

## A System of Drug Handling in Hospital

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### INTRODUCTION

To rely on a system of drug administration based on a transcribed drug list is to court disaster. The high incidence of errors of transcription has been documented by Crooks (1964) (1), Wallace (1965) (2), Watt *et al.* (in press) (3).

The system of drug handling adopted in Aberdeen General Hospitals, with standardized procedures for the prescribing, supply, administering and recording of drugs given, has clearly demonstrated that improvements in accuracy and efficiency of drug handling in hospitals are attainable. The careful recording by Hill and Wigmore (1967) (4) of 'incidents' during drug rounds in relation to planned changes in various aspects of drug handling (prescribing, pharmaceutical involvement on the ward, number of drug rounds, redesigned drug sheet with provisions for recording, etc.) has shown that simple changes in the system may result in marked changes in the level of accuracy of drug administration.

We present details of the system of drug handling currently in operation at Kingsseat Hospital.

### METHOD

As described in an earlier paper (3), the first step was to demonstrate objectively the extent of the inaccuracy resulting from the use of transcribed drug lists in Kingsseat Hospital. Our findings were a cogent argument for a thorough review of drug prescribing and administration. A series of discussions was held with the medical staff to agree on a set of recommendations for recording a prescription. These were based on the principles laid down by Crooks *et al.* (1965) (5) but were modified to suit the special

circumstances of a mental hospital with a low doctor/patient ratio.

Concurrently, one of the authors (J.A.W.) had intensive discussions with many members of the nursing staff, at an informal level, about possible ways of improving the administering and recording of drugs and the many problems which nursing staff could see in relation to drug handling on the wards. Formal discussions with nursing staff followed, in which it was agreed that a pilot scheme be started in four admission and four long-stay wards. The Hospital Pharmacist was closely involved in the introduction of the system from the start. Many subsequent meetings with all three specialties took place, at which further modifications and extensions of the system were discussed and after agreement adopted. The system is now standard procedure throughout the hospital.

### THE TREATMENT RECORD

The same Treatment Record based on the one used in Aberdeen General Hospitals (6), is used for prescribing, ordering and administering all drugs. A section is available for the prescription of Electro-Convulsive Therapy (ECT); drugs routinely used in ECT are recorded on a separate ECT form. 'Regular' and 'once only' prescriptions are sub-divided into parenteral drugs and drugs given by any other route. A section is also available for the prescription of special diets. A table of metric and imperial equivalents is provided, and space is available to record any drugs to which the patient is allergic. The reverse side of the Treatment Record is used for prescribing drugs to be given at the discretion of nursing staff. The four main groups are hypnotics, drugs prescribed to be given for disturbed behaviour, simple analgesics and aperients. Spaces for

recording the date of each administration of these drugs are situated beneath each prescription. Copies of the Treatment Record may be obtained on request from Mr. N. Dorricott, Group Medical Records Officer, Royal Cornhill and Associated Hospitals, Aberdeen.

#### STORAGE OF TREATMENT RECORD

Treatment Records are kept individually in firm polythene envelopes filed in alphabetical order in a ring-binder with index sheets to facilitate reference. In addition to protecting the Treatment Record the transparent envelope functions as an administration recording sheet for regular drugs as described later.

#### PRESCRIBING RECOMMENDATIONS

These have deliberately been made simple and direct, as follows:

