The quality of patients' data in medical documentation and statistical forms

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Abstract. The analysis of legal regulations on statistical and medical documentation has been performed and the quality of data was evaluated. The patients' records and statistical forms of 31 patients discharged from a local hospital were studied. 127 initial diagnoses, 148 final diagnoses were stated in medical documentation, but only 73 of them were presented as ICD-10 codes. The identical initial and final diagnoses were noted in 57 cases. The average number of initial diagnoses per patient was 4.09 ± 1.97 and final diagnoses – 4.77 ± 1.81. The average number of diagnoses identical at admission and at discharge was 1.84 ± 1.67. Statistical forms of the same patients contained only 93 diagnoses and 93 ICD-10 codes i.e. 55 diseases were not reported in statistical forms. The accordance in ICD-10 codes in medical and statistical documentation was noted only in 30 cases (out of 148 in clinical and out of 93 in statistical documentation). The diagnoses were identically written down in the medical and statistical forms only in 10 cases. All of that means poor completeness but high consistency of statistical data presented as MZ/Szp-11. In contrast, the medical data are of high completeness, validity and accuracy but of relatively low consistency. The further investigations are needed to reveal the most important reasons of discrepancies between medical and statistical data.

Introduction

The methods of collecting primary data in health care determine the quality and reliability of all indicators derived from the medical and statistical documentation. Many organizations (e.g. WHO, OECD, PAHO) stress the importance of quality of primary data collected in healthcare institutions. The use of data from electronic (and/or paper) medical records for any kind of evaluation requires an extraction process. Many efforts have failed because the extracted data seemed to be unstructured, incomplete and ridden by errors [16]. The quality of data can be described by the following terms: completeness, validity, consistency, timeliness and accuracy. However, there is no satisfactory definition for some of those terms. For example, completeness of medical data (full information about the patient) is not exactly the same as the completeness of data in a statistical survey (coverage of all patients). The medical data refer mainly to the individuals and the statistical data should reflect the health status of the population.

ISBN 978–83–7431–296–7 ISSN 0860-150X

It is assumed that the both kinds of data should be in accordance as well as that the statistical data on hospitalization are simply extracted from medical documentation. However, looking at the hospital morbidity reports one can notice that the number of procedures reported in the statistical forms differ from the figures in individual patient's documentation. On the other hand, there is no underreporting of procedures in reports send from the hospital to the payer. Record documentation by community family physicians in the USA largely reflects the level of services billed using evaluation and management codes. Undercoding and overcoding occur at a similar frequency (21% and 19%, respectively) and differ by more than 1 code in fewer than 4% of visits [14]. Similar problems may be met in Polish hospitals, so it seems reasonable to compare the data collected in medical records and statistical forms to disclose the discrepancies between both sources of information.

Material and Methods

The essential elements of patient's record and in coding systems used in healthcare were reviewed. The processes of stating the diagnosis and problems emerging from different types of diagnoses in medical documentation were presented and compared with the requirements for statistical forms.

Current legal acts on medical documentation in Poland were analyzed with the special reference to the standards on medical information and structure of patient's record. MZ/Szp-26 (clinical) form was used as a standard. Also the selected elements of MZ/Szp-11 (statistical) form – diagnoses and procedures – were reviewed and the content of information in both types of documentation was compared.

The 31 sets of medical records were obtained from a local hospital in 2011. The consecutive records of patients discharged from non-surgical wards were analyzed. An experienced physician (lecturer at the Medical University) reviewed all the records and forms to establish whether there are important differences in documentation from the professional (clinical) point of view. The different sequence of diseases in one patient's documentation was taken as different diagnoses as the difference between main disease and co-morbidity influences the statistical data in MZ/Szp-11. For example, if the main initial disease was hypertension and co-morbidity – ischemic heart disease, but in the final diagnosis the main disease was ischemic heart disease and hypertension was co-morbidity – those data were recognized as different diagnoses. This is because the "main" disease is the reason of hospitalization with all consequences (statistical, economical and epidemiological ones).

