Quality of Coding Diagnoses in Emergency Departments: Effects on Mapping the Public's Health

Limor Aharonson-Daniel PhD[1,2], Dagan Schwartz MD[1,2], Tzipi Hornik-Lurie MA[2] and Pinchas Halpern MD[3]

[1]Department of Emergency Medicine, Recanati School for Community Health Professions, Faculty of Health Sciences, Ben-Gurion University of the Negev, Beer Sheva, Israel
[2]PREPARED Center for Emergency Response Research, Ben-Gurion University of the Negev, Beer Sheva, Israel
[3]Department of Emergency Medicine, Tel Aviv Sourasky Medical Center, affiliated with Sackler Faculty of Medicine, Tel Aviv University, Ramat Aviv, Israel

ABSTRACT: **Background:** Emergency department (ED) attendees reflect the health of the population served by that hospital and the availability of health care services in the community.

Objectives: To examine the quality and accuracy of diagnoses recorded in the ED to appraise its potential utility as a guage of the population's medical needs.

Methods: Using the Delphi process, a preliminary list of health indicators generated by an expert focus group was converted to a query to the Ministry of Health's database. In parallel, medical charts were reviewed in four hospitals to compare the handwritten diagnosis in the medical record with that recorded on the standard diagnosis "pick list" coding sheet. Quantity and quality of coding were assessed using explicit criteria.

Results: During 2010 a total of 17,761 charts were reviewed; diagnoses were not coded in 42%. The accuracy of existing coding was excellent (mismatch 1%–5%). Database query (2,670,300 visits to 28 hospitals in 2009) demonstrated potential benefits of these data as indicators of regional health needs.

Conclusions: The findings suggest that an increase in the provision of community care may reduce ED attendance. Information on ED visits can be used to support health care planning. A "pick list" form with common diagnoses can facilitate quality recording of diagnoses in a busy ED, profiling the population's health needs in order to optimize care. Better compliance with the directive to code diagnosis is desired.

IMAJ 2014; 16: 11–16

KEY WORDS: emergency department (ED), coding and classification, health needs

For Editorial see page 52

The population visiting the emergency department reflects its health and the availability of health services in the community. The knowledge accumulated in the ED regarding the health needs of the patients who attend it is of value as a guideline for providing health care appropriate to the population's needs. Monitoring the patterns of injury and illness can provide the data needed to plan prevention and intervention programs and decrease gaps in accessibility or availability of services. Despite this potential contribution of the ED to community health and the growing availability of electronic medical records, routine recording of clinical diagnosis in the ED is not universally accepted, mainly because of the characteristically brief doctor-patient encounter and the hectic nature of work in the ED [1].

Since 1992, the National Hospital Ambulatory Medical Care Survey (NHAMCS) has been gathering, analyzing and disseminating information about hospital emergency departments based on information collected in a sample of hospitals [2]. In 1997 the U.S. Centers for Disease Control recommended the documentation of clinical diagnoses as an important step to ensure optimal care in the ED [3]. These data have been used widely for administrative purposes (e.g., designing financial data systems) [4], as well as for a national standard for health care estimates in the "Healthy People 2010" initiative (e.g., baseline estimates for asthma and non-fatal dog bite injuries) [5].

The growing amounts of data that are made available by ubiquitous computerized systems provide unprecedented opportunities to apply clinical data to map community health needs. Interestingly, a recent report claimed that the use of electronic medical records in the ED is not suited to the ED environment for several reasons; among them, that increased documentation results in a larger proportion of incomplete charts, and that doctors' work has become largely stationary in the charting room, which contributes to reducing doctors' time with patients and their interaction with nurses [6].

All hospitals in Israel have computerized admission-triage-discharge systems capable of accepting diagnostic codes. ED diagnoses can be used as an indicator of the health of a community, providing the basis for evidence-based resource allocation and better matching between medical facilities and the specific population's health needs.

