of shoulder and upper arm | S40 | 658 | 0.2 |

Table 3. One hundred most commonly recorded diagnoses in the ED. ICD-10 codes, numbers of cases and percentage of recorded diagnoses are presented.

visits resulted in one of these 10 diagnoses. This represents a proportion of 29.7% of all the visits with a recorded diagnosis, and 17.2% of all the visits to the ED in total. In the office-hours practices, 501,662 visits were recorded with one of these 10 diagnoses. This represents a proportion of 32.8% of all the visits with a recorded diagnosis, and 20.3% of all the visits to office-hours practices in total.

Among these 10 diagnoses, the absolute number of diagnosed patients in each diagnosis category was consistently higher in office-hours practices than in the ED (Table 3). Five out of the six most-commonly recorded
diagnoses were the same in both ED and office-hours practices. The main diagnoses with a higher proportion of ICD-10-diagnoses recordings in the ED than in the office-hours practices were abdominal and pelvic pain, other gastroenteritis and colitis of infectious and unspecified origin, and acute tonsillitis. The remaining diagnoses from the list of 20 most commonly recorded in the ED were pain in throat and chest (N = 11,238 or 0.73% of the recorded diagnoses in the office-hours practices), abnormalities in breathing (N = 7177, 0.47%), malaise and fatigue (N = 6030, 0.39%), cystitis (N = 5738, 0.38%), and mental and behavioural disorder due to use of alcohol (N = 2992, 0.2%). Minor trauma diagnoses, such as dislocation, sprain and strain of joints and ligaments to ankle and foot (N = 9639, 0.63%), fracture of forearm (N = 4009, 0.26%), open wound of wrist and hand (N = 3249, 0.21%) and open wound of head (N = 2465, 0.16%) were also more frequently recorded in the ED (see Tables 1 and 2 for comparison).

There were occasional years when the rate of recording diagnoses was higher in one or other of the studied practices (p < 0.001, time X practice-interaction, Two-Way ANOVA). In the years 2003, 2004, 2005 the percentage of visits with recorded diagnoses was higher in the ED than in the office-hours practices (p < 0.05). In the years 2007, 2008 and 2014 this percentage was higher in the office-hours practices than in the ED (p < 0.05). There was, however, no general difference in the rate of recording diagnoses in visits to office-hour GPs or doctors of EDs (for practice-factor, P = 0.158). The recording of diagnoses was enhanced after the years 2002–2007, e.g., after implementing ERs, in both practices studied (for time-factor, P < 0.001, Figure 1).

Discussion

The most commonly recorded diagnoses were practically the same in the ED and office-hours practices. There were some diagnoses, mostly concerning minor traumas, which were primarily recorded in the ED but not to the same extent in the office-hours practices. Certain symptomatic diagnoses (group-R in ICD-10-classification) were also more often recorded in the ED. The ERs enhanced recording of diagnoses equally well in the ED and office-hours practices.

Although data from the private sector are missing, the data of the present work are comprehensive. It is also quite extensive and therefore it compensates many putative biases of this type of study. It contains every diagnosis recorded in office-hours visits to GPs or ED doctors between 2002 and 2014. Although the data are relatively old, they are still the most relevant that can be obtained in Finland because reasons to visit an ED of GP and/or diagnoses are not often recorded in Finnish primary care. In fact, more than one-third of the encounters had no diagnosis code in the present study. This is not unusual in Finnish primary care. According to the very latest official Finnish statistics [12] less than two-thirds of visits to Finnish primary health care include the reason for the visit or the diagnosis. Furthermore, the reason for the visit is not recorded in structural manner and therefore this data is difficult to analyse. Naturally, the present data does not exclude the possibility that the given diagnosis is not adequate, as has been suggested to be the case in about 15% of the primary care doctor consultations [13]. There is always a slight possibility that internal validity of diagnoses varies when comparing those made in the ED and office-hours practices. Using International Classification for Primary Care (ICPC) might also give a slightly different distribution in diagnostics. However, Finnish doctors in primary care do not frequently use ICPC. We do not know the ultimate reason. One factor could be that training of physicians specialised in general practice (called yleislääketieteen erikoislääkäri in Finnish) takes also place in secondary and tertiary health care. ICD-10 is solely used in specialised health care. Furthermore, the Social Insurance Institution of Finland (KELA), the main financing institute of Finnish health care, uses mainly ICD-10-codes. Therefore, ICD-10 may be more used than ICPC in Finnish primary care.

The analysis was carried out at a 3-digit aggregated level of ICD-10 and this caused some loss of details in the data. Considering the accuracy of the ICD-10-code we had to make a compromise to keep the sizes of the different diagnosis-related groups adequate for statistical comparisons.

