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A Feasibility Study for Recording of Dispensing Errors and 'Near Misses' in Four UK Primary Care Pharmacies

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Abstract

Medication errors can occur at the prescribing, transcription, dispensing and administration stage of drug therapy. However, publication of the *Organisation with a Memory* (OWAM) by the Department of Health in the UK has raised awareness of the need for pharmacies to collect information about dispensing errors and near misses, which occur within an organisation. Such information provides valuable insights into the vulnerabilities of dispensing procedures and identifies areas for improvement in dispensing systems

The main aim of this study was to investigate the feasibility of a self-reporting system for dispensing errors and near misses in primary care (community) pharmacies. It was also to identify the types of errors or near misses commonly encountered in community pharmacies.

A data collection form was designed and modified for use after a pilot study. Four community pharmacies volunteered to participate in this feasibility study. The data collection was conducted in two phases each of 4 weeks' duration. Any dispensing errors and near misses that occurred during the study periods were recorded by the pharmacy staff in a standard data collection form. A focus group discussion was held with the dispensing staff of participating pharmacies to identify and evaluate the feasibility of the reporting system.

Out of a total of 51 357 items dispensed during the two phases of the study, 39 dispensing errors (0.08%) and 247 near misses (0.48%) were detected. The results show that near misses occurred six times more often than dispensing errors, indicating the importance of final checking in pharmacies. The most common types of dispensing errors or near misses appeared to be incorrect strength of medication, followed by incorrect drug, incorrect quantity, incorrect dosage form

and incorrect label. Feedback during the focus group discussion indicated that the outcome of the self-reporting scheme was more important than the incidence of errors or near misses. Participating pharmacies also agreed that the self-reporting scheme used was feasible and they would continue using the scheme although some incentives would be helpful.

The quantitative results of this study and the qualitative feedback from the participating pharmacies indicate that the self-reporting scheme used is practical and feasible.

Medication errors can occur at the prescribing, transcription, dispensing and administration stage of drug therapy.[1,2] Most of the reports and studies in the literature involve the administration and prescribing stage and/or the impact of pharmacist interventions in detecting and preventing errors in prescriptions.[3-10] Studies on medication errors date back as far as the early 1960s[9] and some countries have set up national error reporting schemes as measures to minimise such risk.[11,12] Secondary care institutions appear to have more organised reporting and auditing systems[2,13-17] than primary care units, although some individual organisations have taken an initiative to report and prevent such errors.[18] The publication of the *Organisation with a Memory* (OWAM) by the Department of Health in the UK[19] has raised awareness of and intensified the need for primary care pharmacy to collect information about dispensing errors and 'near misses', which occur within an organisation. Such information provides valuable insights into the vulnerabilities of dispensing procedures and identifies areas for improvement in dispensing systems.[13] Therefore, the information collected should be used in a clinical governance framework to reduce the risk identified and not to penalise any individual. In the UK, a National Patient Safety Agency (NPSA) has been established and an action plan for implementation of OWAM published in *Building a safer NHS*.[19] One of the four key targets identified is to reduce the incidence of serious medication errors by 40% by year 2005. However, there appears to be a paucity of data documenting medication errors during the dispensing process, especially in primary care, although some such schemes have been launched in the UK.[20,21] Therefore, establishing a dispensing error reporting system within Primary Care Trusts (PCTs) would be in accordance with the clinical governance agenda as well as to serve as a quality improvement measure.

1. Aims

The main aim of this study was to investigate the feasibility of a self-reporting system for dispensing errors and near misses in primary care (community) pharmacies. It was also to identify the types of errors or near misses commonly encountered in community pharmacies.

2. Methods

A near miss in this study was defined as an error in the dispensing process that was identified by the pharmacy staff before the medication was given to the patient. A dispensing error was recorded if the error was discovered after the medication had been given to the patient.