ED = emergency department

Table 1. Criteria for scoring the match between handwritten diagnosis in the medical record and "pick list" coding sheet diagnosis

Match	Score	Description
Missing	0	No coding
Mismatch	1	Complete mismatch between coding and diagnosis in medical file
Partial match	2	Coded as "other" in a general category, despite an available more accurate code in the sheet
	3	Coded as "other" in a general category, when there is no suitable code in the sheet
	4	Coded as "other" in suitable category, when there is a specific appropriate code in the sheet
	5	Coded sign or symptom that comprise part of the diagnosis but not the accurate diagnosis
	6	Coded as "other" in suitable category, when there is no specific appropriate code in the sheet
Full match	7	Full match between the diagnosis in the medical chart and the coding in the sheet

Table 2. Expert panel suggestions for applications using ED diagnosis data

Target application	Required data analysis	Example of foreseen use
To support optimal utilization of ED resources in a regional/national perspective	Frequency/ratio and patterns of arrival of patients with a diagnosis from a list of predefined diagnoses/procedures	Plan number of beds. Optimize spread of diagnostic and curative resources between EDs regionally/nationally (ICU beds, procedure rooms, capacity of radiological diagnostic facilities)
Optimal utilization of ED resources in a local/hospital perspective	Frequency/ratio and patterns of arrival of patients with a diagnosis from a list of predefined diagnoses/procedures	Match manpower skills for handling the excess of orthopedic injuries on Saturdays (i.e., the 1 day weekend in Israel)
Quality control: training staff towards correct and accurate coding and classification	Frequency distribution of codes Focus on excess or scarce diagnoses	Lack of use of certain diagnoses or an unexplained low frequency may indicate true illness characteristics or superficial under-diagnosis
Management of care of communicative illness. Match manpower skills to specific preparedness needs Make structural changes (e.g., isolation rooms) per need	Continuous epidemiological analysis of patients arriving with communicative disease in order to facilitate prediction	Excess incidence of communicable disease (influenza, tuberculosis, meningitis, anthrax, etc.)
Reduction of injury	Epidemiologic analysis of traumatic injuries	Trends may be identified by geographic regions, detailing typical injuries per region, such as insect bites, snake attack, drowning, poisoning, road accidents, violence
Identify population at risk of abuse	Analysis of recurrent visitors' address and diagnoses	Recurrent visits to different EDs by elderly or children with traumatic injuries may indicate an unsafe or abusive environment. An unreasonable grouping of patients from a single institution or employer may suggest benefit of intervention for the reduction of injury or illness
Syndromic surveillance	Real-time update of primary physician on patient complaint (and diagnosis)	Epidemics of flu as well as biological or radiological causes of deteriorated state of health

The ultimate goal of this study was to improve the provision of community health care through better understanding of public health needs as portrayed by diagnoses of patients in the ED. In order to achieve this goal, this study set out to:

- examine the quality, accuracy and relevance of data recorded in four EDs in order to assess their potential utility as an indicator of the populations' medical needs
- demonstrate the utility of the "pick list" diagnosis recording form for collecting clinical data by physicians in the busy ED environment.

METHODS

Data for visits during 2010 were analyzed in the EDs of four Israeli hospitals throughout the country. Three were adult general hospitals and the fourth was a children's hospital. A chart review was conducted retrospectively during 2011 to facilitate seasonal variation and a more complete review of hospitalized patients whose charts are often stalled in the departments before arriving at the archive. Comparisons between the medical chart and the "pick list" coding sheet were conducted using predefined explicit criteria [Table 1] by a physician who had undergone specific training. Training included practice on simulated charts and double-coding by different coders. During the study period a random sample of records was checked by the authors to ensure standard completion. The results were satisfactory. The institutional review boards in all participating hospitals approved the study protocol.

A panel of experts (senior physicians from the Ministry of Health, public and private hospitals, and the military) was assigned to identify and select topics that could serve as health indicators [Table 2]. Experts ranked the relevance and significance of each of the peer-suggested queries using a modified Delphi process [7]. The Ministry of Health information branch was contacted to supply data on ED attendees at all 28 hospitals in Israel during 2009 (the most recent year for which data were available) with regard to the specific queries.

OUTCOME MEASURES

The Delphi process for experts resulted in a structured standard query to the Ministry of Health. The comparison of handwritten ED diagnoses in the patients' charts with the diagnoses recorded on the ED "pick list" enabled us to estimate the current reliability of statistics based on these data.

PRIMARY DATA ANALYSIS

The collected data were entered into a standardized abstraction instrument built on Microsoft Excel. Missing data were noted. The data from the four participating hospitals were analyzed using SPSS18 software and included frequency tables, cross-tabulations, *t*-tests, chi-square tests, analyses of variance (ANOVA), and post hoc tests.