The following parameters were calculated:
- the number of initial diagnoses together with their ICD-10 codes,
- the number of final diagnoses and their ICD-10 codes as a measure of completeness of data,
- the accordance between preliminary and final diagnoses (exact description of the disease) as a measure of validity and consistency of data,
- the accordance between preliminary and final diagnoses (ICD-10 codes) in patients' records as a measure of validity and consistency of data,
- the accordance between ICD-10 codes in patients' records and in statistical forms as a measure of accuracy of data,
- the number and kinds of procedures recorded in statistical forms as a measure of completeness of data.

No statistical analyses (except calculating mean ± SD) was performed because of small groups of patients with identical diagnoses, and discrepancies between diagnoses in almost each patient's documentation.

Results

Medical documentation and statistical forms

The medical record should accurately reflect the course of disease and indicate the probable cause of disease. This concept of Hippocrates, developed 2500 years ago, is still valid, as referred to medical documentation. The majority of information collected during patient's stay at a hospital is placed into the medical documentation, namely – the patient's record. Those are mainly medical data: results of medical examination (interview – anamnesis, and physical examination), laboratory tests, X-ray images, consultations, medical procedures, medications and their side-effects, complications etc. According to SNOMED-CT (Systematized Nomenclature of Medicine – Clinical Terms), the total number of terms (named "concepts") related to medicine exceeds one million. ICD-10 (International Statistical Classification of Diseases and Related Health Problems 10th Revision) covers 14 400 codes of diseases, which can be expanded up to 16 000 by subclassifications. US national version of ICD contains over 155 000 codes. Moreover, ICD-10 must not be mismatched with ICD-10-PCS (Procedure Coding System) which covers 72 081 procedures.

It seems reasonable to use those codes in everyday practice. However, ICD-10 does not fully reflect the processes and relationships between different diseases in different cases. For example codes I10-I15 (hypertensive diseases) exclude hypertension complicating pregnancy (O10-O11) and pul-

monary hypertension (I-27.0). It is a quite different condition when a woman suffering from idiopathic hypertension becomes pregnant as compared with pregnancy complicated by hypertension. The etiology, therapy and courses of those diseases are different. Pulmonary hypertension is treated with sildenafil (Viagra) and it is easy to look for a mistake or malpractice when sildenafil is prescribed for an old man. Also the economic and legal consequences of such mismatches may be serious. It is clear, that the medical data may be used in structured form, but it is easier for a doctor to describe a complex condition in unstructured form (narrative text) than to look for appropriate codes.

Diagnosing process is based on the signs and symptoms, it may last some time (even weeks) in those complex cases when different diseases reveal the same symptoms, and the number of medical data may increase almost exponentially. So called differential diagnosis is the result of several processes including laboratory tests and specialists consultations. The final diagnosis – at the discharge – may differ from the preliminary (initial) diagnosis stated at the admission. Actually, a doctor sometimes has to manage several kinds and numbers of diagnoses during one patient's stay at the hospital. It is assumed that the final diagnosis is more accurate than the initial diagnosis. For example, "cardiac arrhythmia" may be diagnosed at the admission but the final diagnosis is "Wolf-Parkinson-White syndrome". From the medical point of view, there is no mistake. WPW syndrome is a kind of cardiac arrhythmia. But the ICD-10 codes for these conditions are different. The number of diagnoses in one patient may range from one to over a dozen. The average European above 40 suffers from at least one of chronic diseases. This number is doubled at the age above 50.

So it is essential which diseases are recognized as the main cause of hospitalization. Some problems may emerge here e.g. if the patient suffering from perforation of gastric ulcer and hypertension (not related one with another) is admitted to the surgical ward the main diseases is gastric ulcer treated with surgery. But when the same patient after successful surgery has to be treated because of hypertension at the department of internal medicine hypertension will be the main disease. So we have to manage with one patient's record, two diseases and two hospitalizations with two final diagnoses. Moreover, the final diagnosis is the base for DRG (disease related group) – a classification system in which patients are grouped into medically and economically consistent entities. The diagnoses and surgery codes are the main medical data used by DRGs.