This study was initiated by community pharmacists who attended a research awareness meeting organised by the Hull and East Riding Pharmacy Research Network (PRN) in June 2001. Four community pharmacists and the researchers met to discuss and design the format, content and data collection procedure. The studies by Oborne and col-

leagues[20] and other auditing systems[22] were used as guidelines. The data collection form was formulated based on the experience of the participating community pharmacists. A pilot study was conducted in November 2001 by the four community pharmacies using the first draft of the data collection form. After the pilot study, the identification of the recorder or person who made the error or near miss was included in the data collection form. This was suggested by the participating pharmacies to assist them with internal training and the development of their standard operating procedures but confidentiality was ensured as the data was only analysed quantitatively. In addition, the participating pharmacies agreed to a 'no blame' policy to the reporting and the information collected would only be used to improve the dispensing system.

The modified data collection form was used in this study. It consisted of a 1-page table with columns for recording the date and time of the error or near miss, whether it was a dispensing error or near miss, columns for ticking the types of error or near miss made, a column for describing the error or near miss and a column to record the initial of the person who made the error or near miss. A fresh page was used for the recording each week and the total number of items dispensed per week were also recorded at the end of the table. The back of each form had additional space for comments and description of training or organisational changes introduced as a result of the errors or near misses identified each week.

The study was conducted in two phases each lasting 4 weeks. Phase 1 was conducted between 7 January and 2 February 2002 and phase 2 between 10 June and 6 July 2002. The four community pharmacies that were involved in the design of the data collection form volunteered to participate in this study. A review meeting was held with the pharmacists between the two phases of the study to discuss the methodology adopted. From this meeting, a letter explaining the aims and methodology of the study was sent to the participating pharmacies to encourage better participation of locums in the second phase. After the two data collection periods, a focus group discussion was held with two of the participating pharmacists and their dispensing staff to identify and evaluate any problems in order to improve the reporting system.

Any dispensing errors and near misses that occurred during the two 4-week study periods were recorded using the standard data collection form. Any staff of the participating pharmacies who knew of the error or near miss could do the recording. The pharmacy staff members were trained by their respective pharmacists to fill in the data collection form. Letters were sent by the research team to all staff members in the participating pharmacies to explain the aim of the study and to reassure that no individual sanctions would occur from reporting errors. Ethical Committee approval was not required as the study constituted an internal audit within community pharmacies with no patient details collected.

Error rates in this study were calculated using the total number of dispensing errors and near misses with the total number of items dispensed as the denominator. All data collected was entered and analysed using SPSS version 10.1 for windows. Data was summarised using standard descriptive methods and Pearson chi-square test was used to analyse differences in error rates between phase 1 and 2 with statistical significant level set at ≤ 0.05. The error rates of each pharmacy were also calculated at 95% CI.

3. Results

Four community pharmacies, one from each PCT in Hull and East Riding participated in the study. Three were branches of multiple companies and one was an independent contractor. The workload varied amongst the pharmacies, ranging between 2500 and