Table 3. Example of various indicators by ED diagnosis based on Health Ministry query results

		% of attending population in each group (row)							
		Day of week		Referral		Hospitalization rate		Age (yr)	
Diagnosis in ED	Number	Saturday	Sunday	Medical	Self	From medical referral	From self-arrival	0–1	Over 75
Orthopedic	96,264	13	17	58	38	14	8	0.3	10
AMI	20,897	9	19	74	23	98	97	0	29
Asthma, PE, COPD	5945	13	17	66	30	65	51	3	21
Hypoglycemia	3902	12	15	75	21	77	68	0.4	38
Fainting/LOC	31,013	10	17	70	26	50	42	0.2	26
Pneumonia	40,861	13	17	73	20	65	60	6.3	28
UTI	2590	13	17	75	19	69	62	23	1
Cellulitis	17,553	11	18	72	23	50	45	1	19
Arhythmia	143,255	9	19	71	26	59	50	0	21
Intentional injury	1978	15	17	35	52	7	11	0	1

All data in the table are % of the number column

AMI = acute myocardial infarction, PE = pulmonary embolism, COPD = chronic obstructive pulmonary disease, LOC = loss of consciousness, UTI = urinary tract infection

RESULTS

Ten experts comprised the panel: one was from the military medicine branch of the Israel Defense Forces, two from the Ministry of Health, and the other seven were senior physicians, ED chairpersons and hospital directors. The Ministry of Health information branch analyzed the data from 2,670,300 visits to 28 public hospitals during 2009. A total of 17,761 charts from the four study hospitals were sampled to compare handwritten and "pick list" coded diagnoses. The three adult general hospital EDs provided 4513, 3000 and 6240 records, and the pediatric ED provided 4003 records. The quality of coding was assessed in 9992 (73%) of the 13,753 general adult hospital records due to technical difficulties in record retrieval. Data retrieval in the ED of the pediatric hospital was complete.

MAIN FINDINGS

Essential elements as defined by the expert panel served as a basis for decision making among health policy makers. Table 3 demonstrates that systematic documentation facilitates drawing conclusions relevant to health care management. As can be seen, with the exception of patients diagnosed with acute myocardial infarction and traumatic injuries, the proportion of hospitalizations among the self-referred admissions to the ED was lower than that of patients who were referred from primary care providers in the community.

The use of technologies such as computed tomography in the ED or the intensive care unit also showed patterns that may have administrative implications in terms of resources and patient management. Approximately 90,000 CT scans were documented during the study period. An analysis of the distribution of patients using ICU and ventilation resources by age group and gender showed that the demand increased with age, and there was a male predominance in all age groups.

The Ministry of Health provided data on 1,547,579 visits that had a recorded International Classification of Diseases diagnosis (58% of all visits in 2009). Recording a diagnosis was less frequent among visitors aged 15–44 years compared to young and elderly visitors. Fourteen percent of the codes recorded on the ED coding sheet were 999.9 ("other"), thus informative data were available for only 38% of all coded visits. Furthermore, exploring the data raised some concern about coding accuracy. For example, 90% of the patients coded with a urinary tract infection were females. In fact, there was a female predominance in all age groups below the age of 55 years. This changed with age, and only 2% of patients older than 65 years diagnosed as having a UTI were females compared to 6% males. Another suspicious result was noted in patients coded as having an AMI. Instead of an expected 100% hospitalization for an AMI code, 6% of the males and 32% of the females who were given an AMI code were discharged from the ED.

The medical chart review that was used to compare the handwritten ED diagnosis with the coded one revealed a very large variation between hospitals with regard to the rate of completion of forms. The variability between hospitals ranged from 2% to 63% for patients who were discharged and 4%–93% for patients who were hospitalized. In coded records,

ICU = intensive care unit
UTI = urinary tract infection
AMI = acute myocardial infarction

a complete mismatch between coded and handwritten diagnoses occurred at a rate of only 3%, 4%, 4.8% and 0.9% in the studied hospitals. There was significantly close matching in the coding of patients hospitalized compared with those who were discharged (68% vs. 60%, chi-square $P = 0.0001$).

One of the participating hospitals carried out coding for hospitalized patients at discharge rather than at admission. Although 93% of the hospitalized patients did not have a handwritten diagnosis in their ED files, the hospital database contained their ED diagnoses, indicating that the inpatient discharge diagnosis had been copied at a later stage. No differences were found in the quality of coding between shifts or between genders; however, there were significant differences between the days of the week and between specialties [Table 4].

