

Medication errors during hospital drug rounds

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Abstract

Objective—To determine the nature and rate of drug administration errors in one National Health Service hospital.

Design—Covert observational survey between January and April 1993 of drug rounds with intervention to stop drug administration errors reaching the patient.

Setting—Two medical, two surgical, and two medicine for the elderly wards in a former district general hospital, now a NHS trust hospital.

Subjects—37 Nurses performing routine single nurse drug rounds.

Main measures—Drug administration errors recorded by trained observers.

Results—Seventy four drug rounds were observed in which 115 errors occurred during 3312 drug administrations. The overall error rate was 3.5% (95% confidence interval 2.9% to 4.1%). Errors owing to omissions, because the drug had not been supplied or located or the prescription had not been seen, accounted for most (68%, 78) of the errors. Wrong doses accounted for 15% (17) errors, four of which were greater than the prescribed dose. The dose was given within two hours of the time indicated by the prescriber in 98.2% of cases.

Conclusion—The observed rate of drug administration errors is too high. It might be reduced by a multidisciplinary review of practices in prescribing, supply, and administration of drugs.

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Introduction

Errors in drug administration to patients which are associated with increased complexity of prescribing were reported in the 1960s.¹⁻² This led to the development of new systems of prescribing and supplying drugs and recording drug administrations.³⁻⁴ A standard drug chart and ward pharmacy system came into widespread use after publication of the Gillie report in 1970.⁵ The research which identified these problems in the 1960s has not been followed up in the United Kingdom; however, in the United States it remains an active area.⁶ Monitoring the drug administration error rate is obligatory to gain approval from the Joint Commission on Accreditation of Healthcare Organisations, and drug administration errors are an established part of the medicolegal environment.⁷

In the National Health Service (NHS), trust hospitals currently bear financial liability for any legal actions brought against them. As part of their risk management plans it is likely that they would wish to monitor drug administration errors as an indicator of the effectiveness of their prescribing, supply, and administration chain. A review of coroner's records in Birmingham concluded that about a fifth of deaths relating to prescribing and administering drugs were due to errors and that these are more easily prevented than deaths due to adverse drug reactions.⁸ We previously investigated the quality of prescribing⁹ and prescription writing¹⁰ in hospitals. In this study we determine the rate and nature of drug administration errors in a NHS trust hospital.

Methods

Six wards (A-F) were selected in one NHS trust hospital (formerly a district general hospital): two general surgery, two medicine for the elderly, and two general medical wards. The study was carried out between January and April 1993. In each ward the drug administration error rate was studied during at least 10 drug rounds over one week. Four or five scheduled rounds took place a day and each was represented in the sample at least once. The round was monitored by direct observation by one of two trained observers (DBJ, KWR) who accompanied the nurse on the round. A work sampling study was carried out simultaneously to keep the nature of the error study covert. The observers were pharmacists not normally employed at the study site, who intervened if necessary to ensure errors did not reach the patient. The studies were approved by the local ethical committee and the hospital's nurse managers, with the agreement that no comments on an individual nurse's performance would be fed back to the nursing management. The hospital routinely used single nurse administration for drugs.

Before the study week started the nurse in charge was informed that studies in the ward would soon start and would entail recording nurses' time involved in the medication process. A general notice was also issued to inform all ward staff. Immediately before nurses started their first round of the study the observer explained that this was a work sampling study and that all drugs due at that time would be noted to give an indication of workload. In general, if the nurse was about to make an error, they were stopped by the observer in a standardised, discreet manner before the nurse left the drug trolley. The intervention was designed not to indicate the

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nature of the covert study. In the case of omission errors intervention was delayed until the nurse had signed the drug chart indicating all administrations had been completed. The observer then recorded the error and informed the nurse of the omission. All types of medication administered during the round were included in the study, although the rate of administration of parenteral preparations was excluded. The actual time of each administration and the time indicated by the prescriber were noted. No form of intervention by the observer took place during the recording of non-availability of medication or incorrect time of administration.

