

ORIGINAL RESEARCH

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The importance of ICD-10 applications on daily practice**Leyla Serinoglu¹, Onur Yazar², Can Mehmet Eti³, Tugce Puturgeli³, Yusuf Vayisoglu³, Mehmet Farsak⁴, Ece Sevin Cukurova⁴, Cemnur Tancil⁴, Emine Arzu Kanik⁵, Derya Umit Talas³**¹Mersin University Medical Faculty, Hospital Information Technology Department, Mersin, Turkey²Okan University Faculty of Health Sciences Department of Health Administration, İstanbul, Turkey³Mersin University Faculty of Medicine Department of Otorhinolaryngologic Diseases, Mersin, Turkey⁴Mersin University Faculty of Medicine Mersin, Turkey⁵Mersin University Medical Faculty, Department of Biostatistics and Medical Informatics, Mersin, Turkey

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Abstract

This study assessed the adequacy of patient data entry in the context of International Statistical Classification of Diseases and Related Health Problems (ICD-10) in the Hospital Information Administration System. It was also aimed to study the adequacy and functionality of the ICD-10 coding in the current Turkish Otorhinolaryngology (ORL) practice in detail. The medical records of 1216 patients who presented to the ORL outpatient clinic between 2012 and 2013 were reviewed. Eight diagnostic codes used by the ORL department were selected from the patient diagnoses report to form patient lists. The accessibility of the ICD-10 codes was analyzed. The data was transferred into the MedCalc 12.0 software package in a digital medium. The study data was analyzed using frequency tables, Chi-square test, and the two sided likelihood ratio test. Among the ICD-10 codes included in the study, the larynx malignant neoplasm diagnosis (C32.9) was recorded at a rate of 60% and had the greatest ratio of recorded medical history, followed by malignant disorders (C32.3) of the laryngeal cartilage, vertigo (R42) (12.4%) whereas facial asymmetry (Q67.0) (10.5%) had the lowest recorded medical history ratios. There was a significant difference between the recorded and unrecorded patient groups ($p < 0.0001$). Hospital Information Administration Systems are needed to be effective and efficient in order to have appropriate future decisions in healthcare system. The ICD codes should be updated frequently according to the recent necessities and physicians should be trained about new developments.

Keywords: Otorhinolaryngology, ICD-10, hospital information administration system, medical records**Introduction**

One needs to classify and code data incorporating administrative and clinical processes in the field of healthcare in order to transform them into information and to conduct quantitative studies [1].

Classification refers to listing similar diseases and procedures into a unified group while coding refers to the process of expressing diseases, injuries, and procedures in a numerical or α numerical pattern [1]. Among many coding and classification systems used in healthcare, ICD-10 is the most commonly preferred one for clinical diagnosis and training [2].

ICD-10 (International Statistical Classification of Diseases and Related Health Problems) is defined as an International Statistical Classification of Diseases and Health-related Problems, and also as a system of categories [3].

The purpose of ICD is to systematically record, evaluate, interpret, and compare morbidity and mortality data gathered from different countries or regions at different times [4].

The need for using computers in human healthcare has arisen from the need of making the right diagnosis at the right time, providing healthcare service, and recording accurate patient information.

Hospital Information Administration Systems gather information from different sources and integrate them to help the clinicians and administrative staff to reach the most appropriate, accurate decision [1]. This system is also an important source to reach statistical data.

In the present study, the adequacy of patient data entry in the context of ICD-10 in the Hospital Information Administration System was examined. The effectiveness and efficiency of the Hospital Information Administration System with respect to person-based and system-based defects were also analyzed. Lastly, it was aimed to elucidate the adequacy and functionality of the ICD-10 coding system in the current Turkish Otorhinolaryngology (ORL) practice.

Materials and Methods

This study reviewed the medical records of 1216 patients presenting to the ORL outpatient clinic of Mersin University Health Research

*Corresponding Author: Leyla Serinoglu, Mersin University Medical Faculty, Hospital Information Technology Department, Mersin, Turkey.
E-mail: leyla_serinoglu@yahoo.com

and Application Center. A retrospective screening was performed to encompass a time period between 1st April 2012 and 1st April 2013. A total of 8 different disease codes were selected from the otology, neurotology, rhinology, neck and head branches, which were the most commonly encountered conditions at the ORL clinic deemed of special importance with respect to mortality, morbidity, and patient follow-up. The data were transferred to the "MedCalc 12.0" software package in a digital medium. The data were analyzed using frequency tables, Chi-square test, and two-sided likelihood ratio test.