The implementation of the ordinance on medical documentation issued by the Ministry of Health (Dec 21th, 2010) evoked the expectations on new

quality of health care system in Poland. The possibility of analyzing almost all data collected in all (approx. 16 000) health care units, wards, clinics, and hospitals (approx. 700) etc. seems to be promising – from managerial point of view. However, the enthusiastic opinion of an expert [22] should be confirmed in an ordinary hospital practices. One may have rather serious objections to the results of the unification and combined system of medical and statistical information. First of all, according to § 10. 1 of the ordinance the information on health status and disease, diagnostic, therapeutic and rehabilitation processes should be placed into medical documentation. In detail these mean:

- description of health services provided to the patient;
- diagnosis/diagnoses of the disease, condition, injury or pregnancy;
- orders and advices;
- information about medical statements and opinions
- information about prescriptions, prescribed drugs and medicines
- other information

At the discharge from the ward (§ 19) also the final diagnoses, comorbidities, complications should be described as well as their ICD-10 codes. The description of medical procedures, surgical operations and their ICD-9 codes, epicrisis (a summing up of a medical case history), date and cause of discharge from the ward. So the medical documentation according to the regulations of the Ordinance contains a series of pictures reflecting a dynamic process.

The most important difference between medical data and statistical ones may be described as the medical data refer mainly to an individual and the statistical data should reflect the status of population. Moreover, the requirements of statistical offices differ from those of medical clinics. Statistical data should be aggregated in a uniform way to enable the comparison of population, and to create the measures and indicators referring to large number of patients. Differing from a dynamic, clinical form (MZ/Szp-26) a "snapshot" approach is represented by the statistical information completed by the hospital. The form MZ/Szp-11 should contain the information extracted from inpatient documentation.

Statistical data are collected according to the Public Statistics Act by the use of standard forms. 39 forms are used by the Ministry of Health. The MZ/Szp-11 form (The Statistical, General, Hospital Chart) contains the following information about each individual patient's stay at the hospital (all wards):

- one main (final) diagnosis,
- one additional diagnosis

- one diagnosis from ICD blocks V-Y – external causes of morbidity and mortality (accidents; event of undetermined intent; legal intervention and operations of war; complications of medical and surgical care; sequelae of external causes of morbidity and mortality; supplementary factors related to causes of morbidity and mortality classified elsewhere)
- 3 co-morbidities,
- 6 procedures

Each diagnosis should be named, and its ICD-10 code should be also used. 4-digit standard is obligatory. The codes of medical procedures must be in accordance with the 2nd edition of International Classification of Medical Procedures. Data of all patients hospitalized in Polish hospitals are sent to the National Institute of Public Health – National Institute of Hygiene where the annual reports on hospital morbidity rate are prepared.

Comparing the medical and statistical forms one can conclude that the patient's stay at the hospital is the unit of healthcare services in medical documentation. The number of diagnoses and procedures is not limited here. In the statistical form the units are diagnoses (1 to 5) and procedures (up to 6). So, as the result of legal regulation on medical and statistical documentation one may expect the underreporting of diseases and procedures which are not recognized as important enough to be placed in MZ/Szp-11. So the reports on hospital morbidity have to be limited to main diseases and underreporting may be enhanced by aggregation of simplified data. Different approach to medical data is used for billing purposes with National Health Fund, but this problem should be investigated and discussed in a separate report.