The lack of data about individual doctors and patients is also a flaw of this study. The lack of this data inhibits us from drawing conclusions about whether there were doctors who regularly recorded inappropriate diagnoses despite the ERs. Furthermore, recording diagnoses does not necessarily mean that the clinician would take any actions to treat the problem he/she observed [14]. Thus, treating some of the diagnosed cases in the other of the settings studied here may be suboptimal for some patients. The present results can with certainty be applied only to primary health care. Furthermore, patients will often self-select to office-hours primary care if they perceive a minor problem and to the ED, if major. Thus, the patient-perceived acuity and severity are not always the same although, in the end, the diagnosis itself may be. Furthermore, we do not know to which extent the
| Diagnosis                                           | ICD-10 | N  | %     | Diagnosis                                           | ICD-10 | N  | %     |
|-----------------------------------------------------|--------|----|-------|-----------------------------------------------------|--------|----|-------|
| Acute upper respiratory infections of multiple and unspecified sites | J06    | 142,039 | 9.3 | Haemorrhoids                                        | I84    | 6205 | 0.4  |
| Dorsalgia                                           | M54    | 81,174 | 5.3 | Fever of other and unknown origin                   | R50    | 6119 | 0.4  |
| Suppurative and unspecified otitis media            | H66    | 60,288 | 3.9 | Malaise and fatigue                                 | R53    | 6030 | 0.4  |
| Acute sinusitis                                     | J00    | 50,089 | 3.3 | Medical observation and evaluation for suspected diseases and conditions | Z03    | 5847 | 0.4  |
| Acute bronchitis                                    | J20    | 48,219 | 3.2 | Cystitis                                            | N30    | 5738 | 0.4  |
| Essential (primary) hypertension                    | I10    | 47,373 | 3.1 | Other functional intestinal disorders                | K59    | 5572 | 0.4  |
| Abdominal and pelvic pain                           | R10    | 34,660 | 2.3 | Localised swelling, mass and lump of skin and subcutaneous tissue | R22    | 5489 | 0.4  |
| Non-insulin-dependent diabetes mellitus              | E11    | 32,740 | 2.1 | Other cardiac arrhythmias                           | J49    | 5217 | 0.3  |
| Conjunctivitis                                      | H10    | 32,406 | 2.1 | Seborrhoeic keratosis                               | L82    | 5209 | 0.3  |
| Depressive episode                                  | F32    | 27,040 | 1.8 | Dyspepsia                                           | K30    | 5079 | 0.3  |
| Other soft tissue disorders, not elsewhere classified| M79    | 25,877 | 1.7 | Examination and observation for unspecified reason  | Z04    | 4926 | 0.3  |
| Gonorrhoea [arthritis of knee]                      | M17    | 23,721 | 1.6 | Synovitis and tenosynovitis                         | M65    | 4820 | 0.3  |
| Shoulder lesions                                    | M75    | 22,843 | 1.5 | Erysipelas                                          | A46    | 4811 | 0.3  |
| Asthma                                              | J45    | 20,524 | 1.3 | Pneumonia, organum unspecified                      | J18    | 4768 | 0.3  |
| Cough                                               | R05    | 16,979 | 1.1 | Dermatophytosis                                     | B35    | 4724 | 0.3  |
| Other dorsopathies, not elsewhere classified        | M53    | 15,269 | 1.0 | Other disorders of urinary system                   | N39    | 4624 | 0.3  |
| Other gastroenteritis and colitis of infectious and unspecified origin | A09    | 13,994 | 0.9 | Gastro-oesophageal reflux disease                   | K21    | 4414 | 0.3  |
| Other anxiety disorders                             | F41    | 13,847 | 0.9 | Fibroblastic disorders                              | M72    | 4391 | 0.3  |
| Otitis externa                                       | H60    | 13,090 | 0.9 | Dislocation, sprain and strain of joints and ligaments at wrist and hand level | S63    | 4331 | 0.3  |
| Acute tonsillitis                                    | J03    | 12,916 | 0.8 | Fracture at wrist and hand level                    | S62    | 4255 | 0.3  |
| Examination and encounter for administrative purpo  | Z02    | 12,105 | 0.8 | Hordeolum and chalazion                             | H00    | 4196 | 0.3  |