DISCUSSION

Standardized classifications of fatal disease were documented as early as 1839 [8] and expanded to cover non-fatal conditions in 1948. The Ninth Revision of the International Coding and Classification of Disease (ICD-9) adopted in 1975 is still used in many countries [9], including Israel, for coding morbidity and hospital discharge diagnoses. The recording of a diagnosis is a basic component of medical documentation that enables the delineation of patients' profiles to assist caregivers, health authorities and decision makers in planning and providing optimal medical care. A comprehensive overview of collective diagnoses can be used to evaluate the effectiveness of preventive measures as well as provide a basis for monitoring health and disease in a given society. The aim of this study was to determine how ED data can be used for establishing health policies.

The ED is the default entry point to health care for many patients. In Israel, 2,670,300 patient visits were recorded in 28 EDs in general hospitals during 2009 [10]. With the aging of the population, health care of the elderly is becoming increasingly important. Elderly patients attending an ED for a variety of medical complaints need special attention due to issues unique to this population, such as comorbidities and social and demographic factors [11].

Admission registration to all hospital EDs in the country has been computerized for many years and includes administrative admission-cause coding from a Health Ministry-mandated list as well as a handwritten text in the medical chart. The administrative admission-cause code is not associated with common classifications and serves mainly to determine the reimbursing party (i.e., work-related, traffic-related, and general illness have different insurer coverage). A variety of computer systems are used within hospitals, but the Health Ministry's information branch maintains a national database capable of processing information from all the hospitals nationwide [10].

Inpatient diagnoses are usually coded from handwritten notes in the medical charts after the patient's discharge by trained medical recording clerks. In Israel, however, physicians handle the coding process as a cost-saving measure since ED visits are reimbursed on a fixed-fee basis (unlike the U.S. where it is billed separately).

Often, the "presenting problem" or "chief complaint" is considered the equivalent of the diagnosis for coding purposes as a means to expedite the process in the often hectic ED environment. Although the accuracy of that shortcut has been questioned, several studies have shown that "chief complaints" in the ED can provide timely indicators for disease outbreaks [12-14].

It is nevertheless important to note that the "chief complaint" can also be quite different from the diagnosis. The broad use of the ICD-9-Clinical Modification is hampered by the fact that there are over 24,000 ICD-9-CM codes. Previous attempts to reduce the volume of codes to a more manageable number resulted in the development of standardized groupings (clusters) of ICD-9-CM codes by other disciplines, among them traumatic injury [15], family medicine,

Table 4. Comparison between handwritten diagnosis in medical chart and diagnosis coded in the ED coding sheet

	No coding on form	Complete mismatch between coding on form and medical record	Partial match between coding on form and medical record	Complete match between coding on form and medical record	N
By specialty					
Trauma	6.3%	5.4%	11.4%	76.9%	1370
Orthopedic	10.5%	7.3%	7.3%	75.0%	344
Psychiatry	5.0%	6.6%	23.1%	65.3%	121
Ophthalmology	2.7%	6.1%	22.0%	69.2%	328
Dermatology	5.5%	10.5%	23.2%	60.8%	181
Ear, nose and throat	3.5%	5.4%	22.8%	68.3%	202
Respiratory	7.0%	3.0%	8.4%	81.5%	525
Cardiology	8.5%	4.0%	8.4%	79.1%	694
General Surgery	13.6%	7.2%	28.1%	51.1%	221
Neurology	10.3%	11.0%	12.1%	66.7%	273
Gastrointestinal	13.1%	4.0%	17.1%	65.7%	648
Urogenital	12.1%	2.4%	14.0%	71.6%	464
General	12.5%	2.0%	63.8%	21.7%	2672
By weekday					
Sunday	21.9%	2.6%	30.8%	44.7%	1305
Monday	13.9%	6.3%	20.4%	59.5%	1615
Tuesday	25.9%	3.7%	26.6%	43.8%	1745
Wednesday	22.6%	4.0%	19.6%	53.8%	1843
Thursday	22.9%	2.8%	32.5%	41.8%	1461
Friday	16.3%	4.8%	18.5%	60.5%	1002
Saturday	16.7%	3.3%	36.3%	43.6%	1021
Total n	2046	396	2588	4962	9992
Total %	20.5%	4.0%	25.9%	49.7%	100.0%

Quality is ranked based on explicit criteria categories depicted in Table 1

CM = clinical modification

internal medicine, and inpatient care (Agency for Healthcare Research and Quality, AHRQ), and vital statistics (National Center for Health Statistics, NCHS). A study on 7543 visits with 19,530 diagnoses that explored the coverage of the ICD-9-CM codes in the ED concluded that the AHRQ system provided the best coverage of ED ICD-9-CM codes, but that most of the clusters were small and not significantly different from the raw data [16].