Diagnoses and ICD-10 codes

According to the opinion of a Medical University expert, the evaluated clinical documentation was correct, and no important differences in describing the clinical status of all patients could be found. However, the final diagnoses were described mostly in unstructured way, i.e. using different terms for the same disease. For example, in one patient the chronic ischemic heart diseases was recognized as acute transmural myocardial infarction of anterior wall. Actually these are different conditions but the acute infarction may be the result of chronic ischemic heart disease. In a given example the problem was that the final diagnosis of chronic disease (I25.0) did not precede the acute infarction (I21.0), as could be expected in classical history of that disease. The analysis of medical documentation revealed that the initially observed signs and symptoms of acute infarction were not confirmed during hospitalization. This way of thinking was confirmed by the number

and kinds of procedures applied to this patient: ECG, Holter's monitoring and chest x-ray are more likely used in chronic ischemic diseases than in acute heart infarction. However, no trace of differential diagnosing was found in the statistical form. That is the result of "snapshot" information collected in a statistical form.

Another problem is illustrated by the case of a patient with the following final diagnoses and ICD-10 codes found in his record (medical documentation / statistical documentation)[1]:

1. Wolff-Parkinson-White syndrome / Wolff-Parkinson-White syndrome – I45.6.
2. Paroxysmal tachycardia / Paroxysmal atrioventricular tachycardia – I47.1.
3. Status post cholecystectomy / no diagnosis – no ICD code.
4. Status post electrical cardioversion / no diagnosis – no ICD code.

The main diagnosis was the WPW syndrome, and that was reported also in MZ/Szp-11, but the status post cholecystectomy and status post cardioversion were omitted in the statistical form. It should be stressed here that the past history of the patient (anamnesis) contains important information: some time ago (not determined) the patient had the episode of cardiac arrest successfully treated with cardioversion. Such an episode may appear also in future, and probably it could be the indication for implanting a pacemaker. No information about such a risk can be found in statistical form. Similar diagnostic and prognostic problems could appear when the status of patient's liver and alimentary tract were analyzed.

The results of the documentation analysis are summed up in [Tab. 1]. In 31 patients' medical documentation 127 initial diagnoses, 148 final diagnoses were stated, but only 73 of them were presented as ICD-10 codes. The identical initial and final diagnoses were noted in 57 cases. In 19 out of 31 cases the diseases of circulatory system (codes I00-I99) were main final diagnoses in both statistical and medical documentation. Only in two cases the preliminary and final diagnoses were fully identical. i.e. noted exactly in the same words. The average number of initial diagnoses per patient in medical documentation was 4.09 ± 1.97 as compared with final diagnoses 4.77 ± 1.81. The average number of diagnoses identical at admission and at discharge was 1.84 ± 1.67. This indicates the changing diagnoses and/or the rank of each diagnosis (main or co-morbidity).

[1] Only one diagnosis is exactly the same in both types of documentation.

Tab. 1. The content of medical and statistical forms – number of diagnoses, ICD-10 codes in each studied documentation

Patient's number	Medical documentation				Statistical documentation	Comparison of data	
	The number of diagnoses at admission (initial diagnoses)	The number of diagnoses at discharge (final diagnoses)	The number of diagnoses identical at admission and at discharge	The number of ICD-10 codes at discharge (MZ/Szp-26)	The number of diagnoses in MZ/Szp-11	The number of identical diagnoses in medical and statistical forms	The number of identical ICD-10 codes in medical and statistical forms
1.	2	4	1	2	2	0	2
2.	5	5	1	0	2	0	0
3.	5	4	0	3	3	1	1
4.	4	5	3	3	2	0	2
5.	4	5	0	4	2	0	0
6.	4	4	4	2	2	0	2
7.	5	5	4	0	3	0	0
8.	1	4	1	2	3	1	2
9.	8	5	1	5	3	0	0
10.	5	6	3	0	4	1	0
11.	6	6	5	6	4	1	4
12.	3	5	1	3	3	0	3
13.	1	4	1	0	3	0	0
14.	2	1	0	0	1	1	1
15.	4	8	2	0	3	0	0
16.	9	7	6	0	4	0	0
17.	3	3	2	0	4	0	0
18.	6	4	4	0	3	2	0
19.	1	1	1	0	1	0	1
20.	6	5	3	0	3	0	0
21.	2	4	2	4	4	0	4
22.	4	5	1	3	4	0	0
23.	5	8	2	6	4	0	2
24.	3	6	2	4	4	0	0
25.	7	7	5	6	4	0	0
26.	2	6	1	5	4	0	3
27.	2	1	1	1	1	0	1
28.	5	6	0	1	3	0	0
29.	5	5	0	4	4	0	0
30.	5	2	0	2	2	3	2
31.	3	7	0	7	4	0	0
Mean	**4.09**	**4.77**	**1.84**	**2.35**	**3**	**0.32**	**0.97**
SD	**1.97**	**1.81**	**1.67**	**2.22**	**0.98**	**0.69**	**1.25**

