Errors on a handwritten Cardex: Is it time for a change?

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ABSTRACT

A medical order is a medical and legal document and careful writing of this document is necessary. In Nepal the medical order in the admitted patients is written on a cardex which is utilised by the nurses to dispense medicines and to follow the doctor's orders. However, with the dawn of the electronic age this is being replaced by a computerized system, which is suggested to be better. The aim of this study was to identify if the existing cardex was adequate for the purpose of writing orders, or whether this needed modification. This was a prospective observational study were 240 cardexes from eight different Departments from the same Medical College Hospital were randomly looked into for errors. Thirteen different parameters were looked into including the legibility/readability of the handwriting. The results suggested the error rates to be high in certain parameters viz. utilization of the columns (77.9%), documentation of allergy history (77.5%), writing the prescribers name (89.6%) and writing date of discontinuation of medicines (62.5%). The handwriting was unreadable or difficult to read in 49.2% of the documents. However, the other parameters also had errors and no parameter was error free. The study suggested the need of the hour was to modify the existing cardex and also to educate the doctors to minimise errors. However, in the future we may have to move towards a computerized system in order to avoid errors related to bad handwriting.

Keywords: Cardex, error, handwriting.

INTRODUCTION

The means of writing orders or prescriptions has changed in recent times with the introduction of computers. However, in Nepal we still write our orders on a cardex which is an order form filled up by the doctors for admitted patients and which is handwritten. A medical order is a medical and legal document; careful writing of this document enables the reduction of many therapeutic errors.[1] Errors may occur during prescribing and more importantly during administration of the medication by the concerned nurses with adverse effects on the health of the patients. These errors in medication documentation have been divided into prescribing errors (found on prescribing sheets, e.g. wrong date, missing information about dosage), transcription errors (occur in the process of transcription from a prescribing sheet to a patient's medication list) and administration documentation errors (errors in the documentation of the actual drug dispensation on the medication list by nursing staff).[2] Medication errors are the second most common cause of patient safety incidents, with prescribing errors an important component of these.[3]

The cardex which is the chart on which the doctor's orders are written is a document which is used in the in-patients of most hospitals in Nepal. The order forms include space for writing the patient identification, medication ordered including dosages, diagnosis and orders for the nursing staff. This has been the system of prescribing medication but this has its drawbacks including errors in prescribing. This study was under taken to identify if the existing cardex was adequate or if it needed modification. We also looked at errors involved in handwritten orders and if they were linked to the cardex.

MATERIALS AND METHODS

This study was a prospective observational study undertaken during the summer of 2011 in a Medical College Hospital, in Kathmandu, Nepal. We randomly picked 30 cardexes each from the eight departments under study and looked at them for various errors. The cardexes were picked on various days of the study period. The errors were documented under various headings and we also took into account the format of the cardex itself to see if the space provided was sufficient for input of the relevant information. The errors were inputted into a pre-made proforma and they were statistically analysed for frequency and cross-tabulated using SPSS 20. The components we looked into regarding the cardex was proper layout of columns and use of columns by the prescriber. We also looked into the prescribing itself to find out errors. The fields looked into were patient identification errors, where we looked

Table-1: Errors in the cardex among the various Departments under study (in percentages)

Variables	Departments															
	A		B		C		D		E		F		G		H	
	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Pt. Identification	60	40	80	20	67	33	67	33	70	30	53	47	83	17	90	10
Ward admitted	28	2	70	30	83	17	73	27	93	7	77	23	100	0	97	3
Use of Columns	37	63	0	30	0	100	10	90	80	20	10	90	40	60	0	100
Start Date	100	0	100	0	77	23	100	0	100	0	97	3	100	0	97	3
Stop Date	10	90	20	80	57	43	40	60	43	57	37	63	53	47	40	60
Allergies	20	80	13	87	10	90	30	70	27	73	40	60	17	83	23	77
Medication order	93	7	63	37	97	3	100	0	93	7	73	27	37	63	63	37
Dosages	87	13	93	7	83	17	83	17	90	10	97	3	97	3	80	20
Doctor's Sign	90	10	53	47	70	30	87	13	100	0	50	50	100	0	87	13
Doctor's Name	7	93	0	100	13	87	10	90	10	90	33	67	3	97	7	93
Instructions	50	50	87	13	77	23	60	40	53	47	60	40	80	20	47	53
Diagnosis	90	10	100	0	97	3	77	23	100	0	97	3	97	3	77	23
Legibility	37	63	43	57	50	50	63	37	57	43	47	53	63	37	47	53