At the international level, some EDs are in the process of developing individual data collection systems, but, without coordination, they are likely to establish different data sets and conflicting data definitions [6]. The resulting variations in the way that ED data are defined and recorded will limit their future utility [17]. It is highly desirable that the data collected in ED recording systems be used to encourage compatibility and globalization. The system described in this paper aims to provide a unified coding scheme that is a modification of and compatible with ICD-9-CM. Our experience demonstrated that the availability of this type of information enables delineation of the morbidity of patients visiting the ED and can assist in optimizing the planning and utilization of services. The collected data were used to: a) compare between various medical centers in different geographical areas, b) identify patterns of hospital admissions based on clinical diagnoses, and c) measure and enhance service utilization. One of the advantages of this approach is its applicability in places where computer-based clinical management is not yet the practice. Nevertheless, this study had two limitations. First, we received tabulated rather than raw data from the Health Ministry that precluded carrying out in-depth analyses of these data. Second, the sampling of hospitalized patients in one of the hospitals had an excess of non-hospitalized patients, requiring adjustments to the data.

The use of data for routine surveillance is a common epidemiological approach. Surveillance enables both the identification of areas that need intervention to reduce the burden of disease, and the detection of gaps in the availability of certain health services in designated communities. Furthermore, identification of these gaps and filling them at the community level can lead to a much desired reduction of unnecessary ED visits and ease the overload [18-20]. ED data can be used for public health surveillance of various conditions, such as infectious diseases, asthma, pneumonia, ischemic heart disease, and other acute medical problems [14]. An ED Sentinel Syndromic Surveillance System (EDSSS) had been constructed to support the public health surveillance requirements of the 2012 London Olympic Games and it did so with considerable success [21].

The coding tool we describe here fits into one double-sided A4 sheet of paper [Appendix A]. Unlike most information systems that are motivated by managerial and economic interests, the current instrument was initiated and supported by ED physicians. It is a tool that emerged from hands-on practice by actual users. Data on coding rates have been published by the Health Information department of the Ministry of Health [10], but the quality of these coded data has never been examined.

Our results demonstrated a gap between male and female hospitalization rates for the same cause (e.g., 94% vs. 68%, respectively, for chest complaints), suggesting a possible bias. This finding is similar to a recent report from Sweden where female gender was associated with a long delay until admission to a hospital ward, administration of aspirin, and coronary angiography in patients hospitalized for chest pain [22].

The availability of health services in the community offers better continuity of care [23,24] at a lower cost [18]. In Canada, increasing availability has been shown to reduce the modal number of visits from 26.5 to 6.5 [25]. Accurate recording of ED diagnoses can be expected to facilitate better understanding of the regional health needs.

In summary, the gaps in quality and frequency of coding that were found between hospitals and between regions revealed the need to standardize coding practices nationwide. Our results showed that such data hold potential benefit for public health and that the frequency and not the quality of coding was a barrier to routine use of those data for health policy setting and planning. Countries in which electronic medical records and computerized clinical decision support systems are not yet implemented will find much value in this tool.

Acknowledgments

This study was supported by the Israel National Institute for Health Policy Research.

Corresponding author:
Dr. L. Aharonson-Daniel
Head, Dept. of Emergency Medicine, Recanati School for Community Health Professions, Faculty of Health Sciences, Ben-Gurion University of the Negev, P.O Box 653, Beer Sheva 84105, Israel
Phone: (972-8) 647-2137
email: limorad@bgu.ac.il