Drug administration error definitions were adapted from Allan and Barker⁶ and were categorised as: wrong dose, omission (when the nurse did not see that a dose was due or could not find the drug in the drug trolley despite it being present), commission (when the nurse intended to give an extra dose of a prescribed drug), unprescribed drug (including drugs not actually prescribed but about to be intentionally administered and instances of wrong selection or misreading of the drug name on the prescription), wrong dosage form, wrong route, expired or unusable drug, wrong preparation of dose (when the product is not prepared according to the manufacturer's guidelines – for example, using the incorrect diluent for an injection) and error due to non-availability of medication (when supplies of the drug are either exhausted or a new drug has not arrived from the pharmacy or cannot be found). Timing errors were, in common with the practice of other authors, excluded from the drug administration error rate and reported separately.

Results

Thirty seven nurses of grades C to G were observed on 74 drug rounds, during which they made 3312 drug administrations. In all, 115 errors were noted and 68 drugs were involved. The total drug administration error rate was 3.5% (95% confidence interval 2.9 to 4.1%). Table 1 shows the number and type of errors observed and table 2 details of the drugs associated with three errors or more. The errors fell into the following groups: 33 anti-infective agents, 24 gastrointestinal drugs, 13 cardiovascular drugs; 10 drugs involved pain control, nine the central nervous system, eight the respiratory system, seven steroids, and 11 were "others". The errors ranged in seriousness from omission of 40 mg pred-

Table 2 Drugs associated with three or more errors (for oral administration unless otherwise stated)

Drug	Details
Prednisolone	40 mg dose omitted 5 mg given instead of 3 mg (the figure 3 was read as 5) 5 mg soluble tablets not available Normal tablets given instead of enteric coated tablets on four occasions
Cefuroxime	Intravenous dose prepared incorrectly on four occasions Intravenous dose omitted once Intravenous dose given after the drug had been stopped
Chloramphenicol	Eye drops not available on four occasions
Nystatin	Mouthwash not available on three occasions Mouthwash omitted once
Cephalexin	Not available on four occasions
Aspirin	Wrong dose given twice Omitted once
Heparin	Subcutaneous dose omitted twice Subcutaneous wrong dose once
Metronidazole	Suppository not available Suppository not given Intravenous dose given after the drug had been stopped

nisolone in a patient with severe asthma to substitution of vitamin B compound with vitamin B compound forte. On three occasions one nurse gave drugs that were not prescribed but she felt that the patient needed, senna being given to two patients and Asilone to another. Five incidents involved patients not being offered an inhaler or being made to take an extra dose. On three occasions extra doses of prophylactic antibiotics, written up "for three doses only" were given. The observed drug administration error rate excluding errors due to non-availability of medication was 1.9% (95% confidence interval 1.4% to 2.4%) and the observed rate of errors due to non-availability of medication was 1.5% (95% confidence interval 1.1 to 1.9%). Omissions because the nurse did not see the dose should be given, or because the drug could not be located in the trolley, or because the drug was not available accounted for 78 of the 115 errors (68%), and of the 17 wrong doses, four were greater than the prescribed dose and 13 were lower. The dose was given within one hour of the time indicated by the prescriber in 81.3% of cases and within two hours in 98.2% of cases.

Discussion

The drug administration error rate of 3.5% in this study compares with a rate of 6.3% recorded on the introduction of drug charts.⁴ Three types of error predominated: non-availability of the drug, omitting to give the drug when it was available, and giving the

Table 1 Incidence and nature of drug administration errors observed during hospital drug rounds

Ward	No of Rounds	No of Nurses	Type of error									Total drug administration errors	Total doses observed	Drug administration error rate (%)
			Wrong dose	Omission	Commission	Unprescribed drug	Wrong dosage form	Wrong route	Expired/unusable drug	Wrong preparation	Non-availability			
A	13	5	6	6	0	0	1	0	1	0	4	18	611	2.9
B	11	7	1	6	0	0	0	0	0	0	13	20	434	4.6
C	14	7	2	1	1	0	0	0	0	0	2	6	393	1.5
D	12	6	2	9	1	3	1	0	0	0	7	23	781	2.9
E	12	6	6	2	2	1	3	1	0	0	17	32	592	5.4
F	12	6	0	3	0	0	1	0	0	4	8	16	501	3.2
Total	74	37	17	27	4	4	6	1	1	4	51	115	3312	3.5

wrong dose (usually too little). Most errors appeared at random and generally were not repeated; however, some, particularly non-availability, were repeated on each round, occasionally leading to patients going for several days without treatment.

