Accuracy of an Electronic Problem List from Primary Care Providers and Specialists

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Abstract

Accurate patient problem lists in Electronic Health Records (EHRs) are valuable tools for improving the quality of care, communication among professionals, facilitating research, quality measurement and the implementation of clinical decision support systems. However, problem lists are frequently inaccurate and out-of-date, and use varies widely across providers. These deficiencies limit problem list benefits.

We decided to check if accuracy of problem lists -assessed at a granular level of detail- registered in EHRs depended on the specialty of the physician (primary care providers vs. specialists), and in the event that such differences did occur, whether or not accuracy had also been affected by the work environment.

By using registered problems and taking the generated clinical document, we designed a cross-sectional survey following the guidelines of the Clinical Document Architecture standard.

Problems registered by primary care providers have a higher level of accuracy than those registered by specialists in all settings considered (emergency unit, inpatient and outpatient).The work environment also significantly affects the accuracy level of problems registered.

Keywords:

Problem-oriented Medical Records, Problem List, Electronic Health Record.

Introduction

In the late 1960s, Weed published his ideas about the Problem-Oriented Medical Record (POMR). The POMR itemizes and monitors each medical problem. This "problem list" should be a dynamic "table of contents", which can be updated at any time [1]. Nowadays it is a structural component of most Electronic Health Records (EHRs) [2]. The completeness and accuracy of the problem list have become the most important features to measure record quality [3]. An updated quality problem list, with an adequate level of detail improves communication among health professionals [4], the quality of patient attention and safety [5]. Accurate problem lists also help health care plans and programs improve care and guarantee the implementation of clinical decision support systems.

Despite these numerous benefits, problems lists are often inaccurate, incomplete, and out of date [7], and the provider attitudes toward, and use of, the problem list vary widely [8]. When the use of an electronic problem lists by primary care providers and specialists was evaluated, inaccuracy in the rec-

ords was responsible for the majority of the problem documentation [9].

Knowledge of problem list documentation quality -at a granular or detail level- and of possible differences in the provision of details by professionals and of other aspects concerning the use of the problem list is necessary to understand the development of tools that reflect the patients' clinical situation with the highest degree of accuracy.

This study will assess whether or not differences in the accuracy of problems entered in an EHR by primary care providers or specialists exists. In cases where these differences occur, impact of work environment will also be analyzed. Additionally, we intend to assess the match between the problems registered with its supporting information.

Materials and Methods

This study was carried out at the Hospital Italiano of Buenos Aires (HIBA), an academic medical center equipped with 750 beds. Annually, the hospital discharges 50,000 patients and provides 2.8 million outpatient visits. The hospital has a Health Maintenance Organization with 150,000 members. HIBA uses a problem-oriented EHR [10] that registers the care process of patients in all settings (outpatient, inpatient, emergency unit, and home care). This EHR is equipped with an interface that allows registration of problems. It also uses centralized terminology services [11], with different narrowing options to find registers entered by professionals through a SNOMED CT-related interface terminology [12]. All clinical documentation actions registered by a professional are stored in one session, from the moment he logs into the patient's medical record to the moment he logs out. This information is stored in a document that is formatted following the Clinical Document Architecture (CDA) standard [13].

A cross-sectional survey was conducted using problems registered between September 1st, 2012 and November 30th, 2012. Problems entered by physicians using EHR from the outpatient, inpatient and emergency care unit areas during the same time period were included. Problems entered and undergoing revision -as they had not been controlled by the interface terminology- and problems entered by non-physicians were excluded.

Problems entered in the time period were the analysis unit. For this purpose, a random sample was selected and was categorized by the patient area (outpatient, inpatient and emergency care unit) and by the specialization of the physicians. The physician's specializations were divided into (i) Primary Care Providers (PCP) which included specializations such like internal medicine, family medicine, pediatricians, adolescent

medicine, gerontologist and palliative care; and (ii) Specialist Providers (SP) which included the remaining clinical and surgical specializations.

The level of accuracy (granularity or level of detail) of the problem registered in the EHR was assessed with the information contained in the CDA document of the session where a new problem was registered. The assessment was carried out in an independent and double-blind manner where two physicians acted as a PCP and the other as a SP, both of them with over 10 years of practice. The problem and the CDA document of the session where the new problem had been created were provided to them. The information in the CDA varied according to the function of the actions of the physician, which might only include the entering of the problem, or the problem along with additional pieces of information (i.e.: the progress note, referrals, orders, medication, etc). In the case of non-coinciding assessments, a third assessment was carried out by the other PCP. Each group of problems was analyzed according to the position of the physician registering the problem (PCP or SP) and according to the work environment where such entering was done.