at patient identification features such as name, age, gender and in-patient numbers. We looked at whether the correct ward/department was entered into the cardex sheet. Other parameters we scrutinised were medication dosages and whether they were written in the proper format. We looked at whether the documents were named and signed by the respective prescribers and whether the dates were entered correctly including the start and end dates for medication. We also identified if there were errors regarding the instructions to the nursing staff and the diagnosis. The legibility of the orders written was also looked into, and in order to assess the legibility of the documents they were first scrutinised by ourselves and then we asked the nurses on duty to read the documents to see if they understood the orders clearly. If they could not decipher the writing clearly it was considered illegible and unreadable.

RESULTS

We looked at a total of 240 cardexes (n=240) from the eight departments and documented errors in writing the orders as shown in Fig. 1. Out of this total number of cases the patient identification was correctly entered in 71.2% of cases (n=171), whereas details of the patient were missing in 28.8% (n=69). The place/ward where the patient was admitted was mentioned correctly in 85.8% (n=206) of records whereas 14.2% (n=34) had made errors which mostly included failure to write the ward. We looked at whether the columns in the order sheet were used correctly, and we found only 22.1% (n=53) had medication and instructions written within the columns, however, the majority 77.9% (n=187) did not write within the provided columns. On looking at the start and end dates of medications given 96.2% (n=231) had written the start date with only 3.8% (n=9) not writing the date of commencement. Whereas, only 37.5% (n=90) had written the stop date after crossing out the medication and 62.5% (n=150) had not written any stop date. There was a marked failure to mention the allergy history with only 22.5% (n=54) being written and the majority 77.5% (n=186) having no documentation of allergies. We also looked at the order or correct format of writing medication, where we found 77.5% (n=186) had been correctly written with 22.5% (n=54) erring to write the medications in the correct order. The dosages of the various medications were also analysed and it was found that 88.8% (n=213) had the correct dosages prescribed with 11.2% (n=27) not having the correct dosages. The signature and names of the doctors who prescribed these medications were also scrutinised and it was seen that 79.6% (n=191) had signed for the medications whereas, 20.4% (n=49) had not signed. However, only 10.4% (n=25) of doctors had written their names on the order sheet with 89.6% (n=215) not doing so. We further looked at whether the instructions given to the nursing staff were written clearly and we documented 64.2% (n=154) to be written clearly but 35.8% (n=86) not to be so. The order sheet also has a place to write the diagnosis and it was found that 92.8% (n=220) had the diagnosis written in an understandable manner whereas in 8.3% (n=20) the diagnosis was either missing or not understandable. The handwritten

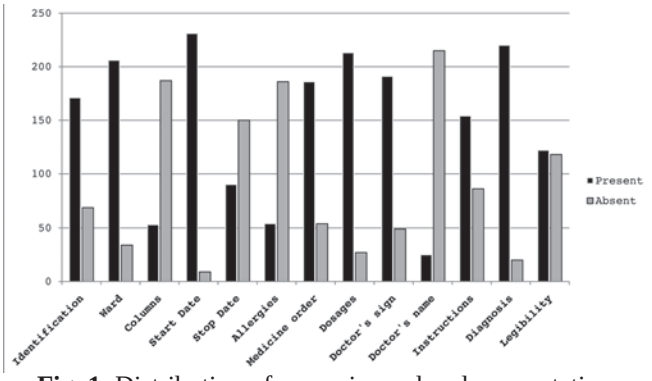

Fig. 1. Distribution of errors in cardex documentation

documents were examined for legibility and it was found that only 50.8% (n=122) files were clearly readable whereas 49.2% (n=118) were difficult or not readable.

We also made comparisons among the different departments involved in the study. Table-1 shows the different parameters looked into and their findings. The numbers are shown as percentages and the Departments have been named from A to H. From this we can see that some parameters have been entered by most Departments e.g. start date of the medications where they have been entered in 100% of cases by five Departments and two others having a 97% entry rate, whereas only one Department has 77%. Whereas, certain parameters like the name of the doctor prescribing the medication were entered only sometimes in all Departments, with the maximum percentage entered being only 33% and in one Department the names were not documented at all (0%). Similarly the use of the columns provided was also lacking with three Departments not using the columns at all (0%). Only one Department used the columns to good effect with a response of 80%. The other parameters and their findings are documented in the Table-1.