| Other enthesopathies                                 | M77    | 11,953 | 0.8 | Other hypothyroidism                               | E03    | 4088 | 0.3  |
| Pain in throat and chest                             | R07    | 11,238 | 0.7 | Other chronic obstructive pulmonary disease         | J44    | 4082 | 0.3  |
| Acute pharyngitis, unspecified                       | J02    | 9672  | 0.6 | Other inflammation of vagina and vulva              | N76    | 4021 | 0.3  |
| Dislocation, sprain and strain of joints and ligaments at ankle and foot level | S93    | 9639 | 0.6 | Fracture of forearm                                 | S52    | 4009 | 0.3  |
| Other joint disorders, not elsewhere classified     | M25    | 9528  | 0.6 | Hyperplasia of prostate                            | N40    | 4003 | 0.3  |
| Atopic dermatitis                                    | L20    | 9392  | 0.6 | Coxarthrosis [arthritis of hip]                     | M16    | 3870 | 0.3  |
| Soft tissue disorders related to use, overuse and pressure | M70    | 9350  | 0.6 | Oedema, not elsewhere classified                    | R60    | 3714 | 0.2  |
| Nonsuppurative otitis media                          | H65    | 9161  | 0.6 | Gout                                                | M10    | 3699 | 0.2  |
| Nonorganic sleep disorders                           | F51    | 8919  | 0.6 | Dislocation, sprain and strain of joints and ligaments of knee | S83    | 3641 | 0.2  |
| Cellulitis                                           | L03    | 8775  | 0.6 | Impetigo                                            | L01    | 3596 | 0.2  |
| Vasomotor and allergic rhinitis                      | J30    | 8648  | 0.6 | Superficial injury of wrist and hand                | S60    | 3541 | 0.2  |
| Headache                                            | R51    | 8507  | 0.6 | Diseases of capillaries                             | I78    | 3539 | 0.2  |
| Atrial fibrillation and flutter                      | J48    | 8072  | 0.5 | Acne                                                | L70    | 3504 | 0.2  |
| Other headache syndromes                            | G44    | 8063  | 0.5 | Adverse effects, not elsewhere classified           | T78    | 3371 | 0.2  |
| Acute laryngitis and tracheitis                      | J04    | 8046  | 0.5 | Superficial injury of lower leg                     | S80    | 3347 | 0.2  |
| Disorders of lipoprotein metabolism and other lipidaias | E78    | 7726  | 0.5 | Enthesopathies of lower limb, excluding foot        | M76    | 3337 | 0.2  |
| Other dermatitis                                    | L30    | 7636  | 0.5 | Open wound of wrist and hand                        | S61    | 3249 | 0.2  |
| Internal derangement of knee                        | M23    | 7575  | 0.5 | Recurrent depressive disorder                       | F33    | 3236 | 0.2  |
| Influenza with pneumonia, virus not identified      | J11    | 7513  | 0.5 | Superficial injury of ankle and foot                | S90    | 3182 | 0.2  |
| General examination and investigation of persons without complaint and reported diagnosis | Z00    | 7208  | 0.5 | Disorders of vestibular function                    | H81    | 3125 | 0.2  |
| Reaction to severe stress, and adjustment disorders | F43    | 7193  | 0.5 | Urticaria                                           | L50    | 3114 | 0.2  |
| Dyspnoea                                            | R06    | 7177  | 0.5 | Seropositive rheumatoid arthritis                   | M05    | 3086 | 0.2  |
| Cutaneous abscess, furuncle and carbuncle of face   | L02    | 7161  | 0.5 | Mononeuropathies of upper limb                     | G56    | 3052 | 0.2  |
| Dizziness and giddiness                             | R42    | 7130  | 0.5 | Psoriasis                                           | L40    | 3046 | 0.2  |
| Pain, not elsewhere classified                      | R52    | 6969  | 0.5 | Nail disorders                                      | L60    | 3020 | 0.2  |
| Other special examinations and investigations of persons without complaint or reported diagnosis | Z01    | 6635  | 0.4 | Otalgia and effusion of ear                        | H92    | 3020 | 0.2  |
| Migraine                                            | G43    | 6360  | 0.4 | Angina pectoris                                     | I20    | 3014 | 0.2  |
| Insulin-dependent diabetes mellitus                 | E10    | 6304  | 0.4 | Mental and behavioural disorders due to use of alcohol | F10    | 2992 | 0.2  |
| Chronic ischaemic heart disease                     | I25    | 6270  | 0.4 | Melanocytic naevi                                   | D22    | 2984 | 0.2  |

