ORIGINAL ARTICLE

A paired-comparison intervention to improve quality of medical records

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Abstract

Background: To evaluate the quality of medical record (MR) compilation in the Teaching Hospital of the Second University of Naples, Italy, after a controlled intervention for quality improvement.

Methods: From the 66 wards of the Teaching Hospital, we selected eight homogeneous pairs of wards, matched for similar typology. For each pair, we randomized a ward to undergo a training course about correct compilation of MRs (treated group) and considered the remaining ward as a control (untreated group). For each section of MR we evaluated completeness and clarity of handwriting and presence and clarity of signature.

Results: In general, the worst result in both groups was the absence of signature in the daily diary (76.6% in the treated group and 94.4% in the untreated group). The greatest differences between the two groups were detected in the compilation of the daily diary (absent/incomplete in 1.9% of the treated group compared with 21.9% of the untreated group; relative risk [RR] = 11, 95% confidence interval [CI] = 5.1-26.4) and the physical examination section (absent/incomplete in 2.8% of the treated group compared with 21.3% of the untreated group; RR = 7.5; 95% CI = 3.8-14.8).

Conclusions: Comparison between the treated and untreated groups shows that there is a significant improvement in compilation of several sections of the MRs in the treated group. However, the results obtained were only partially satisfactory because of the poor quality of MR compilation in both groups.

Key words

Hospital, Medical records, Quality improvement

1 Introduction

Medical records (MRs) are an important tool for data collection and communication between health care professionals in hospitals. MRs have a variety of uses, in patient care management, quality review, claim filing, education, research and public health. MRs are important for many people: patients (better care), providers (few care-giver difficulties) and professionals (increased knowledge). Research into the content of MRs indicates at least four standards of correct compilation: Completeness (the MR should be fill in all its sections), Clarity (the handwriting and the signature should be

always comprehensible), Traceability (in each moment it should be possible to trace the activities, the documents and the responsible operators), and Truthfulness (the events should be wholly reported, in the way they occur and as quick as possible). Nevertheless, MRs are rarely compiled in a satisfactory way [1-7].

At the Teaching Hospital of the Second University of Naples, Italy, we have been trying to improve the quality of MR compilation for several years. In a previous study [8], we used a before-and-after methodology in four steps: (1) MR assessment before the quality improvement intervention; (2) a MR quality improvement intervention consisting of sending a letter explaining the purpose of the study, the results obtained in the first step, and the guidelines for correctly completing MRs; (3) a new MR assessment after 4 months; and (4) comparison of the data before and after the distribution of the guidelines, using indicators of completeness of all sections of the MR, clarity of handwriting, and presence and clarity of a signature. The results suggested that simply sending information and guidelines to clinicians was not enough to change their behavior and we found little improvement based on our initial intervention.

The aim of this study, as we suggested in the conclusion of the first study report, is to use a more direct and in-depth method to achieve better results.

2 Methods

2.1 Sampling

Data for the study were collected between January 2011 and June 2011. We performed a two-stage cluster sampling. In the first stage we selected eight homogeneous pairs of wards, corresponding to the 25% of the total, from the 66 wards (cluster) of the Teaching Hospital. Each pair of wards was matched for similar typology and similar results in quality compilation detected in the previous study. Specifically, we selected four pairs of medical and four pairs of surgical wards. For each pair we randomized one ward to undergo a training course about correct compilation of MRs (treated group) and considered the other ward as a control (untreated group). This model is also similar to a community-based intervention trial in which randomization was between groups rather than individuals [9].

Sample size, power and precision

We calculated a sample size, considering the eight clusters of the treated and untreated wards as two single homogeneous groups. Thus, sample size was calculated before study initiation, assuming $\alpha = 0.05\%$, power = 80%, a relative risk ≥ 1.5, and a mean prevalence of 30% of correct compilation in the control group. We obtained a random sample of 626 MRs, approximately 40 MRs for each ward. The statistical significance was set to 0.01. The statistical package SPSS (version 18; IBM Corp., Armonk, NY) was used for the analysis.

2.2 Training course

A total of eight wards (treated group) attended a training course about correct compilation of medical records; each ward sent two nurses and two doctors, for a total of 32 participants. The course lasted 2 hours and included an introduction about legal and health functions of MRs, the analysis of the results of the previous study of MR quality improvement [8], and a discussion of the guidelines for correct MR compilation. We invited the participants to apply the guidelines and to spread them to other operators of the wards in one or more meetings formally recorded.