1. Check drug sensitivity.
2. Do not prescribe prospectively.
3. Print the drug name in full in block letters using the approved name if possible.
4. Use the metric system. Avoid substitutes for dosage weight, e.g. tabs., caps. etc., except in cases of compound formulations.
5. For 'once only' prescriptions state actual time. For all other prescriptions indicate times of administration by a tick in the appropriate column or specify time in untimed columns if necessary.
6. Write any special instructions in English across times of administration columns. Do not use abbreviations (other than those defined in 7) or Latin terms. If the frequency is less than daily, state this in terms of days of week or dates of month. For drugs to be given at the discretion of nursing staff, state the maximum frequency of administration.
7. State method of administration if other than oral:  
 Inhalation = INHAL.      Intramuscular = I.M.  
 Intravenous = I.V.      Per rectum = P.R.  
 Per vaginam = P.V.      Sub-lingual = S.L.  
 Topical = TOP.
8. Sign in full.
9. To stop a prescription, draw a straight line through it and record the date and initials. If a prescription is made in error, stop as above and print 'Cancelled' across it.
10. In emergency, a drug may be prescribed by telephone. The prescription must be given to the senior nurse on the ward who will record it and sign it in red on the Treatment Record. It must be countersigned by the prescribing or ward doctor as soon as possible and in every case within 72 hours.
11. Intravenous fluids, prolonged narcosis, anticoagulants and insulin are prescribed on the Treatment Record in general terms only. Details of dose and frequency of administration are stated on the appropriate form and their administration is recorded.
12. Prescriptions for oxygen must be recorded, with instructions.
13. Specify any special diet indicated.
14. When all lines in any section are full, transfer all current prescriptions to a new Treatment Record and sign 'B/F by .....'. Include patient details and drug sensitivity.
15. On transfer to a different ward within the same unit, the same Treatment Record will continue in use.
16. On discharge, file the Treatment Record, even if blank, in the case record; on readmission, start a new Treatment Record.

#### CHANGES IN METHODS OF RECORDING PRESCRIPTIONS

Before the introduction of the new system of drug handling in Kingsat Hospital no recommendations existed for the use of the Treatment Record. Since these were agreed upon by the medical staff the standard of recording prescriptions has improved (Table I).

TABLE I  
Manner of recording prescriptions as percentage of total in each period studied

Features of prescribing	As observed at 19.12.1966	Items prescribed 0-3 mths after introduction of recommendations	Items prescribed 6-9 mths after introduction of recommendations
Printed clearly ..	64.7	77.7	93.9
Approved drug name .. ..	54.4	78.2	86.2
Metric system of dosage ..	74.3	86.7	77.4
Imperial system of dosage ..	8.7	4.8	11.0

**RECOMMENDATIONS FOR THE ADMINISTERING OF DRUGS AND RECORDING OF DRUG ADMINISTRATION**

These were provided as follows for the nursing staff:

1. The administration of drugs must be performed or supervised by a Registered Nurse or specially authorized Enrolled Nurse.
2. For each drug to be given, check that the appropriate tick has not been:
  - (a) Crossed (drug given);
  - (b) Circled (not to be given) and that
  - (c) The dose has not been amended on the transparent envelope.
3. Select the drug required and check the label against the prescription. Put the correct dose in the appropriate container. Record the selection of the drug. For regular prescriptions, draw a wax line on the transparent envelope across the long arm of the tick (X). For 'once only' prescriptions draw a line through the prescription on the treatment record. For drugs given at discretion of nursing staff enter the 'date given', and if the drug may be given more than once in a day, also state the time of administration. If a half dose of any of these drugs is given draw a diagonal line across the 'date given' box.
4. Repeat 2 and 3 for all current drugs.
5. Administer the drug(s) immediately.
6. If it appears inappropriate for the patient to be given the drugs prescribed (e.g. suspected allergy or overdosage), withhold it and record this decision by circling on the transparent envelope the underlying tick(s). If it appears necessary to reduce the dose, write the amended dose on the transparent envelope over the prescribed dose. In either case, record the change in the patient's nursing notes and inform the doctor as soon as possible.
7. If a drug is refused or cannot be given because the patient is absent, report this to Sister/Charge Nurse who will record it in the nursing notes.
8. If the missed dose is later given to the patient, proceed as in 2-5 and record in the notes the time of administration.
9. If in doubt, consult the Sister/Charge Nurse.
10. (a) For administration of Dangerous Drugs proceed according to 2-5 above. In addition, a trained nurse must check the patient's name, the prescription, the selected drug, the calculation (if any) and the measured dose, and also witness the administration.
  - (b) Details of administration of a Dangerous Drug must be recorded in the Ward Dangerous Drug Book and signed in full by both the donor and the witness.
11. Barbiturates are given as in 10(a). A record of administration is kept in the Schedule IV Book.
12. The recording on the transparent envelope should be erased before starting the first drug round of the day.