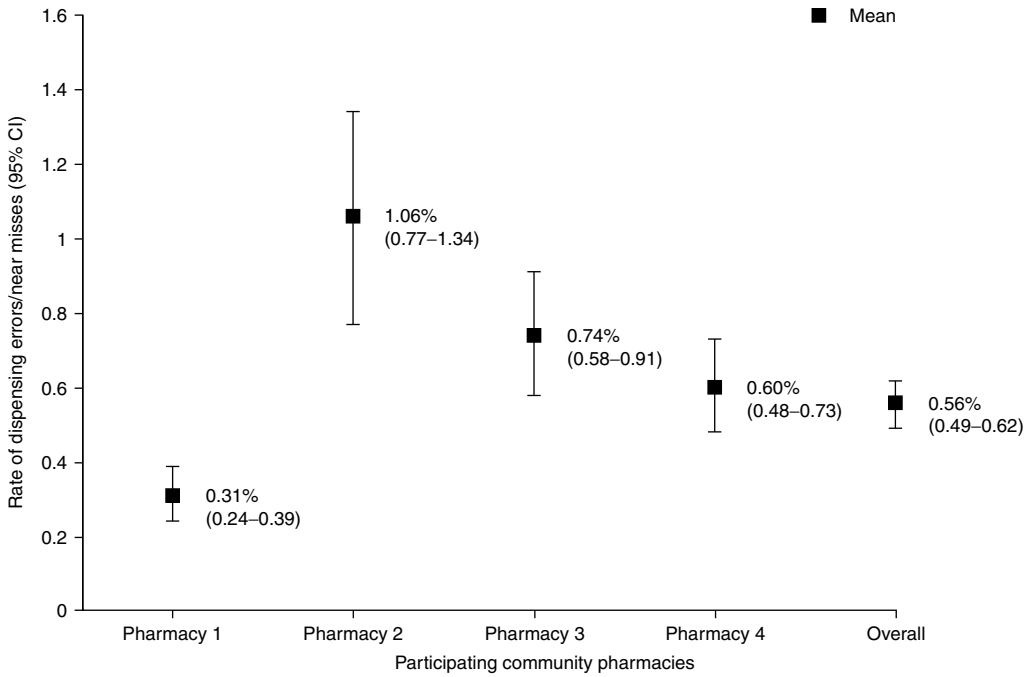

Fig. 1. Comparison of the rate of dispensing errors/near misses recorded between the four community pharmacies.

11 000 dispensing items per month. Qualifications and experience of staff also varied between pharmacies.

Out of a total of 51 357 items dispensed during the two phases of the study, 39 dispensing errors (0.08%) and 247 near misses (0.48%) were detected in 277 items. Nine of the items dispensed had two different errors or near misses detected. This means that for every 10 000 items dispensed, 56 dispensing errors or near misses were reported with 95% CI of 49–62. The incidence of dispensing errors and near misses of the four participating pharmacies were compared as shown in figure 1. The rate of recording in pharmacies 1 and 2 were outside the limits of the 95% CI of the overall combined results of the four pharmacies. Pharmacy 1 recorded the lowest rate while pharmacy 2 the highest.

Since the overall results between phase 1 and 2 were not significantly different (table I), the results of the two phases were combined to analyse the other parameters. The most common types of dispensing errors or near misses recorded were incorrect strength of medication, followed by incorrect drug, incorrect quantity, incorrect dosage form and incorrect label (figure 2). Examples of these are shown in table II, table III, table IV and table V. The high proportion of incorrect quantity was partially due to one of the pharmacies that dispensed 30 tablets instead of 28 tablets 7 times consecutively. Incorrect label constituted mainly the wrong direction or dose for using the drug (16 out of 28 errors that stated this reason). Most of the drugs involved in the dispensing errors or near misses were implicated once only except for a few items such as atenolol (3), Co-Codamol®[1] (codeine phosphate and paracetamol [acetaminophen]) [3], Gaviscon® (alginic acid, dried aluminium hydroxide, magnesium trisilicate and sodium bicarbonate) [3], salbutamol

1 The use of tradenames is for product identification purposes only and does not imply endorsement.

Table I. Near misses and dispensing errors recorded in the two phases of the study

Pharmacy	No. of items		Near misses (%)		Dispensing errors (%)		Total records (%)		Pearson χ^2 test	
	phase 1	phase 2	phase 1	phase 2	phase 1	phase 2	phase 1	phase 2	χ^2	p-values
1	11 910	9382	29 (0.24)	26 (0.28)	5 (0.04)	7 (0.07)	34 (0.29)	33 (0.35)	0.735	0.391
2	2295	2617	23 (1.00)	25 (0.96)	2 (0.09)	2 (0.08)	25 (1.09)	27 (1.04)	0.039	0.844
3	5295	5586	23 (0.43)	49 (0.88)	3 (0.06)	6 (0.11)	26 (0.49)	55 (0.99)	8.963	0.003
4	6698	7574	62 (0.93)	10 (0.13)	2 (0.03)	12 (0.16)	64 (0.96)	22 (0.29)	26.248	<0.001
Total E/NM			137 (0.52)	110 (0.44)	12 (0.05)	27 (0.11)	149 (0.57)	137 (0.54)	0.136	0.712
Total items	26 198	25 159								

E = dispensing errors; **NM** = near misses.