References

1. Ben-Assuli O, Leshno M, Shabtai I. Using electronic medical record systems for admission decisions in emergency departments: examining the crowdedness effect. *J Med Syst* 2012; 36 (6): 3795-803.
2. Niska R, Bhuiya F, Xu J. National Hospital Ambulatory Medical Care Survey: 2007 Emergency Department Summary. National Health Statistics Reports; no 26. Hyattsville, MD: National Center for Health Statistics, 2010.
3. Pollock DA, Adams DL, Bernardo LM, et al. Data elements for emergency department systems, release 1.0 (x): a summary report. DEEDS Writing Committee. *Ann Emerg Med* 1998; 31: 264-73.
4. Weiss HB, Dill SM, Forjuoh SN, Garrison H, Coben JH. Injury surveillance: a statewide survey of emergency department data collection practices. *Ann Emerg Med* 1996; 28: 635-40.
5. U.S. Department of Health and Human Services. Healthy People 2010. 2nd edn. Understanding and Improving Health and Objectives for Improving Health. 2 vols. Washington, DC: U.S. Government Printing Office, 2000.
6. Park SY, Lee SY, Chen Y. The effects of EMR deployment on doctors' work practices: a qualitative study in the emergency department of a teaching hospital. *Int J Med Inform* 2012; 81: 204-17.
7. Okoli C, Pawlowski SD. The Delphi Method as a research tool: an example,

design considerations and applications. *Inf Manag* 2004; 42: 15-30.

8. ICD-10: International Statistical Classification of Diseases and Related Health Problems: 10th revision – 2nd edn. Geneva: World Health Organization, 2004.
9. The International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM). 5th edition. Salt Lake City, Utah: Medicode Publications, 1996.
10. Haklai Z, Aborba M, Gordon ES. Emergency department visits 2007 – diagnoses. Jerusalem: Health Information Department Ministry of Health, 2009.
11. Dagan E, Wolf M, Migirov L, Why do geriatric patients attend otolaryngology emergency rooms? *IMAJ* 2012; 14: 633-6.
12. Begier EM, Sockwell D, Branch LM, et al. The National Capitol Region's Emergency Department Syndromic Surveillance System: do chief complaint and discharge diagnosis yield different results? *Emerg Infect Dis* 2003; 9: 393-6.
13. Weiss HB, Dill SM, Garrison HG, Coben JH. The potential of using billing data for emergency department injury surveillance. *Acad Emerg Med* 1997; 4: 287-90.
14. Lombardo J, Burkom H, Elbert E, et al. A systems overview of the Electronic Surveillance System for the Early Notification of Community-Based Epidemics (ESSENCE II). *J Urban Health* 2003; 80 (2 Suppl 1): i32-42.
15. Barell V, Aharonson-Daniel L, Fingerhut LA, et al. An introduction to the Barell body region by nature of injury diagnosis matrix. *Inj Prev* 2002; 8: 91-9.
16. Travers DA, Haas SW, Waller AE, Tintinalli JE. Diagnosis clusters for emergency medicine. *Acad Emerg Med* 2003;10: 1337-44.
17. Garrison HG, Runyan CW, Tintinalli JE, et al. Emergency department surveillance: an examination of issues and a proposal for a national strategy. *Ann Emerg Med* 1994; 24: 848-56.
18. Baker LC, Baker LS. Excess cost of emergency department visits for non-urgent care. *Health Aff* 1994; 13 (5): 162-71.
19. Brillman JC, Burr T, Forslund D, Joyce E, Picard R, Umland E. Modeling emergency department visit patterns for infectious disease complaints: Results and application to disease surveillance. *BMC Med Inform Decis Mak* 2005; 5: 4.
20. Wu TS, Shih FY, Yen MY, et al. Establishing a nationwide emergency department-based syndromic surveillance system for better public health responses in Taiwan. *BMC Public Health* 2008; 8: 18.
21. Elliot AJ, Hughes HE, Hughes TC, et al. Establishing an emergency department syndromic surveillance system to support the London 2012 Olympic and Paralympic Games. *Emerg Med J* 2012; 29: 954-60.
22. Ravn-Fischer A, Karlsson T, Santos M, et al. Inequalities in the early treatment of women and men with acute chest pain? *Am J Emerg Med* 2012; 30 (8): 1515-21 [Epub ahead of print].
23. Christakis DA, Mell L, Koepsell, Zimmerman FJ, Connel FA. Association of lower continuity of care with greater risk of emergency department use and hospitalization in children. *Pediatrics* 2001; 107: 524-9.
24. Gill JM, Mainous AG 3rd, Nsereko M. The effect of continuity of care on emergency department use. *Arch Fam Med* 2000; 9: 333-8.
25. Pope D, Fernandes C, Bouthillette F, et al. Frequent users of the emergency department: a program to improve care and reduce visits. *CMAJ* 2000; 162: 1017-20.