**ERRORS IN DRUG ADMINISTRATION AND USE OF THE RECORDING SYSTEM**

Direct observation of drug rounds (Miss Martin) in two long-stay wards prior to their starting the new system of drug handling, and again nine months later, showed a decrease in errors of drug administration (Table II). On two occasions, almost a year after the introduction of a system of recording drug administration, a check was made of the extent to which the system was being used throughout the hospital. The survey was conducted after a period in which the intense interest of medical and senior nursing staff in various aspects of drug handling had decreased and the system

**TABLE II**  
*Direct observation of drug rounds on two wards*

Ward	No. of drug rounds observed		Average No. of patients on drugs		Total no. of items on observed rounds		Type of error observed		Errors as % of total items			
	1967	1968	1967	1968	1967	1968	1967	1968	1967	1968		
A	..	19	26	36.3	36.8	836	1,289	*A B C	5 3 1	6 - -	1.08	0.47
B	..	13	14	47.0	43.9	1,091	931		- 3 1	2 - -	0.37	0.21
Totals	..	32	40	40.6	39.3	1,927	2,220		5 6 2	8 - -	0.68	0.36

\*A B C— A = Omission; B = Wrong dose; C = Wrong drug.

had lost its novelty value. Of a total of 4,883 items prescribed, 4,667 (95.6 per cent) items were recorded as having been administered. Topical applications, used most commonly in the wards for female psychogeriatric patients, appeared to be over-represented in the remaining 4.4 per cent. A similar survey was repeated one month later.

Of 2,380 drugs, administration was recorded in 95.5 per cent. Internal drugs totalled 2,258, of which only 68 (3.0 per cent) were not recorded as having been given. The remaining 122 topical drugs showed a failure to record in 37 (30.3 per cent).

#### ORDERING DRUGS FROM THE PHARMACY

As in most Scottish hospitals, drugs are regarded either as 'stock' or 'individual' drugs for the purposes of ordering and dispensing. In general, 'individual' drugs, in containers labelled with the patient's name, are given when only one or two patients in the ward are receiving the same drug, and 'stock' drugs are issued when the demand exceeds this level.

The Hospital Pharmacist, who is responsible for dispensing drugs for a potential hospital population of 1,000 (Kingsseat Hospital and House of Daviot) has the full-time assistance of one Assistant in Dispensing and a small group of long-stay patients to whom are delegated simple tasks not involving the handling of drugs. She visits the four Admission Wards twice weekly and the remaining fifteen long-stay wards fortnightly. At these visits she studies each patient's treatment record and calculates the requirement for stock drugs to cover the period until her next visit. At the same visit she inspects the drug cupboard, noting the balance of drug stocks and comparing this balance with the balance expected as calculated from the prescriptions current during the previous period. Any drugs no longer required are removed. For all stock drugs, duplicate containers are kept. On the day after the visit by the hospital pharmacist, empty stock bottles with a list of stock drugs in the Pharmacy Book are sent to the pharmacy, where the appropriate quantities of drugs are dispensed. Drug containers are normally labelled with both approved and trade names.

'Individual' drugs are ordered by submitting to the pharmacy the patient's Treatment Record showing the new prescription. This is noted by the pharmacist, and the Treatment Record is immediately returned to the ward. Further supplies of the same prescription are obtained on written request without the Treatment Records. Drug containers for individual drugs are labelled with the patient's name as well as the name of the drug.

