Quality of the information contained in the minimum basic data set: Results from an evaluation in 8 hospitals

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Abstract. To assess the quality of the information included in the minimum basic data set (MBDS) of the eight public hospitals of the Murcia region in order to ascertain what should be improved to be valid and reliable. An external encoder performed a recoding of a random sample of hospital discharges, using the patients hospital records and comparing afterwards the information obtained with the one reflected in the MBDS databases. Quality was assessed using 12 criteria. The reviewed discharges sample consisted at least of 96 cases per hospital (Type I error = 0.05, Type II = 0.10, for the most unfavorable case). A total of 796 cases were reviewed. The MBDS disagreement percentages with the patient record data were higher for the clinical data, with 41.6% for the main diagnosis and 33.5% for the main surgical procedure, being in both cases higher in those

hospitals that had used to codify just the discharge record with regard to those that did so with

the complete patient record. The variation rate in the diagnosisrelated group (DRG) assignment was of 29.6%, and there was a decrease in the casemix index of 1.07397 when reviewing with the patient record to 1.05555 in the MBDS. Within the administrative data, the highest disagreement rate was for the physician that signs the discharge (60.5%) and the patient's address (31.6%). In many of these assessed aspects there are significant differences between hospitals. A reliability problem was identified in the collected data, which mainly affects the clinical variables. It is therefore advisable to carefully assess the use of this information (both the MBDS directly as well as its grouping through the use of patient classification systems), and the indicators derived from it as its quality is not guaranteed. Systematic assessment and quality control of the MBDS production is advised.

Key words: Information systems, MBDS, Quality control

Definitions: INSALUD: A central Institute that manages the health care system in the Autonomous Regions to which health care system management has not been; Patient or complete hospital record: It's the dossier that files all the documents generated by all health care episodes for a same patient in the same hospital; Statisticalclinical sheet or hospitalization summary sheet: a document that contains the administrative and clinical summary data of a single episode, and it is utilized

essentially for statistical purposes; Discharge record or report: a document that summarizes a hospital episode. It contains both administrative and clinical information. It is regulated by law, signed by the physician in charge of the hospital episode it refers to, and it is meant to inform the patient, primary health care physicians and the MBDS about the care provided.

Introduction

The hospital discharge minimum basic data set (MBDS) consists of a set of clinical and administrative variables, which should be collected when discharging in each hospitalization case in all Spanish hospitals. The Autonomous Regions and the INSALUD send it to the Spanish Ministry of Health to conform a nationwide database. The MBDS was approved in Spain in 1987 by the National Health System Interterritorial Council, having as a basis the recommendation made by the European Union to develop the European minimum basic data set [1] (Table 1), and it has become an information system of great importance within the hospital sector, with various applications such as quality management, the study of hospital morbidity, services utilization, planning and distribution of health resources, funding, study of health care services efficiency, and clinical and epidemiological research [26].

All these potential and important uses of the MBDS can be jeopardized in the event of a deficient (TABLE 1).

quality in the recorded information [2, 3, 724]. However, although the utilization of the MBDS data is increasing, little research has been done in Europe to compare and asses the quality of the information in multicenter studies to be able to improve it, if appropriate, and ensure that the conclusions that its use may lead to are not biased or systematically wrong. This is the reason why the present study is carried out, in order to identify the main problems or quality improvement opportunities in the MBDS in the Murcia region public hospitals, so that they can be used as guidelines for the introduction of corrective measures to make it reliable and valid.

Methods

The Murcia region has eight public general hospitals that range from 102 to 944 installed beds. The MBDS databases (whose variables are shown in Table 1) of all of them were evaluated, using 12 quality criteria elaborated by the research team within a wider MBDS project that started assessing the MBDS information and data production circuits in our region [25]. These criteria were the following.

19. The MBDS administrative data (date of birth, gender, address, payment system, admission date, admission type, discharge date, discharge type and physician who signs the discharge) have to coincide with those abstracted from the patient record.

10. The MBDS main diagnosis should be the one that motivated the admission, and should not differ from that abstracted from the patient record.

11. The MBDS main surgical procedure has to be the one that being related with the main diagnosis, be identified by looking at the patient record.

12. The diagnosisrelated groups (DRGs) and the casemix index obtained from the MBDS have to coincide with those abstracted from the patient record.