Problems were grouped according to the information contained in the CDA as shown below:

1. Problems that did not have supporting information linked to the same session register where the problems had been registered.

2. Problems that had enough supporting information linked to the same session register where the problems had been registered. This group was divided into:

    2.1. Problems whose clinical sessions register (CDA) offered additional information in some of the following characteristics:

    - anatomical placement
    - laterality
    - clinical course
    - periodicity
    - severity in connection with the problem.

    It is assumed that the level of detail of the problem was lower to the information contained in the CDA of the session.

    2.2. Problems whose session register (CDA) did not offer additional information in the characteristics mentioned above, thereby assuming that the problem registered had a level of detail that was adequate according to the clinical information contained in the CDA document of the session.

Grouped problems were compared with chi-square test according to the area of care (outpatient, emergency care unit and inpatient) and group physician (PCP vs. SP) and the month and day of the week. Continuous variables were compared using Wilcoxon-Mann-Whitney test. The analysis was performed using SPSS version 17.0 software. Statistically significant p values less than 0.05 were considered.

Results

During the period between December 1st, 2011 and November 30th, 2012, 764,590 new problems were registered in the EHR, 438,694 of which were generated in the outpatient area, 300,582 in the emergency care unit and 132,954 in the inpatient area. Taking into account the specialization of the physician that registered the problem, 285,076 problems were registered by the PCPs and 479,514 by the SPs.

A random sample of 1,800 problems registered during September 1st, 2012 and November 30th, 2012 was considered and grouped by 300-problem clusters according to the area of attention and specialization of the physician. Out of the 1,800-problem sample for the period, 1,623 problems (90%) were included for analysis. Ninety-seven problems were discarded because they were registered by non-physicians (nurses and kinesiologists) and seventy-one problems were also excluded because of lack of information on physician identification as generalist or specialist. Six cases were also discarded because the problems were in revision status by the terminology server audit system and three more cases eliminated because the assessment was incomplete since the patients had left the emergency unit.

Out of the total of 1,623 problems, 563 belonged to the outpatient area, 521 to the emergency area, and 539 to the inpatient area. On the other hand, out of the above mentioned total, 880 problems were registered by PCPs and 743 by SPs. The different types of specialty and the distribution of the problems in the random sample taken in the three months period are showed in the Table 1.

Table 1 – Types of specialty and the distribution of the problems in the random sample

PCP	Num. Problems	SP	Num. Problems
Internal Medicine	573	Traumatology and orthopedics	160
Family Medicine	148	Obstetrics	100
Pediatrics	128	General surgery	89
Adolescent Medicine	12	Cardiology	61
Geriatrics	12	Gynecology	44
Palliative Care	7	Ophthalmology	39
		Otolaryngology	32
		Psychiatry	26
		Urology	26
		Dermatology	20
		Emergency medicine	20
		Rheumatology	17
		Endocrinology	15
		Oncology	15
		Hematology & hemotherapy	14
		Neurology	14
		Nutrition	12
		Gastroenterology	11

Analysis of the supporting information for the accuracy evaluation

Out of the 1,623 problems analyzed, 1,358 (83,7%) of them were supported with information in the CDA session and only 265 (16.3%) were not. This means that the session summary (CDA) did not contain information that allowed verifying where the problem belonged to and the problem detail level. The rates classified by area of attention are shown in Table 2, the differences among the areas being significant (p lower than 0.0001).

Table 2 – Supporting information of problems registered by area of attention

Area of attention	Number of problems (%)	Supported problems (%)	Unsupported problems (%)
Outpatient	563	520	43
Emergency	521	413	108
Inpatient	539	425	114
Total	1623 (100)	1358 (83.7)	265 (16.3)

The results of the supporting information by physician group was not significant p=0.384. Table 3 shows data in percentage terms.

Table 3 – Supporting information of problems registered by physician group

Group	Number of problems (%)	Unsupported problems (%)
PCP	880 (54.2)	141 (16.0)
SP	743 (45,7)	124 (16.7)
Total	1623 (100)	265 (16.3)

No significant difference was found (p=0.195) in the analysis of the supporting information during the three months where the samples were taken nor during the weekdays (p= 0.988). Tables 4 and 5 show the corresponding distribution. The assessment of the supporting information distributed by hour did not show any significant evidence: p=0.178.