#### EMERGENCY DRUG CUPBOARD

Since the new system successfully reduced the amount and variety of drugs held in ward drug cupboards, an improvement in the system of obtaining drugs for emergency use outside pharmacy hours became necessary. Formerly drugs for emergency use might be found in ward cupboards or might be obtained direct from the pharmacy by the duty doctor, who held pharmacy keys. The latter method was inconvenient and time-consuming. An Emergency drug cupboard was therefore established centrally in one of the Admission Wards. In it are stored a quantity of drugs, mainly antibiotics and others (but not Dangerous Drugs) which may be required urgently. The use and restocking of this cupboard are supervised daily by the pharmacist. This facility has proved very satisfactory.

#### TIME SPENT IN DRUG HANDLING

The results of surveys in seven wards before the introduction of the current system and again one year later show a reduction in the total time spent in drug handling (Table III).

TABLE III  
*Comparison of total time spent in drug handling by nursing staff over a fourteen-day period in seven wards in Kingsseat Hospital before and after change of system*

	Time in minutes		Percentage change
	1967	1968	
Drug ordering ..	2,108	952	-54.8
Maintenance of drug list ..	583	—	—
Drug rounds ..	7,694	8,162	+6.1
Miscellaneous ..	389	295	-24.2
Totals ..	10,774	9,409	-12.2

## DISCUSSION

A drug administration error rate of 0.68 per cent (Table II) as shown by direct observation of the system in which a drug list was used, is extremely low and is comparable with the high degree of accuracy achieved by punch-card operators (Hill and Wigmore, 1967) (4). With such accuracy, greater than that attained in most other hospitals with more sophisticated systems, it may be asked firstly whether this figure is accurate and secondly whether any changes in the system are justifiable. Presumably the low error rate is due in part to the fact that both wards studied were long-stay units where the turnover of patients was extremely low and the drug treatment was relatively stable. Moreover, it is rare for a patient to be on more than three drugs. Vere (7) demonstrated that errors of drug administration decrease with learning and increase with the work load, the critical level being six drugs per patient. In this respect, the situation in the long-stay wards of a mental hospital favours accuracy of drug administration. Moreover, in one of the wards with an average total of 84 drug items to be given on average to 47 patients per round, a simple checking system was used so that as each patient was given her drugs a mark was put opposite her name on the drug list. Using this method, only four administration errors were made in giving over 1,000 drug items, and there were no errors of omission. We would have no doubts of the ability of the nursing administrator to detect errors on a drug-round and would accept the very low incident rate as accurate. The effect of learning on reducing errors of administration is suggested by our finding that mistakes occurred only in the case of staff nurses recently moved to the wards studied. It is unfortunate that we omitted to perform a similar experiment in the Admission Units prior to their starting the new system, as in these wards both patient population and drugs prescribed are constantly changing.

We are in no doubt that the changes made in Kingseat Hospital were necessary. It is important to remember that in almost 10 per cent of prescriptions studied (3) it was impossible because of transcription error for the patient to receive his drugs in accordance with the doctor's

wishes. This source of error has been abolished. The medical staff now have a greater responsibility in their prescribing. On their ability to communicate effectively depends the sequence of events determining whether the patient receives the appropriate treatment. With the abolition of the drug list, it was felt that unless the standard of recording prescriptions improved errors of interpretation might occur more frequently. The opposite has occurred. In spite of a great reduction in the overt concern shown for all aspects of drug handling the standard of recording prescriptions has continued to improve, except for an increased usage of the Imperial system.

We feel that one important factor in obtaining improved prescribing habits has been the involvement of all the medical staff in deciding on the recommendations for prescribing. We consider that no doctor can expect a nurse or any other member of the clinical team to take drug handling seriously if he is seen to be irresponsible in his prescribing. Although provision has been made for prescribing by telephone, this appears to have been done only rarely. It is emphasized that the doctor/patient ratio in mental hospitals generally, and indeed in most peripheral hospitals, is such that at times of understaffing it would be virtually impossible for the doctor to operate efficiently unless such a facility were available. The fact that telephoned prescriptions are recorded differently from all others renders them obvious and may deter any particular member of the medical staff from abusing the system.