The statistical forms of the same patients contained only 93 diagnoses and 93 ICD-10 codes. It is easy to see that 55 diseases were not reported in statistical forms. The accordance in ICD-10 codes in medical and statistical documentation was noted only in 30 cases (out of 148 in clinical and out of 93 in statistical documentation). The diagnoses were identically written down in the medical and statistical forms only in 10 cases. All of this means poor completeness of statistical data presented as MZ/Szp-11.

It is obvious, that no rule nor any regularity could be found when each patient's documentation was analyzed. In some cases the number of final diagnoses was greater than the initial ones – in other patient quite opposite phenomena were noted. The only exception is MZ/Szp-11 in which all parameters (diagnoses and codes) are fully in accordance one with another, but not with the medical documentation.

Procedures

Both, the names of procedures and their ICD-9 codes were placed into statistical forms with different frequency (mean $3{,}00 \pm 0{,}98$ per case). In two fatal cases no procedures were noted in the statistical form. In the rest 29 forms the number of procedures ranged from 1 to 5. However, it should be stressed that the actual number of procedures performed should be many times higher. First of all, the International Classification of Medical Procedures contains the routine procedures performed every day at every ward. Here are the most often of them:

89 Interview, evaluation, consultation, and examination
- 89.0 Diagnostic interview, consultation, and evaluation
- 89.7 General physical examination
- 89.6 Circulatory monitoring

99 Other non-operative procedures
- 99.0 Transfusion of blood and blood components
- 99.1 Injection or infusion of therapeutic or prophylactic substance
- 99.2 Injection or infusion of other therapeutic or prophylactic substance
- 99.6 Conversion of cardiac rhythm

It is impossible to diagnose the patient without examination and to treat her/him without injections at the hospital. The lack of such procedures in statistical form strongly indicates that the medical personnel did not register all procedures, but chose some of them to write down in MZ/Szp-11. The following procedures were noted there:

1. Electrocardiogram 93% of patients
2. Routine chest x-ray, so described – 45% of patients
3. Electrographic monitoring – 24% of patients

4. Diagnostic ultrasound of heart – 18% of patients
5. Diagnostic ultrasound of abdomen and retroperitoneum – 12% of patients
6. Computerized axial tomography of thorax – 12% of patients
7. Cardiovascular stress test using treadmill – 9% of patients
8. Cardioversion – 6% of patients
9. Diagnostic ultrasound of head and neck – 3% of patients
10. Diagnostic ultrasound of peripheral vascular system – 3% of patients
11. Electrographic monitoring of blood pressure Holter's type – 3% of patients
12. Gastric lavage – 3% of patients
13. Injection or infusion of therapeutic or prophylactic substance – 3% of patients

All these are the cases of serious underreporting of the procedures independently from the types of patients and their diseases.