(albuterol) [3], tramadol (3), Tubifast® (an elasticated viscose stockinette) [3], amlodipine (2), aspirin (acetylsalicylic acid) [2], levodopa-beserazide (2), diclofenac (2), insulin lispro (2), Prempak® (conjugate oestrogen and norgestrel) [2] and metronidazole (2).

Only one of the participating pharmacies recorded that training of the staff was conducted and drugs with similar packaging were separated from the storage shelves as a consequence of the reporting. Another pharmacy noted that the staff involved in the error was advised to be careful. The column for identifying the staff that made the error was mainly in initials but in phase 2 of the study, there were many missing data in this column.

At the focus group discussion, the participating pharmacies reported that the attitude of staff members became more positive with training and understanding of the study and with experience. The staff indicated that the outcome of the self-reporting scheme was more important than the incidence of errors or near misses. Participating pharmacies agreed that the reporting scheme used was easy to administer and feasible. They would continue using the scheme although motivation or incentives to fill in the reporting forms and feedback of results from the research team would encourage better response rates. Pharmacies 1, 3 and 4 noted that their locum pharmacists were not enthusiastic about the reporting for fear of litigation. Therefore, no entry was made in the data collection form when the locum pharmacists were on duty. This occurred despite a letter in the pharmacy to explain the importance of the study.

4. Discussion

The rate of dispensing errors reported in this study is much lower than that reported in the literature for hospital pharmacies that used observational or audit methods (0.56% vs 3–12.5%).[23-26] It is also lower than that reported in a study that used test