Eight diagnostic codes used in the ORL department were selected from the patient diagnoses report of the Hospital Information Administration System to form patient lists (Table 1).

Table 1. Diagnosis codes involved in the research

DIAGNOSIS CODE	DIAGNOSIS
R42	Vertigo
Q67.0	Facial asymmetry
C32.3	Malignant neoplasm of the laryngeal cartilage
C32.9	Malignant neoplasm of the larynx
J33.9	Nasal polyps
D10.6	Benign neoplasm of the nasopharynx
D34	Benign neoplasm of the thyroid gland
C73	Malign neoplasm of the thyroid gland

The effectiveness of medical reporting of ICD-10 applications on the system and the adequacy of patient data entry were analyzed. In the medical information menu, patient files were examined to check past medical and family histories on the medical history screens to draw attention to the clinical importance of medical records. Eight diagnoses were compared with one another in terms of the studied parameters.

- The ability of the ORL clinic to access ICD-10 diagnoses was analyzed.
- It was examined how efficient the Hospital Information Administration System can be used; person- and system-related defects were also assessed.

Results

Quantitative results

On the medical history screen, assessment of the past medical and family history panels showed that 20.4% of the patient histories were recorded whereas 79.6% of them were not. Two hundred and forty-eight patients had their history recorded whereas 968 patients had not. There was a significant difference between the patient groups with and without a recorded medical history ($p < 0.0001$). According to eight ICD-10 codes included in the study conducted in the ORL clinic, the percentages of the recorded patient medical histories were given on Table 2.

Among the ICD-10 codes included in the study, C32.9 Larynx malignant neoplasm diagnosis was recorded at a percentage of 60% and had the greatest ratio of having a recorded medical history. Facial asymmetry (Q67.0) diagnosis was recorded at a percentage of 10.5% and had the lowest ratio of having a recorded medical history.

Qualitative results

The names of the diagnoses that can't be found for the ORL department in the ICD-10 diagnostic list of the Hospital Information Administration System were shown on Table 3. These diagnoses are also widely accepted terms and diagnoses in the international and national literature and in daily practice; however, they could not be found as widely known in ICD-10 coding list. For instance, although facial paralysis is frequently used in daily ORL practice, it is referred to as facial asymmetry in ICD-10 list, and used accordingly.

Table 2. Percentage of taking medical history (by diagnosis)

DIAGNOSIS CODE	DIAGNOSIS	MEDICAL HISTORY TAKEN	MEDICAL HISTORY NOT TAKEN
R42	Vertigo	75 (12,4%)	531 (87,6%)
Q67.0	Facial asymmetry	4 (10,5%)	34 (89,5%)
C32.3	Malignant neoplasm of the laryngeal cartilage	7 (38,9%)	11 (61,1%)
C32.9	Malignant neoplasm of the larynx	87 (60%)	58 (40%)
J33.9	Nasal polyps	34 (20%)	136 (80%)
D10.6	Benign neoplasm of nasopharynx	9 (19,1%)	38 (80,9%)
D34	Benign neoplasm of the thyroid gland	21 (14,7%)	122 (85,3%)
C73	Malignant neoplasm of the thyroid gland	11 (22,4%)	38 (77,6%)

Table 3. Diagnoses that are not included in the ICD-10

Facial Paralysis
Glomus Tumor
Cerebellopontine Angle (CPA) Tumor, Posterior Fossa Tumor, Acoustic Neuroma, Vestibular schwannoma
Angiofibroma
Endolymphatic Hydrops
Inverted Papilloma

A review of the ICD-10 diagnostic coding system in the Hospital Information Administration System revealed that some diagnoses in the ORL chapter were translated to Turkish (Table 4).

Table 4. Diagnoses spelled in Turkish in ICD-10 list

Diagnoses in Turkish	Original spelling
Meniyer Disease	Meniere
Vestibüler Neuronit	Neuritis / Neurinitis

When an attempt was made to match the ICD-10 list in the Hospital Information Administration System with the DRG (Diagnosis Related Groups) Program, defects related to definition were found on the screen. The different spellings of the diagnoses found in the ICD-10 list in the Hospital Information Administration System and the DRG screen are presented below (Table 5).