Discussion

According to WHO guidelines (2007) the purposes of medical documentation are as follows: communication, accountability, fulfilling legislative requirements, research, quality improvement, funding and resources management [28]. The quality of medical information is well documented condition indispensable for patient safety, effective treatment, good practices, effective management and health policies [5, 9, 26]. Twenty years ago Burnum stated that "medical record information has become less reliable than ever before despite the electronic information revolution in medical care and the authority medical records have been accorded in our society" [2]. In contrast to such skeptical but well documented opinion, at present some Polish experts strongly believe in the revolutionary changes in Polish health care system caused by the Ordinance on Medical Documentation issued by the Minister of Health on December 2010 [22, 24]. Six years ago Hillestad et al. were suggesting that electronic medical record system may transform health care [10]. Similar opinion was presented by Wright et al. who proposed a method for automated inference of patient problems from electronic medical record if the data were structured and knowledge-based [29]. In spite of numerous guidelines and standards on medical documentation [1], evaluation of electronic health records [21], the quality of medical data still should be improved.

Medical documentation according to the National Council of Quality Assurance (NCQA) may be a crucial factor for evaluating the quality of

services [28]. The following 6 (out of 21) parameters are core components of a medical record for quality assurance:

- Significant illnesses and medical conditions are indicated on the problem list.
- Medication allergies and adverse reactions are prominently noted in the record.
- Past medical history.
- Working diagnoses are consistent with findings.
- Treatment plans are consistent with diagnoses.
- There is no evidence that the patient is placed at inappropriate risk by a diagnostic or therapeutic procedure.

All of this information may be retrieved from electronic or paper patient's record if it is structured in a correct way. However, narrative text may be also a good source of information [18]. Pullen and Loudon present 17 purposes of the clinical record [23]:

- To act as a working document for day-today recording of patient care
- To store a chronological account of the patient's life, illnesses, its context and who did what and to what effect
- To enable the clinician to communicate with him- or herself
- To aid communication between team members
- To allow continuity of approach in a continuing illness
- To record any special factors that appear to affect the patient or the patient's response to treatment
- To record any factors that might render the patient more vulnerable to an adverse reaction to management or treatment
- To record risk assessments to protect the patient and others
- To record the advice given to general practitioners, other clinicians and other agencies
- To record the information received from others, including carers
- To store a record to which the patient may have access
- To inform medico-legal investigations
- To inform clinical audit, governance and accreditation
- To inform bodies handling complaints and inquiries
- To inform research
- To inform analyses of clinical activity
- To allow contributions to national data-sets, morbidity registers, etc.

Corrao et al. strongly advised to test the electronic health or medical record system before implementation [4]. However, if the correct and precise data are provided to an electronic system of information the results may be very effective in clinical terms [17, 19]. On the other hand, defi-

cit or lack of appropriate communication and information transfer between medical institutions and doctors may worsen the quality of care and patient safety [15]. Also Kaczmarek et al. claim the poor quality of medical records from the perspective of social security institution [13]. In this case insufficient information meets the overload of information in medical records. Both are not supporting the decision making in individual cases of patients at the Institution of Social Securities. Several years ago, in a study of the influence of specialists supervision on the quality of medical documentation in occupational medicine, Kacprzak et al. postulated that the supervision improves the quality more than legal regulations [12]. According to results presented here, the author may only confirm this controversial opinion, as the quality of medical documentation was higher than the statistical information. Medical documentation was carefully reviewed by the senior doctor in a ward. Statistical forms were simply delivered to statistical offices.

Medical records and statistical forms in presented material seem to function independently one from another. The completeness of information is much better in medical record than in statistical forms, but the consistency seems to be better in statistical documentation. As the result, we may obtain at least two different pictures of hospitalization: statistical – with clear and consistent but not complete information, and clinical – (more complete, valid and accurate) representing more dynamic approach to the processes of diagnosing and therapy. Those two pictures overlap one another only in minor extend. However, similar problems on the inaccurate and incomplete data obtained from common structured sources like patient problem list and billing data were discussed by Wright et al. [29]. Jordan et al. also stated the varied quality of morbidity coding, even in computerized general practices [11]. Fontaine et al. concluded that the potential for health information exchange to reduce costs and improve the quality of health care in ambulatory primary care practices is well recognized but needs further empiric substantiation [6].