The DRGs have been elaborated in both cases with the APDRG10.0 version (all patients DRGs, 10.0 version), and, once they are obtained, it has been assessed the percentage of cases that were classified in a different DRG in the recoding with the patient medical record with regard to the original MBDS. The casemix index indicates the complexity of the patients been cared for, in terms of costs. Low index means low complexity of the patients serviced. The index that has been used was the one calculated by the statistics application called MedigesAPDRG

10.0 as a weighted average, weighted by the number of patients of the different DRGs.

The number of discharges assessed in each hospital was at least 96 (Type I error = 0.05, precision = 0.10, for the most unfavorable case). The selection of discharges to be evaluated was obtained through proportional stratified random sampling per hospital department, establishing a mechanism of substitution that consisted of the abstraction and assessment of the patient record corresponding to the following random number, in the event of the one selected not being found or not containing neither the discharge report nor the statisticalclinical sheet that belongs to that case. A total of 796 cases were reviewed.

An external encoder, whose usual responsibility is the MBDS codingand who also had great experience in auditingits quality, performed a recodingof each case. She reviewed each selected medical record using all patient record documents correspondingto the specific MBDS recorded health care episode, proceeding afterwards to compare that information with the MBDS one that was sent to the Ministry of Health, calculating the disagreement rates for each criterion. Moreover, and as far as criteria 10 and 11 are concerned (main diagnosis and main surgical procedure), it was compared the disagreement rates of the five hospitals that used just the discharge report when codifying, with the other three that did so having as a basis the complete patient record. The external encoder used the complete patient record in all cases given that our objective was to evaluate to what extent the MBDS reflected the care provided in the episode, regardless the actual data source that the hospitals may have used. The discharge report, if complete

and accurate, may have sufficient clinical information for the MBDS, but there were doubts about its reliability.

The definitions and coding systems used for the variables are those that appear in the Instructions for the minimum basic data set completion (MBDS) in the INSALUD hospitals [26]. As far as the physician that signs the discharge is concerned, the internal coding systems used by most hospitals were admitted as valid. In the case of the clinical variables, the ICD9MC was used.

Estimates of disagreement rates for each criterion were calculated with 95% confidence intervals for the region's total, calculating the exact intervals from the binomial distribution in the event of not being fulfilled the conditions to apply the normal approximation [27]. The formula for weighted nonproportional stratified samples was used, considering each hospital sample as a stratum of the regional total.

To assess the statistical significance of the particular validity problems for each hospital, the disagreement rates of each criterion were compared to the region's average, using the z value of the difference between an observed rate (each hospital) and a theoretical one (the region's average). Alternatively, the x2 with Yates correction was used in the event of nonfulfillment of the conditions to apply the normal distribution (np and nq 5). To compare the disagreement rates for the main diagnosis and the main surgical procedure among the hospitals that used exclusively the discharge record when codifying with those hospitals that used the complete medical

record, it has been used the z value for the difference between two rates. In all cases, two tails statistical significance has been calculated.

To highlight the more frequent quality defects on

which to focus an eventual intervention to improve, we use a Pareto analysis considering disagreement with the external encoder as a quality defect. Pareto analysis ranks type of defects in descending order in relation to their frequency, and calculates cumulative percentages over the total number of defects found in the sample, so that the so called 'vital few' type of defects or causes of quality failure (those whose cumulative frequency altogether is above 6070%) could be clearly identified.

RESULTS

Quality of the codified information

Regarding the nine criteria for administrative data (Table 2) we found a disagreement rate of (31.6%)for the address variable and (60.5%) for the physicianthatsignsthedischarge, whereas for the rest it was always lower than 5%. When analyzing the information by hospital we found a significant variability: in the case of the address variable all disagreement rates were statistically

significant (with higher values in two of the centers and lower values in the other six) with regard to those of the region's total. Concerning the physician that signs the discharge, the differences were statistically significant in seven hospitals (in four of them with higher values and in the other three with lower figures) in relation to the region's average. In relation to the rest of administrative data, there was a hospital with higher, statistically significant disagreement rate as far as the payment system is concerned, other hospital with regard to the admissiondate variable and a third one for the admission type and discharge type. In general, a hospital stands out with the highest, statistically significant, disagreement rates for the variables relating to address, payment system and physician that signs the discharge. Another hospital presents high disagreement rates, although not statistically significant, for most administrative data (date of birth, gender, payment system, admission type, and discharge type).