2.3 Data collection and analysis

Data collection was performed by four physicians (operators) who were not involved in care on the 16 wards and who had been previously trained in two working groups by an expert operator specialized in public health and hospital administration. During these meetings the four operators and the expert operator performed a qualitative approach to concordance among operators analyzing in-depth 30 MRs. Three months after the training course, the operators went to

the 16 wards to select randomly 40 MRs from each ward and to evaluate them for clarity and completeness indicators. The operators were blind to treated and untreated wards and they collected data always in couple. Each operator was assigned causally to another operator and to a treated or untreated ward. The criteria used were adapted from the *Agence Nationale pour le Devèlopment de l'Evaluation Mèdicale* [10] and from the *Joint Commission on Accreditation of Health Care Organizations* [11] criteria. The following sections of the MRs were evaluated: patient identity, patient history, physical examination, daily diary, letter of discharge, and patient chart. For each section, we evaluated the completeness (complete/incomplete) and the clarity (clear/unclear handwriting).

Completeness was defined as follows: for patient identity – name, surname, address, and telephone number of the patient were recorded; for patient history – family, social, present pathological and past pathological medical history were described; for physical examination – organ and apparatus were described for both general and specific parts; for daily diary – diary was updated for each day of stay. We further verified the presence of the letter of discharge and the patient chart in each MR. Signatures in the daily diary and of the attending physician were evaluated as present/absent and clear/unclear.

Clarity was defined as follows: a) the handwriting was clear when almost all (about 90%) words are legible and /or the full sentence was comprehensible; b) the signature was clear when name and surname of the physician were legible for both the operators.

The approval of this study was obtained by the Ethics Committee of the Second University of Naples (study number 2011/41).

3 Results

Table 1 lists data for incomplete or absent MR compilation, and Table 2 lists data for lack of clarity of handwriting. In general, the quality of MR compilation for both groups was poor.

Table 1. Incomplete or absent compilation in each section of MRs

Incompleteness/absence of:	Untreated		Treated		RR	CI	*P*
	N	%	N	%			
Patient identity	0/320	0	0/320	0			
Patient history	8/320	2.5	7/320	2.2	1.1	0.4–3.1	0.79
Physical examination	68/320	21.3	9/320	2.8	7.5	3.8–14.8	<0.00
Daily diary	70/320	21.9	6/320	1.9	11.6	5.1–26.4	<0.00
Letter of discharge	193/320	60.3	165/320	51.6	1.2	1.0–1.3	0.03
Patient chart	251/320	78.4	215/320	67.2	1.2	1.1–1.3	0.001
Signature of attending physician	7/320	2.2	2/320	0.6	3.5	0.7–16	0.09
Signature of daily diary	302/320	94.4	245/320	76.6	1.2	1.1–1.3	<0.00

The worst result was the absence of signature in the daily diary (94.4% in the untreated group and 76.6% in the treated group; Table 1). The best compiled section was patient identity for both completeness (Table 1) and clarity (Table 2).

The daily diary was absent/incomplete in 1.9% of the MRs from the treated group compared with 21.9% of the untreated group (relative risk [RR] = 11; 95% confidence interval [CI] = 5.1-26.4). Similarly, the physical examination was

absent/incomplete in 2.8% of the treated group compared with 21.3% of the untreated group (RR = 7.5; 95% CI = 3.8-14.8). For an additional four items, we found a smaller, but statistically significant, difference between the two groups (patient chart and signature in daily diary in Table 1; signature of attending physician and signature in daily diary in Table 2). Although the treated group had better results than the untreated group for the remaining items (with two exception), the differences were not statistically significant.