Table 4 - Supporting information of problems registered by month

Month	Number of problems (%)	Unsupported problems (%)
September	499 (30.7)	86 (17.2)
October	824 (50.7)	122 (14.8)
November	300 (18.4)	57 (19.0)
Total	1.623 (100)	265 (16.3)

Analysis of the accuracy of the problem according to the supporting information.

Out of the 1,358 problems that had supporting information in the session register (CDA), 1,118 (82.3%) showed a terminology description with a degree of accuracy comparable to the contents of the session register, whereas 240 problems (17%) showed an accuracy level inferior to the detail in the corresponding session register.

Table 5 – Supporting information of problems registered by day.

Day	Number of problems (%)	Unsupported problems (%)
Sunday	110 (6.7)	17 (15.5)
Monday	206 (12.7)	33 (16.0)
Tuesday	318 (19.6)	52 (16.4)
Wednesday	257 (15.8)	43 (16.7)
Thursday	299 (18.4)	47 (15.7)
Friday	291 (17.9)	52 (17.9)
Saturday	142 (8.7)	21 (14.8)
Total	1.623 (100)	265 (16.3)

Figure 1 shows the frequency of problem occurrence with good accuracy (blue) and problems with low accuracy with that shown in the session register (green) distributed by the months when the problem was registered, being the difference not significant: (p=0.623).
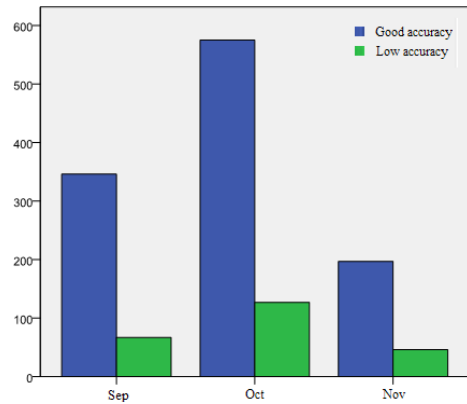

Figure 1- Accuracy of problems by month

The analysis of the registers distributed by weekdays was not of significant value (p=0.771) neither was the assessment distributed by hour (p=0.487). The frequency of problems with good accuracy objectifiable by the CDA of the session (blue) and problems with low accuracy (green) distributed by hour can be seen in Figure 2.
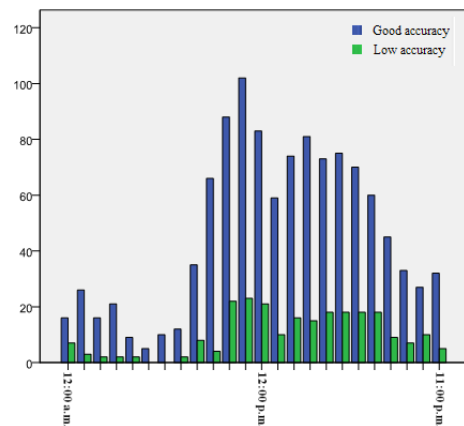

Figure 2 - Accuracy of problems by hour

Once the granularity of area of attention has been analyzed, it can be seen that the resulting differences are statistically significant, with a p lower to 0.0001 (Table 6).

Table 6 – Level of accuracy by area of attention

Area of at-tention	Supported Problems (%)	Good Accu-racy (%)	Low Accu-racy (%)
Outpatient	520 (38,3)	420 (80,8)	100 (19,2)
Emergency	413 (30,4)	305 (73,8)	108 (26,2)
Inpatient	425 (31,3)	393 (92,5)	32 (7,5)
Total	1.358 (100)	1.188 (82,3)	240 (17,7)

Likewise, the accuracy assessment by physician group shows a statistical significance: with a p value lower than 0.0001 (Table 7).

Table 7 - Supporting information of problems registered for physician group.

Area of at-tention	Supported Problem (%)	Good Accu-racy (%)	Low Accu-racy (%)
PCP	739 (54,1)	646 (87,4)	93 (12,6)
SP	619 (45,9)	472 (76,3)	147 (23,7)
Total	1.358 (100)	1.188 (82,3)	240 (17,7)

Finally, the granularity connected with the environment and with the physician groups are also significant between them with a p value below 0.001 (Table 8 and 9).