The disagreement rate for clinical data (Table 3) was, for the region's total, 41.6% for the main diagnosis and 33.5% for the main surgical procedure. There was significant variability when analyzing the information by hospital. With regard to the main diagnosis, we found higher, statistically significant disagreement rates in two of them in relation to the region's average. Concerning the main surgical procedure, four centers presented statistically significant divergences in relation to the region's average (with higher values in three of them and lower in the other hospital).

When comparing, in global terms, the disagreement rates of the hospitals that used exclusively the discharge record when codifying with those that did so having as a basis the complete patient record, we find that, concerningthe main diagnosis, the obtained disagreement values were 44.7 and 39.4%, and 46.8 and 24.3% respectively regarding the main surgical procedure. As it can be seen, in both cases the disagreement rates were higher for the hospitals that used exclusively the discharge record. This difference was statistically significant for the main surgical procedure ($p < 0.001$).

Practical effects of the encountered problems

As a result of the identified disagreements, there was a 29.6% variation rate in the DRG assignment for the region's total, which ranges by hospitals from

16.2 to 42.3%. This variation rate also means a decrease, for the analyzed sample, in the casemix index of 1.07397 with the patient record to 1.05555 with the MBDS that was sent to the Ministry of Health.

Discussion

Validity and generalization level of the data from this study

A possible limitation of this study is that the external encoder, who has performed the field work, has not been assessed by other encoders, which can condition the use of data from her evaluation as golden pattern to assess the MBDS samples of the analyzed hospitals. We may emphasize however the fact that she is an expert encoder, who is highly trained and experienced in the medical records coding field, as well as in performing audits to asses their quality. On the other hand, as the same professional has performed the recoding for all hospitals, it has been possible to avoid interobserver variability. Testretest reliability was not performed mainly due to the external encoder longstanding experience and level of expertise, and, related to that, also because we thought that we would need a large sample and/or a long period of time between evaluations to avoid the result being influenced by recall bias.

The causes of the encountered differences should not only be searched for in the quality problems of the analyzed information, but also in the different methodologies that were used. In this study the information from the complete patient medical record is compared with the MBDS data, as it is done by Guilabert in Spain [21] and in some of the studies carried out at international level [2, 3, 79, 1117].

The generalization of these results to other autonomous region or to other specific hospitals outside the scope of this study should be carefully performed due to the wide variability in quality as well as in the data production circuits and

responsibilities that may exist among hospitals [25]. This variability makes us think, nevertheless, about the need to evaluate each hospital in particular, and about how inadequate it would be to conclude that the MBDS quality is generally assured.

Low disagreement in the administrative data, except for patient address and physician who signs the discharge, and important deficiencies in clinical information

The administrative data (Table 2), usually computerized at the patient' admission to the hospital, present in this study as well as in other similar studies [2, 3, 7 and 17] (Table 5), the lowest disagreement levels. The gender, the date of birth as well as the admission date, showed in this study disagreement rates that are higher than those found in the published literature, being these similar in the case of the payment system, and lower, except in one case, for the discharge date [2, 3, 7 and 17]. When analyzing the information by hospitals (Table 2), the highest, statistically significant disagreement rates that were found for the address variable in two of the centers with regard to the region's total were due to the low percentage of its fillingin and, moreover, in the case of one of them, to the fact that this variable is coded in its internal information system, not as postal code as it is recommended for the MBDS recommends, but as a basic geographical health area [25], which could mean in the later recoding an additional

source of errors. With regard to the physician that signs the discharge, we can emphasize the high, statistically significant, values found in four hospitals (Table 2), which were due to the fact that, in some occasions, the admissions physician was automatically recorded (in two of them this took place due to a computer error). The lowest, statistically significant disagreement values of a hospital can be due to the fact that the coding of that field is performed on the medical record, directly by clinical physicians. The disagreement rates found in this particular center, with the admission not computerized, for the rest of administrative data (date of birth, gender, payment system, admission type and discharge type), are in accordance with some authors' findings that state that data computerization improves data quality [3, 18].