Appendix

Trauma

Injury Site / Injury Type	Head and Face	Neck	Chest	Abdomen	Back	Upper Limb	Lower Limb	Vertebral Column
Contusion	95901	920	9221	9222	9223	923	924	
Laceration	Head 8739 Face 87340	874	875	8792	876	884	894	
Burn	94100	94108	94202	94203	94204	943	945	
Fracture	Skull 803 Face 802	80500	807 Ribs/ Sternum			818	827	805
Dislocation	Jaw 830					8398	8398	83940
Strain / Sprain		8470 Whiplash				840	843	
Abrasion / Friction / Burn	9100	9100		9110	9110	9130	9160	

Other Trauma

E9689	Assault
929	Crush Injury
E9101	Diving Accident - Scuba
9948	Electrocution
V7181	Examination Following Abuse / Neglect-Normal
V714	Examination Following Accident - Normal
V716	Examination Following Assault - Normal
V715	Examination Following Rape / Sexual - Normal
8798	Degloving Injury - Extensive Skin Loss
E888	Fall Accident
E8888	Falls Recurrent
8530	Hemorrhage Intracranial-Traumatic
868	Injury To Intra-Abdominal Organ(s)
862	Injury To Intrathoracic Organ(s)
867	Injury To Pelvic & Retroperitoneal
9598	Injury To Multiple Sites
860	Pneumothorax Traumatic

Orthopedics

845	Ankle Sprain
7169	Arthropathy - Arthritis
7245	Back Pain
7231	Cervicalgia / Neck Pain
81341	Colles' Fracture
886	Finger Tip Amputation
V537	Fitting of Cast / Refitting
2749	Gout
7823	Leg Edema
7295	Limping / Limb Pain
820	Neck of Femur Fracture
730	Osteomyelitis
808	Pelvic Fracture
72888	Rhabdomyolysis
831	Shoulder Dislocation
72700	Synovitis
7279	Tendon Injury / Disease
7235	Torticollis

Psychiatry

309	Adjustment Reaction
3050	Alcohol Intoxication/Dependence
30000	Anxiety
3083	Acute Stress Disorder
3089	Acute Stress Reaction
2900	Dementia - Senile
3059	Drug Dependence / Abuse
30750	Eating Disorder
300	Neurosis
301	Personality Disorder
30981	Post Traumatic Stress Disorder
29690	Psychosis - Affective
2959	Psychosis - Schizophrenia
2929	Psychosis - Substance Induced
E9589	Suicide & Self-Inflicted Injury.
316	Other Psychiatry

Ophthalmology

3723	Conjunctivitis
921	Contusion Of Eye
9181	Corneal Abrasion / Erosion
370	Corneal Ulcer / Keratitis
930	Foreign Body In Eye
365	Glaucoma
3779	Neuro Ophthalmology Disorder
870	Ocular & Periocular Wound
37601	Orbital Inflammation
3770	Papilledema
37313	Periorbital cellulitis
3619	Retinal & Vitreous Disorder
36231	Retinal Artery Occlusion
37272	Subconjunctival Hemorrhage
3640	Uveitis
3799	Other Ophthalmology

Dermatology

6809	Abscess Of Skin
682	Cellulitis
692	Dermatitis / Eczema
035	Erysipelas
054	Herpes Simplex
053	Herpes Zoster
9194	Insect Bite
110	Mycotic Disease
132	Pediculosis
7821	Rash - Undetected Cause
1330	Scabies
707	Ulcus Cruris
7099	Other Dermatology

E.N.T.

5259	Dental / Periodontal Disease
87363	Dental (Tooth) Trauma / Avulsion
7804	Dizziness
7847	Epistaxis
931	Foreign Body - Ear
932	Foreign Body - Nose
933	Foreign Body - Pharynx/Larynx
3804	Impacted Cerumen
3869	Inner Ear Disease
383	Mastoiditis
7842	Neck Disease / Disorder
380	Otitis External - Ear Disease
3829	Otitis Media
475	Peritonsillar Abscess
5272	Parotitis
47824	Retropharyngeal Abscess
461	Sinusitis
5282	Stomatitis Aphthous
52460	TMJ Disease
462	Tonsillitis / Pharyngitis
386	Vertigo
388	Other ENT