The drug administration error rate we observed seems similar to or better than that in other countries, although comparisons are difficult because of the different drug administration and observation methods used. In Spain a rate of 3.5% was reported¹¹ and in France a rate of 6.5%.¹² A recent review of studies of hospitals using unit dose in the United States reported a range of error rates from 0.9% to 14.6%, median 3.7%.⁶ The unit dose system is used in over 90% of United States hospitals and overall seems to show a similar error rate to the system in the UK; however it involves over twice as many pharmacy staff¹³; no drugs are stocked in the wards, they are all individually dispensed, usually requiring a 24 hour service and pharmacy staff visiting wards several times a day.

Our finding that 1.5% of errors resulted from the drug being unavailable is similar to that in an earlier study.¹⁴ The ward pharmacy system is not intended to provide all drugs before the first dose is due, although as a rule of thumb around 80% of doses should be from drugs stocked in the ward and therefore available for immediate administration. Systems exist through which drugs can be obtained quickly if required urgently; however, this decision falls on the nurse doing the round. The implications of those decisions on the quality of care needs to be assessed.

The technique we used raised ethical and methodological issues. In contrast to researchers in other studies, the observer could see at the time of recording that an error was about to be committed and was placed in an ethical dilemma. On the one hand, the risk to the patient needed to be considered, on the other, given the seriousness with which drug administration errors are viewed, the position of the nurses administering medication needed not to be compromised. This was resolved by discreetly preventing errors from actually occurring and maintaining the confidentiality of individual practitioners. The presence of the observer and the act of intervention could lead to an overestimation or underestimation of the true error rate. However, there is no real alternative, and observers have been commonly used in this type of research. About half the errors were because a drug was unavailable; this is unaffected by observation. We would overestimate the true error rate if the nurses would have recognised and corrected the mistake they were about to make between leaving the drug trolley and approaching the patient or if the observer made the nurse flustered. Underestimation of the true rate would occur if the nurse took more care than usual or if an error was due to a nurse's lack of knowledge and the intervention changed the nurse's practice for future administrations. This learning effect occurred on only one

occasion, when the nurse had not known that the strength of a nebuliser solution had changed; she would have made one more error had she not been told of this. In ward F four identical errors were made by one nurse, whose practice seemed not to change despite her being told of each error.

Reduction of the drug administration error rate will depend on doctors, nurses, and pharmacists working together. Each has a role in improving the quality of drug administration and in monitoring the quality of other groups. Doctors must rewrite cluttered drug charts and prescribe clearly, using the generic drug name so that nurses can check it against the label on the drug. Pharmacists must clarify any unclear or inappropriate prescriptions and promptly supply clearly labelled drugs. Nurses must carefully check the drug chart, drug label, and the patient. Both nurses and pharmacists should ensure availability of the prescribed medicine. These issues are all covered in government, local, and professional guidelines, yet are carried out to a varying extent and seem not to be systematically reviewed on a multidisciplinary basis. Nurses who commit errors can be subject to a searching and intimidating disciplinary procedure that inhibits discussion of the subject.¹⁵ There needs to be a "blame free" approach to monitoring errors, using it to identify training needs and to review systems of work. Our experience of observing nurses, the nature of their errors, and our discomfort at using a covert method, lead us to believe that an open approach to the subject is feasible and preferable for routine monitoring. Such a system would show, for example, supply issues, errors resulting from a lack of knowledge, and ambiguities in the prescription or drug labels.

In seeking to minimise the risk associated with prescribing, supplying, and administering drugs there will always be a trade off between the resources needed and the benefits they produce. Although patients may expect an error rate of zero, the hospital is unlikely to be able to afford to attain this rate as all humans make errors and detecting and preventing errors can be expensive. Significantly, however, errors owing to non-availability may not be expensive to reduce and examination of this locally should be a priority. In the United States several computerised systems claim to provide nurses with the right drug at the right time.¹³ Whether the benefits of these systems to the United Kingdom would outweigh their costs remains to be seen. At present more could be done to reduce risk within the existing ways of working. Hospitals should establish a multidisciplinary review of the effectiveness of their current systems and decide on what, if any, drug administration error rate they would accept to maintain a desirable standard of care.

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