The higher disagreement rates are found for the clinical data (Tables 3 and 5), and thus, and as far as the main diagnosis is concerned, in this study it could be seen a 41.6% disagreement, which is higher than that obtained by most North American studies that have evaluated uniform hospital discharge data set (UHDDS) data from the patient medical record [2, 3, 7, 10, 11, 13, and 17]. In Spain, some studies that assessed the quality of this variable in the discharge logbook [19] and in the hospitalization summary sheet [18] with regard to the patient medical record have found 54 and 12.5% disagreement rates respectively. As far as the main surgical procedure is concerned, the disagreement found in this study is considerably higher than that found in North American studies that had used a similar methodology [2, 7, 17]. When analyzing the information

by hospitals we can appreciate that two of them present higher statistically significant disagreement rates (Table 3), for the main diagnosis as well as for the main surgical procedure. This was due to the fact that, in one of the cases, the clinical data coding was temporally carried out by a nursing assistant, as the person that is usually in charge of this task was off due to maternity leave. In this hospital, the disagreement rate for the main surgical procedure was of 100%. The reason was that they wrote down the surgical procedures in the section that corresponds to diagnostic and/or therapeutic procedures. It may seem anecdotal, but it happened and went unadverted, and, with the current system, it may happen again in this or in any other hospital. In the other hospital, which also presents the highest disagreement percentages for the main diagnosis, the coding was not centralized and was performed by different staff from different departments. These facts

support the idea that the hospital should have qualified encoders, with specific training on this field, as many physicians are not familiarized neither with the ICD9MC nor with the coding rules [8, 12]. Other authors state, however, that direct coding by physicians can collaborate in diminishing the number of errors, as the number of codes is reduced in each specialty, and it is therefore possible to give a more adequate interpretation of the diagnosis [22]. However, and in order to improve data quality, it seems that is important to provide

feedback of the information to the clinical physicians, who must supervise the coding duties [2, 10, 20].

In this study higher disagreement rates are found, as far as clinical data is concerned (main diagnosis and main surgical procedure), in the hospitals that used just the discharge report when coding, compared to those that used the complete patient record. However, if complete and accurate, the discharge report may be sufficient as clinical data source for the MBDS. Concerning this issue, some authors claim that the use of the discharge record as a MBDS source has appeared as little reliable and comprehensive, lacking compliance with its (legally regulated) minimum compulsory contents and accuracy [21]. Our study indirectly confirms this concern. On the other hand, to be able to obtain quality discharge reports, it is necessary greater awareness and training among physicians concerning the use and importance of the information they contain [10].

Consequences of the deficient quality: limitations and potential problems in the use of the MBDS

One of the main applications of the MBDS at present is to use it to obtain the DRGs. In this study, it has been found a 29.6% variation rate in the DRG assignment (Table 4). In the reviewed literature, this value is only surpassed by the 37% and 61.1% found by Doremus [10] and the 65% of Schraggenberger [15], ranging the studies between 8.9 and 65% [712, 1416, 21]. When

studying by hospitals the variation rate in the DRG assignment, we found two hospitals that presented higher, statistically significant values than those found for the region's total, which is related to the high disagreement rate encountered for the same ones in relation to the clinical variables, as the main diagnosis and the main surgical procedure are the main variables that have an influence on the DRG assignment [7].

The casemix index obtained from the information that was sent to the Ministry was lower than the one obtained with the recoding from the complete patient record. This means that, if we took as a golden pattern the data obtained by the external encoder, and if a hospital payment system was adopted on the basis of a DRG, the fall in this index would have meant an important economic loss for the studied hospitals. This finding coincides with that obtained by other authors, who state that information quality problems condition the obtaining of different casemix indexes, which may have an effect on funding [911].

What to do to improve?

From the previous results, which can be seen summarized in the Paretó s diagram shown in Figure 1, we can conclude that there is a wide improvement margin that should guide the introduction of corrective measures. As we can see, from the 1670 total disagreements, near 80% are attributable to 4 out of the 12 analyzed criteria, that must be, therefore, be prioritized in

the introduction of corrective measures. The relevant variables on which to focus the improvement are the physician who signs the discharge, the clinical variables and the address. The precise steps and responsibilities within the to which these criteria may refer within the MBDS production process should be considered by hospital; in a previous study [25] we reported widely different MBDS production processes among the studied hospitals. Generally speaking, however, the physician who signs the discharge, is a variable that should be abstracted from the discharge report, making sure that this document fulfils the requirements stated by legislation regarding quality and the minimum compulsory contents [24, 28]. This is also valid in the case of clinical variables. As far as these variables are concerned, it would also be very useful to continuously update the International Diseases Classification, which may help to solve the problems that, nowadays, the ICD9MC presents as a diagnostic classification system for hospital care [3, 13, 23 and

29], along with the provision of continuous training, on diagnosis and procedure coding to the professionals responsible for these duties [24].