Table 8 – Level of PCP accuracy by area of attention

Area of at-tention	Supported Problem (%)	Good Accu-racy (%)	Low Accu-racy (%)
Outpatient	273 (36,9)	235 (86,1)	38 (13,9)
Emergency	227 (30,7)	188 (82,8)	39 (17,2)
Inpatient	239 (32,3)	223 (93,3)	16 (6,7)
Total	739 (100)	646 (87,4)	93 (12,6)

Table 9 – Level of SP accuracy by area of attention

Area of at-tention	Supported Problem (%)	Good Accu-racy (%)	Low Accu-racy (%)
Outpatient	247 (39,9)	185 (74,9)	62 (25,1)
Emergency	186 (30,0)	117 (62,9)	69 (37,1)
Inpatient	186 (30,0)	170 (91,4)	16 (8,6)
Total	619 (100)	472 (76,2)	147 (23,8)

Discussion

There are different strategies to achieve an adequate accuracy in a problem list. Strategies include complying with rules [14, 15], using natural language processing techniques [16], and allowing the patient to adopt an active role [17]. Users feel that the level of accuracy is not always adequate [8]. The rate of use of problem lists by PCPs or SP show noticeable differences [9]. The present study assesses the variations in the accuracy level in the problem-registering process and we found that problems registered by PCPs are more accurate – when measured by the degree of details provided or granularity-than those registered by SP in all the areas considered.

We found that there are no significant differences between the data assessed by month, day or hour when the random sample was taken. This is valid not only when there is, or there is not supporting information but also when the granularity thereof is assessed. Consequently, we infer that the sample reflects the assessed period of time. As for the acting professionals (PCP and SP), they are different populations as much in their role in patient care as in other characteristics as well, apart from the fact that they interact with different groups of patients. Notwithstanding, it is important to highlight that we have not found significant differences in both groups (PCP and SP) in connection with the lack of supporting information to the problem entered in the session record. This means that both groups adopt similar practices at the moment they register problems in the EHR, when they register a progress note of patients, requesting orders, referral with specialists, or recording indications that allow verifying the registered problem. The situation, however, is different when we analyze the information in terms of work environments where it can be observed that the emergency unit and the inpatient area show a similar rate of problems without supporting information. This problem rate is high compared to that of the outpatient environment.

As for the primary objective of this study, we found that the PCPs register problems with a higher degree of detail or granularity (87,4%) than that of the specialists (76,3%), which is a statistically significant difference with a p value lower than 0,0001. The data of the accuracy by environment are statistically significant among them, which allows us to say that problems registered upon hospitalization are notoriously better in connection with their granularity or degree of detail (92,5%), followed by the ambulatory consultations and lastly by the emergency care unit (73,8%).

The amount of problems registered by SPs in another survey on this topic [9], was far less than the amount we found in the present study. This can be explained by the compulsive nature of problem registering in the EHR at HIBA. The fact that PCPs register problems with a higher degree of accuracy than the SPs is in line with a quantitative analysis carried out by the same authors in other studies [8], given the higher level of accuracy found in the problems registered by a PCP in all environment considered.

Additionally, the finding of a 16% rate of problems without supporting information in the session record means the problem is not only verifiable with extant data in the record session where they were generated. Consequently, 84% of assessed problems are verifiable, 17,7% of which have a lower degree of details or granularity than the corresponding record session.

Limitations

This work has several limitations. The first one is related to the use of session record represented by the CDA, since the

assessment of the clinical case with the patient *in situ* is the best gold standard to measure the degree of accuracy of a problem registered by the physician. We cannot assume that all physicians document in a similar way or in a complete manner. Since problem registering to the list is mandatory in the EHR of HIBA, it is not possible to compare our results with other published works in a direct manner. Taking into account the work of Wright et al [9], in connection with a more frequent use of the list by the PCPs, both groups must register any problem before creating a clinical report, requesting tests or consultations with other specialists or beginning a treatment. This study was conducted at a single academic medical center and consequently our results may not be applicable to other sites using a different EHR system.

Conclusion

Our findings show that problems registered to a problem list by PCPs are more accurate -measured by degree of detail or granularity- than those registered by SPs in all the areas considered (ambulatory, emergency and hospitalization areas). Regardless of the physician group considered, the work environment significantly affects the accuracy of the registered problems. Finally, differences of a detailed degree or granularity among the area environments seem to suggest that working on environment-oriented interfaces is required to improve the degree of accuracy of the registered problems in PCP and SP EHR user groups, as well as institutional policies for the correct use of a problem list [18].

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