For the same reasons of work load, it was initially considered necessary to continue to delegate to the senior nursing staff the responsibility for prescribing routine aperients and simple analgesics. At that time the administration of drugs given at the discretion of nursing staff, within prescribed limits of dose and frequency of administration, was recorded in full in the nursing notes. This was time-consuming in recording and retrieval of the information. After further thought and discussion it was agreed that such drugs, including simple analgesics and aperients, should be prescribed on the back of the Treatment Record by the medical staff and that a permanent record



should be made of their administration. This modification was simple and economical of nurses' time. The nurse was still able to exercise her discretion in the treatment of the patient, but this was now carefully defined by the doctor's choice of drug, dose, and maximum frequency of administration. A permanent record of the administration of these drugs was now available, conveniently related to the record of all drugs prescribed, enabling treatment to be reviewed at a glance by the doctor or nurse. We hope that focussing attention on the Treatment Record will minimize the frequency of unnecessarily long courses of drug treatment.

To use failure to record as an index of failure to administer is of dubious value. The extent to which the nursing staff recorded administration compares favourably with the figures published by Crooks *et al.* (1967) (9). In 35 per cent of cases of failure to record the item involved was not a drug given orally or parenterally and had been administered after the completion of the regular round. The administration error rate of 0.36 per cent is much lower than other published figures similarly derived (4). It is particularly gratifying that with the new system these incidents were limited to omission of administering a drug, and in every case, at the end of the drug round, the error was detected and remedied without any indication being given by the observer that an error had been detected. No errors of interpretation involving choice of drug, dosage, form, time or route were noted.

The improved accuracy of drug administration has been achieved at the expense of an increase of 5 per cent in the time devoted to drug rounds. If we take into account, as did Crooks *et al.* (1967) (6), the time previously spent in maintaining drug lists, there is a slight reduction in time devoted to drug administration. For the two weeks in which direct observation of drug rounds occurred, we find that the average time spent was 52.3 seconds per patient on drugs. It is difficult to make a valid comparison with Crooks' quoted figure of 80.2 seconds, since the average number of drugs per patient and the extent of co-operation by the patient tend to be greater in a general than in a psychiatric hospital. There has been no signi-

ficant changes in the wards studied in the form of drug rounds. The accent remains on maintaining the dignity and eliciting the active participation of patients. We have, for example, resisted suggestions that patients be asked to line up in alphabetical order.

As a result of the broadly based reorganization of all aspects of drug handling, the total time expended by the nursing staff has decreased by 12 per cent. This is due partly to the elimination of unnecessary procedures and partly to a shift of responsibility for drug ordering to the Hospital Pharmacist.

Following discussions with Pharmacist, and with medical and nursing staff, ordering of drugs from the pharmacy has been modified a number of times. Initially, a carbon copy was made of each Treatment Record, and all original copies were sent to the pharmacy to requisition drugs. This proved cumbersome, however, and it was agreed that the Hospital Pharmacist should assume most of the nurses' previous responsibility for ordering stock drugs and that keeping duplicate Treatment Records would be unnecessary. When individual drugs are ordered the Treatment Record is kept in the pharmacy for only a few minutes and is not absent from the ward during drug rounds. Brodie (1966) (8), writing in the United States, forecast that the pharmacist's principal responsibility would be 'drug-use control'. The changes described are a step in that direction. Crooks *et al.* (9) found that only 25 per cent of all drugs supplied to a medical ward were for the use of more than one patient. The proportion of 'individual' drugs is much lower in mental hospitals. Without a large increase in the level of staffing in the pharmacy it would be impossible to adopt a comprehensive system of individual dispensing. The most effective way to minimize errors of selection of a drug would be to introduce unit-dose dispensing as suggested by Barker (10) and many others. At present, however, it would be difficult to justify the extra cost, since errors of this type appear to have been virtually eliminated.