Table 2. Poor clarity of handwriting in each section of MRs

Poor clarity of handwriting of:	Untreated		Treated		RR	CI	*P*
	N	%	N	%			
Signature of attending physician	140/313	44.7	86/318	27	1.6	1.3–2.1	<0.00
Patient identity	1/320	0.3	6/320	1.9	0.16	0.02–1.3	0.06
Patient history	47/319	14.7	39/320	12.2	1.2	0.8–1.7	0.34
Physical examination	16/283	5.7	32/318	10.1	0.5	0.3–1.0	0.05
Daily diary	86/313	27.5	38/320	11.9	2.3	1.6–3.2	<0.00
Signature of daily diary	49/55	89.1	82/95	86.3	1	0.9–1.1	0.62
Letter of discharge	5/127	3.9	4/155	2.6	1.5	0.4-5.5	0.42
Patient chart	14/69	20.3	18/105	17.1	1.1	0.6–2.2	0.6

4 Discussion

In the Teaching Hospital of the Second University of Naples and in Italy generally, there is a problem with correct compilation of MRs [12-15]. We have tried to improve this element of hospital care. Results from the first before-and-after intervention, described elsewhere [8], were limited, mainly due to the weakness of the methodology (briefly reported in the introduction). Therefore, we performed the present study as a cohort design comparing an untreated group to a group treated with a training course in correct MR compilation. In addition to our educational model, there are other methods of MR quality improvement: using electronic medical records [16-19], using a personalized self-inking stamp [20-22], and performing a clinical audit [23].

There is a broad consensus on potential benefits of electronic medical records, but in general there are often resistances to adopt them. In our hospital both lack of knowledge about electronic MRs and scarcity of resources are obstacles for electronic medical records implementation. The personalized self-inking stamp is a simple and useful method to improve the legibility of signature, but does not impact the clarity of handwriting or completeness of the section of MR. The audit is not so used in our country, essentially for a lack of cultural background about peer-review process between professionals.

In our study, the treated group had better MR compilation than the untreated group, with the greatest significant differences being in completeness of the daily diary and completeness of the physical examination section, and this represents a better result than that of our previous before-and-after intervention. However, these results are still unsatisfactory as a good compilation of MRs implies complete compilation and clarity of all items. The main reasons are probably the following; first, we did not have the strong support of the hospital management in promoting and performing this intervention; second, selecting only two doctors and two nurses from each ward may be not an adequate number of participants in order to determine a significant change; third, from a methodological point of view, study blindness was at

risk of failure as the operators collected the MRs and completed the evaluation forms directly in the ward, where the staff knew the allocation of treated or untreated group.

The results of this study suggest two further interventions: performing a new intervention with the removal of the above limitations and conducting a follow up analysis to determine if the intervention is sustained.

Conflicts of interest

The authors declare that they have no competing interests.

Authors' contributions

Francesco Attena, the principal investigator, designed the study, contributed to statistical analysis and interpretation, and wrote the article. Concetta P Pelullo was coordinator and main operator of data collection in the wards, performed data entry, and organized and conducted the training course. Sergio Esposito participated in the design of the study and in writing the article and was responsible for statistical analysis and interpretation. Erminia Agozzino was responsible for organization of the study, made and maintained contact with the wards, contributed to statistical analysis and interpretation, and conducted the training course. All authors have read and approved the final version of the manuscript.

References

[1] Winslow EH, Nestor VA, Davidoff SK, Thompson PG, Borum JC: Legibility and completeness of physicians' handwritten medication orders. Heart Lung. 1997; 26: 158-164. http://dx.doi.org/10.1016/S0147-9563(97)90076-5

[2] Attena F, D'Agostino F, Oriente P, Chignoli V, De Paola A. Intervento di miglioramento della qualità di compilazione della Cartella Clinica. Ig Sanita Pubbl. 2003; 59: 157-166. PMid:14576862

[3] Cardo S, Agabiti N, Picconi O, Scarinci M, Papini P, Guasticchi G, Gentile D, Forastiere F, Arcà M, Volpe M, Perucci CA.. La qualità delle Cartelle Cliniche: uno studio retrospettivo nella Regione Lazio, Italia. Ann Ig. 2003; 15: 433-442. PMid:14969296

[4] Farhan J, Al-Jummaa S, Alrajhi AA, Al-Rayes H, Al-Nasser A. Documentation and coding of medical records in a tertiary care center: a pilot study. Ann Saudi Med. 2005; 25: 46-49. PMid:15822494

[5] de Mul M, Berg M. Completeness of medical records in emergency trauma care and an IT-based strategy for improvement. Med Inform Internet Med. 2007; 32: 157-167. PMid:17541865 http://dx.doi.org/10.1080/09670260701231284

[6] Dunlay SM, Alexander KP, Melloni C, Kraschnewski JL, Liang L, Gibler WB, Roe MT, Ohman EM, Peterson ED.. Medical records and quality of care in acute coronary syndromes: results from CRUSADE. Arch Intern Med. 2008; 168: 1692-1698. PMid:18695085 http://dx.doi.org/10.1001/archinte.168.15.1692