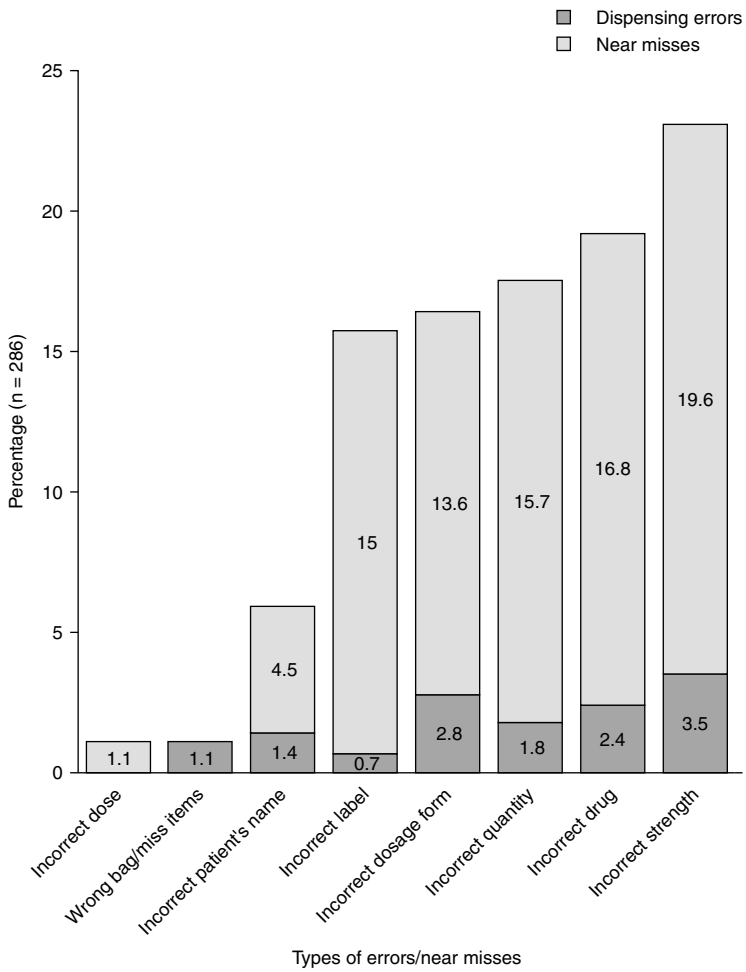

Fig. 2. Types of dispensing errors and near misses recorded.

prescriptions in community pharmacies (24%)[27] but higher than that of other studies in community pharmacies that used the self-reporting method.[20,28] The differences could be partly attributed to the different study designs and operational definitions used.[9] However, under-reporting in the present study could not be ruled out as one of the acknowledged limitations of self-reporting is the possibility of under-reporting of 'trivial' errors especially during busy hours in the pharmacies.[8] Dispensing errors may also have left the pharmacy undetected and if not returned, it would not be reported.[2,26]

Studies using observational design are more reliable in obtaining error rates than self-reporting.[9,10] However, the main aim of our study was not to pinpoint the rate of errors or near misses but more importantly, to develop a system that is feasible and affordable to report such errors so that problem areas and trends could be identified and measures implemented to reduce the risk of occurrence. Since it is the quality of the reporting system rather than the quantity of error reports that is important in our study, we decided that the self-reporting system is

the only feasible and affordable system for long-term use.[29]

The results show that near misses occurred six times more often than dispensing errors. Another similar study in the UK reported 4.75 times.[28] This indicates that final checking in pharmacies is very important to prevent such errors from reaching patients, as agreed by other authors.[15,30,31] The recording of near misses is a proactive approach towards the prevention and minimisation of the risks of drug therapy as it makes the staff more wary and hence, appropriate precautions can be taken.[32]

The higher rate of dispensing errors or near misses reported by Pharmacy 2 may not be evidence of poor practice but more likely that of improved event capture[13] since this pharmacy had the lowest dispensing item volume. Whereas, Pharmacy 1 had the largest dispensing item volume among the four participating pharmacies but had the lowest reporting rate (table I). In addition, Pharmacies 1, 3 and 4 reported that their locum pharmacists did not make any entries when they were on duty.

The high proportion of incorrect strength indicates caution is needed in dealing with drugs that are available in more than one strength. Pharmaceutical manufacturers tend to use very similar packaging to reflect a 'corporate image'. Other studies also found this to be a common cause of medication errors.[14,33] Perhaps, the labelling on the container, shape and colour of each medication should be distinctively different. Some institutions have taken initiatives to reduce this type of error contributed by similarity in

Table II. Examples of dispensing errors or near misses reported: drugs dispensed at the incorrect strength

Drugs	Error
Arthrotec® (diclofenac sodium and misoprostol)	Arthrotec®50 dispensed instead of Arthrotec®75[a]
Aspirin (acetylsalicylic acid)	75mg instead of 300mg
Atenolol	50mg instead of 100mg
Amoxicillin	250mg/5ml instead of 125mg/5mL
Celecoxib	100mg instead of 200mg
Co-codamol® (codeine phosphate and paracetamol [acetaminophen])[b]	8mg/500mg instead of 30mg/500mg
Perindopril	4mg instead of 2mg
Oxybutynin hydrochloride	5mg instead of 2.5mg
Fluticasone propionate	125μg per metered inhalation instead of 250μg per metered inhalation
Flucloxacillin	250mg instead of 500mg
Glyceryl trinitrate	500μg instead of 300μg
Hypromellose	0.3% instead of 0.5%
Metformin	500mg instead of 850mg
Meloxicam	15mg instead of 7.5mg
Paroxetine	20mg instead of 30mg
Pholcodine	Pholcodine strong instead of pholcodine
Moxonidine	200μg instead of 400μg
Pravastatin	20mg instead of 10mg
Prempak® C (conjugate oestrogen and norgestrel)	1.25 instead of 6.25
Ranitidine	150mg instead of 300mg
Verapamil modified-release formulation	240mg instead of 120mg
Ventodisks® (salbutamol [albuterol])	200μg instead of 400μg
Ventolin® Nebules (salbutamol)	2.5mg instead of 5mg
Ventolin® rotacaps (salbutamol)	200μg instead of 400μg