The quality of the address variable also presents a wide improvement margin. This variable should be codified with the postal code, which should be obtained in the admission process either directly from the patient or using existing computer

databases that automatically give the postal code by introducing the patient's address.

Considering the extensive current and potential managerial and epidemiological uses of this widely used information system, our study suggests that it would be advisable to routinely assess its quality, and to control that this quality is continuously maintained throughout the time. Otherwise, the results of any study based on the MBDS information may be considered of doubtful validity.

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Table 1. Hospital discharge minimum basic data set as recommended by the EU and approved by the Spanish National Inter-territorial Health Council, 1987

1. Hospital identification
2. Patient identification
3. Date of birth
4. Sex
5. Address
6. Payment system
7. Admission date
8. Admission circumstances
9. Discharge date
10. Discharge circumstances
11. Identification of the physician who signs the discharge
12. Diagnoses

Main Other

13. Other procedures
14. Surgical and obstetric procedures

TABLA 2 Disagreement percentage for the administrative data, Public General Hospitals of Murcia

	Disagreement (%)							
	Region total	H2	H3	H4	H5	H6	H7	H8
Date of birth	2.4 (1.1-3.7)	4	1	1	3.1	4	3	3
Sex	1.1 (0.2-2)	0	1	3	2.1	1	1	1
Address	31.6 (29.4-33.7)	100*	99*	4*	7.2*	3*	6*	9*
Payment system	2.2 (0.95-3.5)	7*	2	0	3.1	1	0	1
Admission date	0.76 (0.25-1.3)	2	1	4*	1	2	0	0
Admission type	1.9 (1.3-2.5)	3	1	—	3.1	—	5*	0
Discharge date	0.4 (0.004-0.7)	1	0	0	1	1	0	1
Discharge type	4 (2.1-5.9)	2	2	1	3.1	1	8*	1
Physician who signs the discharge	60.5 (57.8-63.2)	98*	25*	50.5 *	3.1*	74*	66	24*

* $p < 0.05$; percentages and confidence interval at 95%.

Table 3. Disagreement percentage for the main diagnosis and surgical procedure, General Public Hospitals of Murcia

Criterion	Disagreement (%)								
	Region total	H1	H2	H3	H4	H5	H6	H7	H8
Main diagnosis	41.6 (37.4-45.9)	41	39	40	34.3	57.7*	56*	33	35
Main surgical procedure[a]	33.5 (28.5-38.5)	18.9*	52.1*	29.5	41.1	51.8*	100*	23.1	22.73

[a] Considering only patients who have been operated on; * $p < 0.05$. Percentages and confidence interval at 95%.

Table 4. Variation rate of the DRG assignment, General Public Hospitals of Murcia, 1996

	Region total	H1	H2	H3	H4	H5	H6	H7	H8
Variation rate in the DRG assignment	29.6 (25.7-33.4)	26	39*	31	16.2*	42.3*	31	25	27

* $p < 0.05$; percentages and confidence interval at 95%.

Table 5. Chronological summary of main disagreement rates obtained in studies on MBDS-like data quality

Author	Year published	Data year and country	Sample size	Date of birth or age	Sex	Payment system	Admission date	Discharge date	Main diagnosis	Main surgical procedure	DRGs	Evaluated document
Demlo	1978	1974 (USA)	Medicare 4.745		-	0.6	-	0.5	0.7	42.8	21.1	- UHDDS data
frompatient record		Private 3.3012.3		0.9	1.9	0.3	0.8	34.8	26.8	-	UHDDS data from	
record Corn	1981	1977 (USA)	New Jersey 2.774		-	0.3	-	-	-	18.5	-	patient - UHDDS
data from record Williams	1982	1979 (USA)	Iowa	0.1		0.4	1.9	0.1	0.4	19	13	patient - UHDDS
record Doremus	1983	1978 (USA)	Medicare 262				-	-	-	-	-	patient 32.1 54.5
	37	DR from patient record							47.7	90.2	61.1	UHDDS data from DR
Cohen	1985	1982-1983 (USA)	Medicare/medicaid 1.027		-	-	-	-	20.2	-	17.5	UHDDS data from patient record
Lloyd	1985	1982 (USA)	Veteran administration 1829		-	-	-	-	-	-	19	UHDDS data from patient record UHDDS data from patient record
Schraggenberger	1986	1984-1985 (USA)			-	-	-	-	-	-	-	-
65 en											DRG 88	
Gonza' lez	1987	1985 (Spain)	Catalonia 721		-	-	-	-	12.5	-	-	HSS with patient medical record