[7] Mishra AK, Bhattarai S, Bhurtel P, Bista NR, Shrestha P, Thakali K, Banthia P, Pathak SR. Need for improvement of medical records. JNMA J Nepal Med Assoc. 2009; 48: 103-106. PMid:20387347

[8] Attena F, Di Palma MA, Esposito S, Galdo V, Gimigliano A, Parmeggiani C, Agozzino E. Quality improvement of medical records in a teaching hospital. J Prev Med Hyg. 2010; 51: 53-56. PMid:21155405

[9] Atienza AA, King AC. Community-based health intervention trials: an overview of methodological issues. Epidemiol Rev. 2002; 24: 72-79. http://dx.doi.org/10.1093/epirev/24.1.72

[10] Agence Nationale d'Accréditation et d'Èvaluation en Santé. "Èvaluation de la tenue du dossier du malade. L'évaluation des pratiques professionnelles dans les établissement de santé". Paris 1994.

[11] Joint Commission on Accreditation of Healthcare Organization (J.C.A.H.O.). Comprehensive Accreditation Manual for Hospitals: The Official Handbook; Oakbrook Terrace, IL 2003.

[12] Terranova G, Cortesi E, Briani S, Giannini R. Analisi di qualità della Cartella Clinica come strumento del Risk Management. Ig Sanita Pubbl. 2006; 62: 371-385. PMid:18536760

[13] Attena F, Panico G, Troisi MR. Appropriatezza d'uso dell'ospedale e qualità della cartella clinica. QA. 2002; 13: 155-160.

[14] Occorsio V. Cartella clinica e responsabilità medica. Milano: Giuffrè Editore; 2011

[15] Pasini E, Ravizza PF. La cartella clinica come documento del sistema di qualità: un esempio pratico. Ital Heart J Suppl. 2004; 5: 112-118. PMid:15080530

[16] Cruz-Correia R, Vieira-Marques P, Ferreira A, Oliveira-Palhares E, Costa P, Costa-Pereira A. Monitoring the integration of hospital information systems: How it may ensure and improve the quality of data. Stud Health Technol Inform. 2006; 121: 176-182. PMid:17095815

[17] Menachemi N, Collum TH. Benefits and drawbacks of electronic health record systems. Risk Manag Healthc Policy. 2011; 4: 47-55. http://dx.doi.org/10.2147/RMHP.S12985

[18] Sheikh A, Cornford T, Barber N, Avery A, Takian A, Lichtner V, Petrakaki D, Crowe S, Marsden K, Robertson A, Morrison Z, Klecun E, Prescott R, Quinn C, Jani Y, Ficociello M, Voutsina K, Paton J, Fernando B, Jacklin A, Cresswell K. Implementation and adoption of nationwide electronic health records in secondary care in England: final qualitative results from prospective national evaluation in "early adopter" hospitals. BMJ. 2011; 343: d6054. http://dx.doi.org/10.1136/bmj.d6054

[19] Hillestad R, Bigelow J, Bower A,Girosi F, Meili R, Scoville R, Taylor R. Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. Health Aff. 2005; 24: 1103-1117. http://dx.doi.org/10.1377/hlthaff.24.5.1103

[20] Daly P, Moloney FJ, Doyle M, O'Mahony JB. Legibility of doctor's signatures: novel approaches to improving an age-old problem. Ir Med J. 2006; 99: 214-215. PMid:16986568

[21] Boehringer PA, Rylander J, Dizon DT, Peterson MW. Improving the quality of the order-writing process for inpatient orders in a teaching hospital. Qual Manag Health Care. 2007; 16: 215-218. PMid:17627216

[22] MacKeith S, Velusamy S, Pajaniappane A, Jervis P. Could Personalised Self-Inking Stamps Improve Identification Standards in Medical Records? Ann R Coll Surg Engl. 2012; 94: 128-130. http://dx.doi.org/10.1308/147363512X13189526440591

[23] Gommans J, McIntosh P, Bee S, Allan W. Improving the quality of written prescriptions in a general hospital: the influence of 10 years of serial audits and targeted interventions. Intern Med J. 2008; 38: 243-248. http://dx.doi.org/10.1111/j.1445-5994.2007.01518.x