The quality of primary data is an important factor influencing the healthcare organization, health policy and/or evaluation of effectiveness of health care. Serden et al. connected the prospective payment system with the primary and secondary diagnoses in health care [25]. They suggested that introduction of DRG-based systems, irrespective of use, focuses on recording diagnoses and therefore increases the number of diagnoses. This makes the value of accurate reporting of primary diagnoses for administrative purposes. However, collecting the valid, accurate and complete data is the problem even in big computerized systems.

Good quality data enable the evaluation of geographic variation in diagnosis frequency as well as the risk-adjustment. Among fee-for-service Medicare beneficiaries, there is an inverse relationship between the regional frequency of diagnoses and the case-fatality rate for chronic conditions [27]. That opinion may radically change the approach of decision makers to the diagnoses in medical documentation.

However, the problem is difficult to solve. In recent publication, Hansen et al. concluded: documentation of discharge process components in the medical record may not reflect actual discharge process activities [8]. Alternatively, mandated discharge processes are ineffective in preventing readmission. The observed absence of an association between discharge documentation and readmission indicates that discharge quality improvement initiatives should target metrics of discharge process quality beyond improving rates of documentation.

So the problem of quality of medical and statistical data persists irrespectively from the country and experience in paper forms, electronic forms of patient record, electronic medical record, electronic health record or so. The development of document-centered electronic patient record (EPR) or the more conventional approach – data-centered EPR would lead to the solution combining both of them [18]. Similar actions should be undertaken to combine medical and statistical data in a tightly linked system. Further investigations on the causes of discrepancies between medical and statistical forms and reports are required to elaborate the most effective legislative, organizational and informatics solutions.

Conclusions

1. The quality of medical and statistical data in patients' documentation should be improved, as the remarkable portion of diagnoses stated in medical documentation are not present in statistical forms.
2. Serious underreporting of procedures was observed in statistical forms.
3. Medical data are of high completeness, validity and accuracy but of relatively low consistency in contrast to statistical data representing poor completeness but high consistency.
4. Further investigations are needed to reveal the most important reasons of discrepancies between medical and statistical data.

REFERENCES

[1] AMA and Medicare's 1997 Documentation Guidelines for Evaluation and Management Services.

[2] Burnum J. F., The Misinformation Era: The Fall of the Medical Record, Annals of Internal Medicine, 110, pp. 482–484, 1989.

[3] Clinical Documentation & Compliance Manual. A Guide to Documentation, Coding, and Billing of Medical Services for Compliance. Prepared by the University of North Texas, Regulatory Compliance Office, 1997.

[4] Corrao N. J., Robinson A. G., Swiernik M. A., Naeim A., Importance of Testing for Usability When Selecting and Implementing an Electronic Health or Medical Record System, Journal of Oncology Practice, 6 (3), pp. 120–124, 2010.

[5] Drozdowska U. (red.), Dokumentacja medyczna, Cegedim, Warszawa, 2011.

[6] Fontaine P., Ross S. E., Zink T., Lisa M. Schilling L. M., Systematic Review of Health Information Exchange in Primary Care Practices, Journal of American Board of Family Medicine, 23, pp. 655–670, 2010.

[7] Guidelines for Medical Record and Clinical Documentation. WHO-SEARO coding workshop September 2007.

[8] Hansen L. O., Amy Strater A., Smith L., et al., Hospital discharge documentation and risk of rehospitalisation, British Medical Journal – Quality and Safety, 20, pp. 773–778, 2010.

[9] Hass-Symotiuk M. (ed.), System pomiaru i oceny dokonań szpitala, ABC Wolters Kluwer, Warszawa, 2011.

[10] Hillestad R., Bigelow J., Bower A., et al., Can Electronic Medical Record Systems Transform Health Care? Potential Health Benefits, Savings, And Costs, Health Affairs, 24 (5), pp. 1103–1117, 2005.

[11] Jordan K., Porcheret M., Croft P., Quality of morbidity coding in general practice computerized medical records: a systematic review, Family Practice, 21, pp. 396–412, 2004.