Patients are the same in the EDs and office-hours practices.

R-codes in the ICD-10 system were recorded more often in the ED than in the office-hours practices. The physicians of the ED have greater time pressure in several aspects than those in the office-hours practices. It is possible that the reason for excessive use of R-codes in the ED could be that the physicians tried to find those ED persons who were severely ill and required more specific diagnoses for acute treatment. If they found out
Table 3. Comparisons of yearly prevalence of the 10 most often recorded diagnoses common to both ED and office-hours practices. Mean±Standard Deviation or Median (25%–75% Interquartile Range) are shown. ** stands for p < 0.01 or *** for p < 0.001 in paired t-test or Wilcoxon signed rank-test (if the median is shown as an estimate).

| ICD-Code | Diagnosis                                         | Office-Hour GPs | ED doctors |
|----------|--------------------------------------------------|----------------|------------|
| J06      | Acute upper respiratory infections of multiple and unspecified sites | 10.926 ± 2073.9.86 ± 1.95 5.78 ± 1.28 | 1568 ± 652*** 6.04 ± 2.59*** 3.29 ± 0.74*** |
| M54      | Dorsalgia                                        | 6244 ± 14225.64(4.84–6.33) 3.31 ± 0.87 | 1065 ± 221*** 4.24(3.47–4.70)*** 2.36 ± 0.56*** |
| H66      | Suppurative and unspecified otitis media         | 4638 ± 9799.41 ± 0.77 2.46 ± 0.59 | 1209 ± 382*** 4.71 ± 1.72 2.57 ± 0.37 |
| J01      | Acute sinusitis                                  | 3853 ± 4773.62 ± 1.12 2.03 ± 0.29 | 723 ± 224*** 1.63 ± 1.18*** 0.81 ± 0.42*** |
| J20      | Acute bronchitis                                 | 3709 ± 7323 ± 1.46 ± 1.04 1.96 ± 0.42 | 716 ± 376*** 2.79 ± 1.49*** 1.47 ± 0.45*** |
| R10      | Abdominal and pelvic pain                        | 2666 ± 12682.17 ± 0.31 1.43 ± 0.72 | 1296 ± 566*** 4.66 ± 1.27*** 3.13 ± 1.89*** |
| H10      | Conjunctivitis                                   | 2493 ± 6462.21 ± 0.38 1.32 ± 0.38 | 423 ± 145*** 1.68 ± 0.72*** 0.90 ± 0.24*** |
| M79      | Other soft tissue disorders, not elsewhere classified | 1991 ± 12721± 1.55 ± 0.52 1.07 ± 0.71 | 347 ± 241*** 1.20 ± 0.66*** 0.87 ± 0.72*** |
| A09      | Other gastroenteritis and colitis of infectious and unspecified origin | 1076 ± 1481.10 ± 0.33 0.57 ± 0.08 | 532 ± 121*** 2.02 ± 0.43*** 1.18 ± 0.28*** |
| J03      | Acute tonsillitis                                 | 950(839–1169)0.92 ± 0.29 0.52 ± 0.11 | 351(265–593)*** 1.78 ± 1.10*** 0.89 ± 0.31** |

Figure 1. Yearly proportions of visits with recorded diagnosis in the ED and in office-hours practices 2002–2014. Mean and 95% Confidence Intervals (brackets) are shown.

that the patient's case did not require emergency actions they did not necessarily perform very specific diagnostics but aimed to guide the patient to the office-hours physicians. Thus, they left more refined diagnostics to office-hours colleagues who had more time and who were responsible for continuing with the treatment in any case if the problem was not totally solved in the ED.

According to Finnish guidelines for GPs [15], almost all of the 10 most commonly recorded diagnoses in the ED and office-hours practices, except severe cases of abdominal and pelvic pain, might have been treatable solely in the office-hours practices. As continuity of care is seldom applied in EDs when compared with office-hours primary care [4–6], organising distribution of work differently between these two health care providers might enhance this continuity [4,16]. It is not only the continuity of care by certain individual care providers which matters but also provider-adjusted regularity of the contacts [17]. To support this view, a large global study (34 countries during the years 2011 to 2013) found that adequate access to primary care decreased ED visits [18]. Similarly, better access to primary care decreased the use of EDs by older adults in a large US study [19]. Functionally adequate primary care may also improve the efficacy of ED functions as strong and advanced Dutch primary care prevented long ED stays in that country, in comparison with other western countries [20]. Thus, better communication and planning between EDs and primary care might improve both continuity and quality of care [21,22]. This means better communication in the redirecting of patients and division of labour and in transferring of individual patient data.

Disregarding the putative organisational improvements in enhancement of functions of office-hours primary care, there will always be some persons who do not appreciate the possibility for continuity of care provided by primary health care. There are reports suggesting that the preference shown by patients for using EDs is not necessarily always caused by lack of primary care nor by the time of day that the complaint began [23]. It may thus be that EDs may also have “customers of their own” and that those patients are not likely to use ordinary daytime primary health care services for various miscellaneous reasons [8,24]. These reasons may be, for example, social [25] or related to the location of the ED [26,27]. Simple convenience factors may also increase the use of EDs [27].

According to the present study, the majority of patients visiting the doctors of EDs and office-hours GPs consists of quite similar patient material. The present data based on recorded diagnoses suggest that maximally about 30% of the visits treated in the ED could be left
to the office-hours GPs where continuity of care could be better guaranteed [4–6]. Thus, part of ED treatments could be performed by PCPs as well, but this should be validated in prospective studies in the future.

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Data availability statement
The data is available from the corresponding author with a reasonable request.

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No potential conflict of interest was reported by the author(s).

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