a Arthrotec®50 = diclofenac sodium 50mg and misoprostol 200mg; Arthrotec®75 = diclofenac sodium 75mg and misoprostol 200mg.

b Compound preparation.

pack design.[34,35] Orthographic and phonological similarity in drug names has been found to cause drug name confusion and consequently is a significant risk factor for medication errors.[16,33,36-38] This was also a main contributor to the dispensing errors or near misses in the present study indicating that the authority concerned should consider legal restriction in registering drugs with similar names. This preventive measure has been recommended by the American Society of Hospital Pharmacists (ASHP).[30,39] If dispensing staff are more familiar with the names of drugs in the market, the risk of drug name confusion may be reduced.[30,38] Counselling patients at the time of supply,[31,40-42] emphasis on the importance of clear prescription writing,[31,43] and the utilisation of computer systems to aid in prescription screening and electronic prescribing[1,6,38,39,44] may further minimise or prevent dispensing errors.

As emphasised repeatedly in the literature, any system for self-reporting of medication or dispensing errors or near misses should be nonpunitive and based on a 'no blame' or 'fair blame' culture.[13,16,28,30-32,39] Reporting systems could be legally protected with the option of complete anonymity to ensure confidentiality and to encourage better

Table III. Examples of dispensing errors or near misses reported: incorrect drugs dispensed

Intended drug	Incorrect drug dispensed
Allopurinol	Atenolol
Amlodipine	Atorvastatin
Amiloride	Amlodipine
Atenolol	Thyroxine
Clobetasone	Clobetasol
Co-amilozide® (amiloride hydrochloride and hydrochlorothiazide)[a]	Co-amilofruse® (amiloride hydrochloride and furosemide)[a]
Co-codamol® (codeine phosphate and paracetamol [acetaminophen])[a]	Coproxamol® (dextropropoxyphene hydrochloride and paracetamol)[a]
Co-codamol® (codeine phosphate and paracetamol)[a]	Paracetamol
Cosopt® (dorzolamide/timolol eye drops)	Trusopt® (dorzolamide eye drops)
Daktacort® (miconazole/hydrocortisone cream)	Daktarin (miconazole cream)
Dermovate® (clobetasol propionate)	Eumovate® (clobetasone butyrate)
Domperidone	Loperamide
Depo-Medrone® (methylprednisolone acetate)	Depo-provera® (medroxyprogesterone acetate)
Emulsifying oint	Epaderm (emulsifying wax, yellow soft paraffin, liquid parrafin)
FuciBET® (betamethasone/fusidic acid cream)	Fucidin® H (hydrocortisone/fusicid acid cream)
Gaviscon® (alginic acid, drid aluminium hydroxide, magnesium trisilicate and sodium bicarbonate)	Peptac® (sodium bicarbonate, sodium alginate and calcium carbonate)
Humalog® (insulin lispro)	Humalog® Mix (biphasic insulin lispro)
Lipostat® (pravastatin)	Lipitor (atorvastatin)
Lisinopril	Fosinopril
Lormetazepam	Lorazepam
Lopressor® (metoprolol)	Voltarol® 50 (diclofenac sodium)
Premarin® (conjugated oestrogen)	Prempak-C® (conjugated oestrogen and norgestrel)
Ramipril	Rideril® (thioridazine)
Rabeprazole	Nexium® (esomeprazole)
Risedronate	Fosamax® (alendronic acid)
Solpadol® (codeine phosphate and paracetamol)	Remedeine® forte (paracetamol and dihydrocodeine tartrate)
Xalatan® (latanoprost eye drops)	Xalacom® (latanoprost/timolol eye drops)

a Compound preparation.