DISCUSSION

Prescribing and writing orders is a fundamental part of clinical medicine. It is of paramount importance to try to make this process as error free as possible. This can be helped to a certain degree by providing a properly formatted order sheet or cardex (Fig. 2). As we can see by the results the cardex used in this particular hospital does not seem to fulfil those criteria. The obvious defect in its design being the columns provided. As many doctors (77.9%) did not make use of the columns at all, hence, defeating the purpose of the provided columns. This may be due to the fact that the provided columns are too narrow to fit in the relevant information. However, this leads to confusion for the dispensers of the medication. This probably can be modified as to fit the appropriate information. The cardex also does not provide a separate place to write medicines which are given immediately or statim (stat) and pro re nata (p.r.n.) as required. This may lead to serious consequences where these stat or p.r.n. medicines may be mistakenly used more than required. There is also no signature or name of the doctor following administration of these medicines which again can lead to confusion as to whether the medicines are given or not. However, the nurses have a place to write the names of the given drugs, dosages and time on the reverse of the cardex but sometimes it has been seen that this alone does not prevent errors in administration of medicines. These potentially serious consequences are the reason why it is time we think about re-designing the cardex sheet with appropriate columns and separate spaces for 'dangerous' medication.

Apart from these, errors are also committed by the prescribing doctors. Obviously the definition of errors has been debatable and no fixed set of definitions have been agreed upon. However, Dean's Delphi derived definition seems to take into account various factors associated with prescribing errors in his definition.[4] The other question to ask is why do these errors occur? According to the theories of human error, errors in prescribing as in any other complex and high-risk procedure, are occasioned by and depend on failure of individuals, but are generated or at least facilitated by failures in the system.[5] As discussed earlier failure to design a proper cardex is failure of the system which probably is contributing to the errors generated by the prescribers. This can be further substantiated by the Human Error Theory, which divides errors into individual and system factors. The system must be modified to reduce errors by the individuals. However, it has also been reported by Dean *et al.* using Human Error Theory that 43% of errors were mistakes or violations, whereas 57% were lapses.[6] This is true of our study where a number of errors were due to the individuals. Failure to record the patient's details can lead to serious consequences of giving the wrong medication

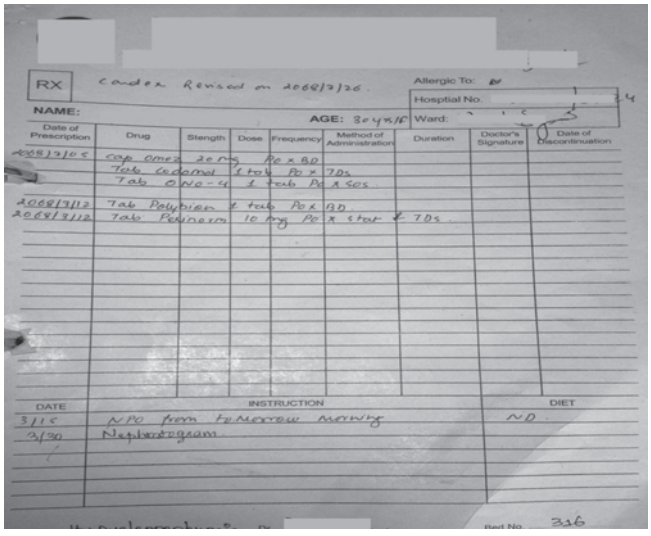

Fig. 2. Cardex used in the Hospital in-patient

to the wrong individual, which can lead to an adverse reaction. Nearly 29% of medication orders did not have the proper details, which is nearly 1/3rd of the documents scrutinised. Similarly, the proper ward where the patient was admitted was not mentioned in 14.2% of the records. This can lead to confusion again with regard to the identity of the patients and also loss of time if an emergency call were to be attended. Although the majority of the doctors had written a start date on the commencement of the medications, only 37.5% had written the stop date. This again can lead to potentially adverse effects. Another very important revelation was the fact that the majority of doctors (77.5%) did not actually mention any allergies in the provided area. This could be due to the fact that the patient did not have any known allergies or they completely ignored mentioning or asking about them. However, the majority of the doctors wrote the medications in the correct order, but some had not written the stat or p.r.n. drugs in the correct order. This obviously may be due to the fact that the cardex does not have a separate area for these kinds of medicines as discussed earlier. The dosages of most medicines were written correctly by the majority of the doctors (88.8%), however, most if not all these medicines were prescribed by their brand names instead of the generic name, as is the practice in most hospitals in Nepal. This can potentially lead to the writing of wrong medicines of similar sounding brand names. It is also possible that the pharmacies which in the majority of cases are not hospital based pharmacies may substitute the medicines to their own liking. McFadzean described a similar error which he included under drug chart errors where he described errors due to inappropriate use of trade names.[7] To improve this aspect the hospital must run a proper pharmacy run by pharmacists where the doctors can prescribe medicines by their generic names.