The introduction of the Pharmacist on the ward, with dual advisory and auditing roles, might have been expected to precipitate a hostile reaction among nursing staff. The

reverse has occurred. Their relationship has improved and she has rapidly become an accepted member of the clinical team. The Pharmacist's work load was greatly increased at the time of the introduction of the new system of drug ordering, largely because of the difficulties entailed in examining drug cupboards and developing a new system. She has assumed responsibility for most of the work of ward drug ordering as well as dispensing. Because of her ability to regulate the frequency of demand for drugs, the initially excessive load placed on her has largely subsided, although her work load is still, inevitably, greater than before. In compensation, however, she now performs an invaluable function in advising on storage and other aspects of drug handling at ward level, as well as contributing to the general effort to increase accuracy of drug administration. If drug handling becomes a significant problem on any ward this can be more readily identified and help and advice offered at an early stage.

Initially the nursing staff were apprehensive about the proposed changes in their traditional methods of drug handling. As they have shared in the development of the new system they have come to appreciate the resulting improvement in accuracy and efficiency and have become increasingly enthusiastic. With all drugs prescribed the nurse is encouraged to use her discretion about the administration. She may decide when not to give a regular drug or, at her discretion and within prescribed limits, administer drugs prescribed on the back of the Treatment Record.

By including patients' details, the ring binder containing the Treatment Records can now be used as a nominal roll, eliminating the need for the transcribing of information. Other documents now abolished include the medicine card on which the doctor previously ordered drugs, the stock drug book completed by the nurse to obtain drugs from the pharmacy, and the drug list previously used as a guide for drug administration.

Because of the difficulty of keeping the Treatment Records in a meaningful sequence in the Kardex pockets, the two wards which had previously used the Kardex system have acknowledged the advantages of filing the Treatment

Records in the ring binders. Although time spent in rearranging the order of Treatment Records in the Kardex would not normally be regarded as being devoted to drug handling, it can scarcely be considered a constructive use of nursing effort.

At first we had a rectangular piece removed from the back of the polythene envelope, so that the nursing staff could record the administration of drugs given at their discretion without withdrawing the Treatment Record from the envelope. This had the disadvantage of allowing the wax pencil marks on the front of the next envelope to rub off on and thus deface the Record. We have now, at the suggestion of the nurses, discontinued the practice of having a 'window' in the back of the envelope. In any case, the presence of the window made the envelopes more liable to tear. Tearing at the punch holes was also a problem, but metal eyelets now effectively prevent the binder rings from tearing out after prolonged use.

Crooks *et al.* (9) stated that 'the "London" system is unacceptably wasteful in nursing time' and 'that to be effective a drug recording system must be simple, accurate, and economical in time'. We feel that the Kingseat system fulfills these criteria. We would add that an essential requirement of any drug recording system must be its benefit to the nurse in drug administration. The simplicity of the system described in this paper and the ease with which it serves as a visual guide in drug administration commend it to the nursing staff. The value of a drug recording system is limited by the accuracy with which it is used by the nursing staff.

One possible disadvantage of systems using separate prescription and recording sheets is the danger of making transcription errors in completion of the recording sheet. This is virtually impossible where a mark has to be superimposed on the junction of the line containing the prescription and a column indicating the time of drug round.

At a conference in Newcastle (11) it was pointed out that '... the hospital service lacked administrative mechanisms by which the three professions—medicine, nursing, and pharmacy—could co-operate in taking policy decisions'. The harmonious way in which the current

system was developed is a tribute to the morale and mutual co-operation of the three specialties at Kingseat Hospital.

#### SUMMARY

With interdisciplinary co-operation, basic changes in the system of drug handling at Kingseat Hospital were introduced, eliminating transcription by nursing staff. Detailed instructions on the use of the Treatment Record for prescribing, drug administration and recording are quoted. The Hospital Pharmacist assumed responsibility for ordering and maintenance of drug supplies and supervision of drug storage.

The changes obtained in the manner of recording prescriptions, accuracy of drug administration and recording, and time taken for various stages in drug handling are here documented.

#### ACKNOWLEDGEMENTS

We are indebted to the medical and nursing staff for co-operation, suggestions and help in collecting data, and to Mrs. Joyce Elliott for typing.

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(Received 17 March 1972)