Table IV. Examples of dispensing errors or near misses reported: incorrect dosage form dispensed

Intended dosage form	Incorrect dosage form dispensed
Diclofenac tabs	Diclofenac capsules
Dispersible	Enteric coated
Enteric coated	Plain tablet
Effervescent	Ordinary tablet
Ismo® (isosorbide mononitrate 10mg)	Ismo® retard (isosorbide mononitrate 40mg)
Madopar® CR (benserazide and levodopa modified-release preparation)	Madopar® (benserazide and levodopa)
Ointment	Cream
Remedeine® Forte (paracetamol [acetaminophen] 500mg/dihydrocodeine 30mg)	Remedeine® (paracetamol 500mg/dihydrocodeine 10mg)
Serevent® Inhaler (salmeterol)	Serevent® Accuhaler® (salmeterol)
Tegretol® (carbamazepine)	Tegretol® retard (carbamazepine modified release)
Tramadol	Zamadol® SR (tramadol slow release capsules)
Voltarol® E/C (diclofenac sodium enteric-coated tablets)	Voltarol® Rapid (diclofenac potassium sugar-coated tablets)
Zamadol® SR (tramadol slow release capsules)	Zydol® (tramadol tablets)

response rates in order to capture a more complete database.[13,17,20,21,28,42,45,46] The aim should be to identify opportunities in an organisation for systematic changes to reduce the risk of future errors and not directed at any individual.[13,15,20,39,43,47,48] Outcome and feedback from the research team or employer organisation as well as group discussions between reporters on the types of errors reported and preventive measures to be adopted were considered to be desirable. Incentives for participation were also viewed as important motivating factors. These views were expressed in our study as well as by Cavell and colleagues[21] and should be taken into consideration. In addition, the cooperation and assistance of all staff and healthcare professionals are paramount to the success of any reporting scheme.

5. Limitations of the Study

The feasibility study had several limitations.

- The number of participating pharmacies was small and they were volunteers. These pharmacies may not be representative of the community pharmacies in the study area.
- The data was only collected over a limited time frame of two 4-week periods and not sufficient to identify any important trends in dispensing errors.
- We were not able to evaluate whether the reporting had helped to reduce errors. The possibility of under-reporting could not be ruled out as in any other self-reporting studies and especially since the locum pharmacists were not keen to participate. Future research could supplement this with observational methods.
- The data collection form included the identification of the individual who made the error and this may have caused some concern in reporting.
- The study did not evaluate adverse drug events caused by the dispensing errors and hence, could not evaluate the clinical significance of the errors. This is an important consideration for future

Table V. Examples of dispensing errors or near misses reported: incorrect label

Examples of incorrect label
Cross labels between two drugs
Cream labelled as ointment and vice versa
Direction on label to use drug in both nostrils instead of left nostril
Wrong quantity written on the label
Wrong strength written on the label
Some drugs to be given as od, but written as bid on the label
Metronidazole to be given as tid, but written as four times a day on the label
Dicycloverine hydrochloride to be given as two tid, but written as one three times a day on the label

bid = twice daily; **od** = once daily; **tid** = three times daily.

studies so that areas of clinical importance can be prioritised since not all dispensing errors result in adverse drug events.

6. Conclusion

The quantitative results of this study and the qualitative feedback from the participating pharmacies indicate that the self-reporting dispensing error scheme used was practical and feasible although an option of complete anonymity and some incentives should be considered. Future research and collaboration with the local clinical governance group is recommended to incorporate this scheme into the dispensing routine as a risk management procedure.

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