The majority of doctors prescribing the medicines had signed for them, however, 1/5th of them had not signed. This is a dilemma for the attending nurse, who is required to only give medicines signed by a physician. In fact, the nurses who were questioned regarding this did not have a clear answer, but they were made aware of the fact that medicines that were not signed for could not be given to the patients. However, some of the signs were illegible and the majority of doctors (89.6%) did not write their names alongside the sign or anywhere on the order sheet. Hence, the doctors causing the errors are sometimes difficult to track down as the junior doctors keep rotating between different Departments and units. Similarly, instructions written down on the medication chart were not understandable or clear in 35.8% of cases. This can again lead to mistreatment of the patients with valuable care either not given or a delay in giving care. The cardex also provides a place to write the diagnosis and the majority had written a working diagnosis (92.8%) along with the attending physician's name, although this in most cases was written in short form.

The other major issue looked at was legibility and readability of the written orders. Here it was found only 50.8% of documents were clearly readable however, nearly half the documents were not readable or readable with effort. This figure is high compared to other papers such as Aylamani *et al.* (0.5% illegibility) and Winslow *et al.*, where it was found 20% of documents illegible or readable with effort.[8,9] The illegibility described by Aylamani *et al*. was based on consensus group of physicians, which became higher (2.5%) if the analysis was performed by nurses.[8] However, a study by Hartel *et al*. showed the handwriting to be bad in 52% of cases and unreadable in 4% of cases.[2] In our study it was decided that the handwriting was to be judged by us as well as the attending nurses in an effort to make it as realistic as possible, since the nurses would be the ones reading the orders and dispensing the medicines. The possible cause for such a high rate of unreadable or barely readable documents may be due to the fact that English is not the first language in our country and everyone does not come from an English speaking background.

Most if not all the errors described can be taken as errors in the medication process and they can potentially lead to adverse drug events.[10-14] This can lead to significant morbidity as well as mortality, as suggested in the paper taken out in 1999 "To Err is Human", where it was suggested that medication errors are the eight most frequent cause of death in the United States, more frequent than care accidents, breast cancer, or AIDS.[15] However, data like this is not available in Nepal and it is imperative that we look into this matter and try to make improvements where possible.

As described previously most of the drug prescription and administration process in most hospitals worldwide is still based on handwritten medical chart entries.[16-18] This is fraught with problems as has been documented, but the errors can be reduced if proper steps are taken as in properly made out drug charts (cardex) and education about the way medicines and orders should be written.[19,20] One such resource is the World Health Organization (WHO) Good Prescribing Guide. Studies showed that the use of this guide had positive results in prescribing and there was good retention effect several months post intervention.[21-23] So proper education and intervention as in doing chart rounds on a regular basis may help improve the standard of prescribing and order writing. We should also involve the pharmacists in the ward, and it has been shown in several studies that this approach can reduce

prescribing errors.[7,24,25] However, this may not solve the fundamental problem of poor readability or handwriting.[2] Therefore, a computerized system of order entry viz. Computerized Physician Order Entry (CPOE), a software system is being used these days. Most of the data published supports the claim that CPOE systems provide a valuable solution for improving the quality of the medication process in hospitals.[2,17,26-28] This system however, will not prevent every documentation error, but may even introduce new sources of error and in our context may be expensive.[2] However, this cost may be offset by the potential legal costs involved if bad prescribing is the cause of patient morbidity or mortality.

In conclusion we would like to stress the fact that it is time that we revise the way the cardex in this hospital is formatted and maybe modify it as necessary. It is also imperative that we look at the error fraught process of writing orders and make improvements as necessary. This would mean co-operation among the various faculties and also the Pharmacology Department in order to monitor the medicines prescribed. Proper education and training is a must to improve the standard of order writing and drug prescribing. It is also time we think about moving towards an electronic computerized system of ordering and prescribing as is done in the more developed countries. Our study is however a single centre study and it should be done in other centres also to compare our results and to develop a robust system of order writing and drug prescribing.

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