Table 5. Comparison of the two diagnoses between the Hospital Information Administration System and the DRG system

Hospital Information Administration System	DRG system
Meniyer Disease	Meniere Disease
Vestibüler Neuronit	Vestibüler Neuronit
	Neuritis

The assessment of the effectiveness and efficiency of the Hospital Information Administration System showed the followings

- There was a variety of defects such as slow startup of the Hospital Information Administration System program, network failures (disconnection from network, Switch failures...), system crashes, keyboard failure, slowed system etc.
- There was no on-screen warnings or screen encolouring for contagious diseases with high mortality and morbidity. For example, HIV (Human Immunodeficiency Virus).
- No button existed on the system by which pathologists could indicate a malignant pathological examination result as the definitive diagnosis on the system, and such a button did not appear on physician procedures screen, either.
- Having too many definitions like provisional diagnosis, primary diagnosis, definitive diagnosis, and main diagnosis on the diagnosis entry screen created complexity and confusion.
- No information regarding blood group and nationality existed on patient diagnosis's report.
- Patient diagnoses report did not contain patients consulted with other departments.

Discussion

Hospital Information Management System

Effective and efficient use of the Hospital Information Management System is important for administrative, financial, and medical purposes. Inability to obtain an accurate information from patient diagnosis report and the absence of consulted patients on the system will reduce quality and reliability of statistical data. Hence, information about blood group and nationality should be presented in order to conduct studies on the relationship between various disorders and blood groups.

It was ascertained that information about past medical history and family history constitute 20% of patient medical records. Therefore, this percentage supports the notion that the necessity and importance of keeping electronic health records have not been appreciated. Filling history screens completely is necessary as it influences both daily practice and future decisions about healthcare. In a European study, medical data was found to have a high quality [5].

An analysis of the inspected patient files to select the diagnosis for which medical history was most commonly recorded showed that it was 60% for the malignant neoplasm of larynx, which can be an indicator of a special interest in recording medical history of specific diagnosis. Hence, being familiar with and questioning about it is necessary.

In hospital information management system, it is important for pathologists to have a button on the screen to mark when the result is malignant and for physicians to be able to see it automatically from the physician procedures screen. As for contagious diseases,

having an on-screen alert or screen encolouring for physician notification is necessary for carefully performing computer tasks. Screen complexity on diagnosis entry screen should also be prevented.

The use of the latest updated version of the ICD-10-AM Australian Modification for the DRG system and the non-updated ICD-10 lists for the Hospital Information Administration System is flawed by some inconsistencies and defects. For example, the Meniere's disease was included in the ICD-10 list of the Hospital Information Administration System in its Turkish spelling "Meniyer" but it appears in its original spelling on the screens of the DRG system, indicating translation errors.

The word with an original spelling of Neuritis/Neurinitis appears as Neuronitis in the ICD-10 list of the Hospital Information Administration System. In the DRG system, on the other hand, it appears that the words neuronitis and neuritis are used collectively. This creates defects in matching stage of medical billing procedures. It is also important as an example of the complex situation with the translational errors.

The use of different spellings by various coding systems used in Turkey for a given disease and syndrome is confusing and far from standardization. Coding should be specific for each clinic and be definitely standardized.

An analysis revealed that 80 or more patients present daily to the ORL clinic. The number of residents was found to be insufficient creating a time constraint. Considering the busy triangle of outpatient clinic, inpatient clinic and operating room, patient medical histories were not paid enough attention. Patient medical histories, clinical course, medical reports, prescription, epicrisis, operative notes, patient orders, and ICD codes lay a burden on physicians and make them spend much of their time at the desk, underlying the necessity of medical secretaries. Moreover, lack of training is also troubling. It is of utmost importance that Hospital Information Administration System training provided by the Information Processing Unit be updated frequently.

Computers in inpatient and outpatient clinics of hospitals should be able to remain open for long working hours and have an ample disc capacity, memory capacity, and processor speed.

ICD

ICD-1 has been updated every 10 years for over 90 years to ultimately be transformed to what is known as ICD-10 in 1999. Retrospective analyses and studies, however, indicated that diseases seen in normal routine practice and symptoms do not match perfectly and thus constant updates are required.

Although Facial Paralysis of the Facial nerve has been used routinely on a daily basis, it appeared here as Facial Asymmetry and Bell's Paralysis. Bell's Paralysis is a subgroup of Facial Paralysis. Facial Paralysis is a broader and encompassing term and thus should be used. Coding a disease using the closest relevant code sometimes precludes the determination of the exact number of cases with specific diseases worldwide [6]. Hence, it is an important issue that must be addressed.

In some countries like Australia, Canada, Germany, and Thailand

some additional complementary studies have been conducted by healthcare professionals on country-specific epidemiological data and complications, and some necessary modifications have been made on ICD-10. We are of the opinion that conducting such studies by various departments and Professional observations would also be beneficial for our country [7].