[12] Kacprzak E., Michalak J., Wągrowska-Koski E., Wpływ nadzoru specjalistycznego na jakość dokumentacji medycznej w służbie medycyny pracy. (The contribution of specialist supervision to the quality of medical documentation in occupational health services), Medycyna Pracy, 48 (4), 1997.

[13] Kaczmarek T., Marcinkowski J. T., Szozda R., et al., Jakość dokumentacji medycznej widziana z perspektywy potrzeb Zakładu Ubezpieczeń Społecznych (The quality of the medical records seen from the perspective of needs of the Institution of Social Securities), Orzecznictwo Lekarskie, 7 (1), pp. 66–73, 2010.

[14] Kikano G. E., Goodwin M. A., Stange K. C., Evaluation and Management Services A Comparison of Medical Record Documentation With Actual Billing in Community Family Practice, Archive of Family Medicine, 9, pp. 68–71, 2000.

[15] Kripalani S., LeFevre F., Phillips C. O., et al., Deficits in Communication and Information Transfer Between Hospital-Based and Primary Care Physicians. Implications for Patient Safety and Continuity of Care, Journal of American Medical Association, 297, pp. 831–841, 2007.

[16] Kristianson K. J., Ljunggren H., Gustafsson L. L., Data extraction from a semi-structured electronic medical record system for outpatients: A model to facilitate the access and use of data for quality control and research, Health Informatics Journal, 15 (4), pp. 305–319, 2009.
[17] Liesenfeld B., Heekeren H., Schade G., Hepp K. D., Quality of Documentation in Medical Reports of Diabetic Patients. International Journal for Quality in Health Care, 8 (6), pp. 537–542, 1996.
[18] Lovis C., Baud R. H., Planche P., Power of expression in the electronic patient record: structured data or narrative text?, International Journal of Medical Informatics, 58–59, pp. 101–110, 2000.
[19] Milewski R., Jamiołkowski J., Milewska A. J., et al., The system of electronic registration of information about patients treated for infertility with the IVF ICSI/ET method, Studies in Logic, Grammar and Rhetoric, 17 (30), 2009.
[20] NCQA: Guidelines for Medical Record Documentation.
[21] NIH, National Institutes of Health National Center for Research Resources. Electronic Health Records Overview, MITRE Center for Enterprise Modernization. McLean, Virginia, April 2006.
[22] Nyczaj K., Rewolucyjne zmiany w dokumentacji medycznej, Medicalnet, http://www.medicalnet.pl/Rewolucyjne-zmiany-w-dokumentacji-medycznej, wiadomosc,13,styczen,2011.aspx.
[23] Pullen I., Loudon J., Improving standards in clinical record-keeping, Advances in Psychiatric Treatment, 12, pp. 280–286, 2006.
[24] Rozporządzenie Ministra Zdrowia z dnia 21 grudnia 2010 r. w sprawie rodzajów i zakresu dokumentacji medycznej oraz sposobu jej przetwarzania, Dz.U. 2010, nr 252, poz. 1697, str. 17424–17444.
[25] Serdén L, Lindqvist R, Rosén M., Have DRG-based prospective payment systems influenced the number of secondary diagnoses in health care administrative data?, Health Policy, 65 (2), pp. 101–107, 2003.
[26] Skurka M. A. (ed.), Health Information Management: Principles and Organization for Health Information Services, Jossey-Bass A Wiley Imprint, Chicago AHA Press, 2003.
[27] Welch H. G., Sharp S. M., Gottlieb D. J., et al., Geographic Variation in Diagnosis Frequency and Risk of Death Among Medicare Beneficiaries, JAMA, 305 (11), pp. 1113–1118, 2011.
[28] WHO guidelines. The purpose of medical documentation, 2007.
[29] Wright A., Pang J., Feblowitz J. C., et al., A method and knowledge base for automated inference of patient problems from structured data in an electronic medical record, JAMIA, 18 (6), pp. 859–867, 2011.