Iezzoni	1988	1984-1985 (USA)		Boston	1.003	-	-	-	-	-	-	UHDDS data from patient record		
	-	25.9 in acute myocardial infarct.												
Holderman	1988	1985 (USA)	Washington	100	-	-	-	-	-	-	-	UHDDS data from patient record		
	30 en DRG 468													
Hsia	1988	1984-1985 (USA)		Medicare	7.050	-	-	-	-	-	-	-	20.8	
	UHDDS data from patient record													
Mart1' nez cases	1991	1985 (Spain)	Seville	2.634	-	-	-	-	-	54 all	-	-	DRB from patient medical record	
										10 cases with diag.				
Hsia	1992	1988 (USA)	Medicare	2.451	-	-	-	-	-	-	-	-	14.7	UHDDS
data from patient record														
Bischofberger	1992	1985 (Spain)	Madrid	787	-	-	-	-	-	-	-	DRB from DR		
	11 all cases													
										25 more than one diag.				

Green	1993	1988	(USA)	Medicare	2.579	0.5	0.3	-	-	-	9	-	-	UHDDS data from patient record
Colin	1994	1990	(France)	Lyon	593	-	-	-	-	-	-	-	8.9	UHDDS data from patient record
Guilabert	1995	1993	(Spain)	Elche	717	-	-	-	-	-	-	-	29.99	CMBD data from patient record
Renau	1996	1995	(Spain)	Castello' n	135						18.5			DR from patient record
											20			MBDS data from patient record

DRB = Discharges register book; UHDDS = uniform hospital discharge data set; DR = discharge report; HSS = hospitalization summary sheet

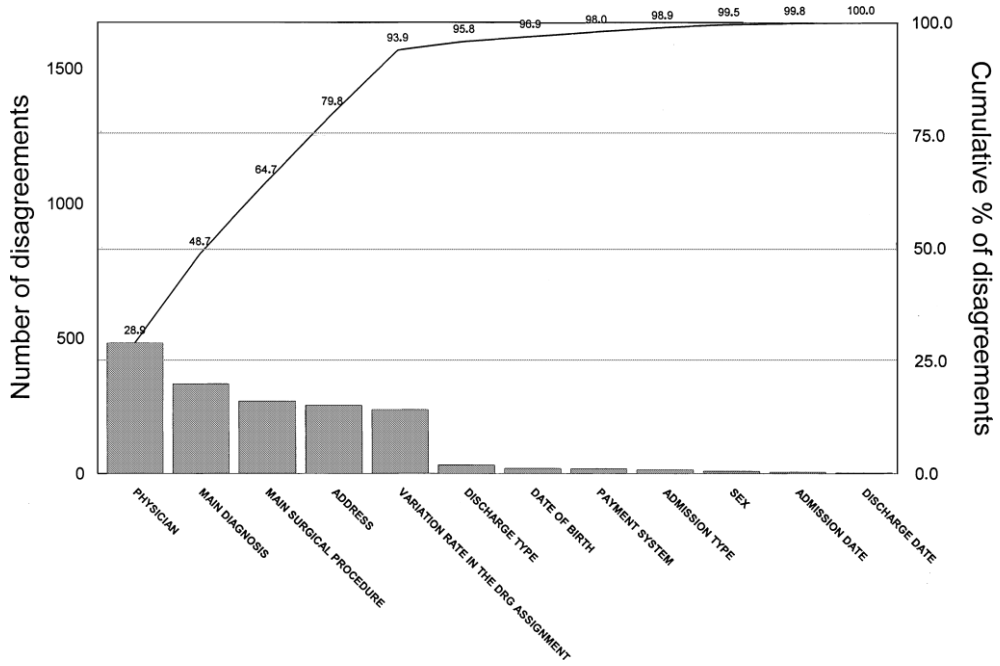

Figure 1. Patient-records data-MBDS Paretos diagram.