Some internationally and nationally accepted common diagnostic codes like vestibular schwannoma do not appear in the Hospital Information Administration System, ICD-10 list, and World Health Organization's list. There is an international standard classification system. However, when assessing the international validity and applicability of this system, an update of diagnosis by every clinic and department is necessary [8]. A specific code for a disease like essential tremor is absent in ICD-9 but added to ICD-10, and it is questionable for clinical coders, also indicating the need for updates [9].

According to several studies, transition from ICD-9 to ICD-10 involves serious costs. There is a significant numerical difference with respect to both diagnostic and procedural codes. Addition of new diagnostic codes and increasing the number of interventional codes are necessary for billing. Although it has gained acceptance by international healthcare institutions, and studies have been performed with limited data, researchers opine that little advance has taken place. Higher healthcare expenditures per capita in the USA show that in addition to healthcare service provided to patients, medical billing processes are important [10,11]. Having said that, the requirement of updating the codes at regular intervals is necessary for both patients and epidemiological studies.

There are publications reporting that certain parts of the coding system are much more detailed and precise. A European study on ICD-10 coding of "injuries", i.e. tissue damage, showed that sites of "injuries" were much more accurately coded in Hungary, Iceland, and Lithuania than the other European countries. Hence, coding quality is variable among persons performing institutional coding, clinical coding, and even between coders in different countries, and it actually requires a good training [5]. Several studies have indicated that a person with a thorough knowledge of the coding system may conceive much more details of it and thus may more objectively reach a diagnosis [12].

It has been asserted that it would be more useful to organize ICD-10 as a more general and larger database (meta-database) in order to compare different versions of it in various countries. The rationale of this is a particular increase in health tourism and tourism health worldwide [13].

A study from Sweden investigated the requirements to form a disease database of electronic patient records and showed a deficiency of tools facilitating coding in addition to lack of training in establishing a valid and reliable database, classification of diseases, and coding process [14]. Incorrect coding results in serious clinical and administrative, billing and purchasing errors. Additionally, coding errors about hospital complications are said to have diverse effects, especially on the clinical performance of a given hospital [15].

In a study conducted by Dixon et al in the UK, it was noted that the concordance between coding's performed by two different groups

coming from other institutes was poorly understood when used by a third person or group for different symptoms or disorders. Particularly, the necessity of providing serious training about coding has been emphasized [16]. It has been recommended that particularly inexperienced persons must pay time and attention to coding in order to enhance their coding quality. It is equally important for the person performing coding to consult the physician and avoid abbreviations [17].

Studies from different clinics have shown that different persons may perform variable coding under normal conditions. Variations in coding certainly affect patient follow-up and future prospective studies [18]. Code users should determine ICD's applicability and limitations in their own specific areas while coding. The use of ICD mortality and morbidity data provide benefits for statistical purposes; thus, ICD use is very relevant to health policies and healthcare finance [2]. Data from the relevant literature point to such coding errors and deficiencies. Coding errors constitute an objective issue overemphasized in international literature [17]. A study from Japan revealed coding errors at a rate of approximately 10% [19].

Diagnostic coding may not necessarily specify the main subject or a patient's problem requiring treatment at the time of admission. It not only hardly specifies a disorder's basic cause, but may also differ significantly from an issue for which a physician or healthcare institution should take longest time. It is a serious issue for outpatients [20].

Some unclassified or graphically expressed lesions are used by the physician in noted, written or signed forms. Hence, it may prove difficult to recall that form and to analyze it statistically for a large number of cases. In this context, it is necessary that every progressing prospective coding system incorporates such features. Using electronic health records is important for patients, physicians, and epidemiological studies [21].

Conclusion

Hospital Information Management Systems should be effective, efficient, and user-friendly. The importance of taking a complete patient history was demonstrated since it affects both daily practice and future decision making.

The lack of a specific code for every diagnosis in ICD-10 forces physicians to code for a similar or general diagnosis instead of the true diagnosis, which leads to the misuse of ICD-10. A common international and national language should be established. ICD updates should be done at frequent intervals to obtain quality statistical data and to ensure an appropriate and effective use of ICD. Physicians should be trained about new developments in ICD. Given the extra workload of physicians, the need for medical secretaries is also evident.

Competing interests

The authors declare that they have no competing interest

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Ethical approval

Ethics Committee approval was obtained Okan University (Date: 02.01.2014, Number: 02.01.2014-24).

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