DECENTRALIZED PHARMACY OPERATIONS UTILIZING THE UNIT DOSE CONCEPT II:

Drug information services and utilization in a decentralized pharmacy substation

by Phillip A. Greth, William W. Tester, and Harold J. Black

In the first article of this series the authors

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Part I of this article appeared in the August 1964 issue of the American Journal of Hospital Pharmacy;

discussed the aims, objectives, and planning for a decentralized unit dose dispensing demonstration financed under a grant from the United States Public Health Service. One of the specific aims of the study was "to improve the availability and thus expand the utilization of the pharmacist as a drug consultant to the physician and nurse." This article describes the drug information services provided by the unit dose decentralized substation and its utilization by the medical team.
NO:          CATEGORY: DIURETICS    GENERIC NAME: MERCAPTOMERIN SODIUM

THERAPEUTIC USE: Used as a diuretic in the treatment of edema of cardiorenal origin and of nephrosis, ascites of the liver, and other conditions where a mercurial diuretic may be indicated.

MOA: Its action is due to the release of small concentrations of mercuric ions which reduce tubular reabsorption of fluid. The resulting diuresis eliminates both water and sodium.

CONTRAINDICATIONS: The drug is contraindicated in advanced chronic nephritis, acute renal disease, ulcerative colitis, and signs of malignant hypertension. While mercaptomerin is less toxic to the heart than other diuretics, it should be used with caution in patients who are especially susceptible to arrhythmias.

ROUTES AND DOSES: The drug may be given by SQ injection. Care must be taken to place the injection beneath the SQ fat and to rotate the site of injection, avoiding edematous areas. IM injection may be preferable in emaciated patients. The drug may also be given IV. The dosage of the usual 13% solution ranges from 0.5 to 2 ml., usually administered SQ. Subsequently, injections of 0.5 to 2 ml. may be given twice weekly as indicated by the reduction of body weight following diuresis. The prior administration of 4-8 grams of an acid-producing diuretic such as ammonium chloride given in divided doses daily for 2 or 3 days before the injection will potentiate its action. Insertion of the rectal suppository form following defecation permits less frequent injection and may be effective in certain cases.

ADMINISTRATIVE CAUTIONS: During prolonged administration of the drug the urine should be examined periodically for albumin, casts, and blood cells. Turbid solutions of the drug should not be used.

SIDE EFFECTS: Side effects in sensitive patients include stomatitis, gastric disturbances, vertigo, febrile reactions and cutaneous eruptions. Patients may be sensitive to one mercurial diuretic yet tolerate another satisfactorily. Irritation of the rectum may preclude continued use of that route. In occasional patients, SQ injection may produce painful local reactions.

PHARMACY INSTRUCTIONS:
1. Available Forms: Injection - 2 cc., 125 mg. per cc. (Equiv. to 40 mg. of mercury)
3. Incompatibilities:
4. Stability and Storage: Solutions are sensitive to heat and should be kept under refrigeration.
   The solution is stable for 40 days when kept below 80°F.
5. Auxiliary Labels:

REFERENCES: AHFS
The Merck Index, 7th Edition

Figure 2. An example of a drug information card used for quick reference in the unit dose dispensing system.
HEPARIN SODIUM, U.S.P.

Category: Anticoagulant

Dose: Determine by clotting time. IV (continuous drip)-15 to 20 drops per minute of solution containing 10,000 to 20,000 units heparin per 1000 cc. of 5% glucose or normal saline. IV. (Intermittent) - 5,000 to 10,000 units q. 4 h. SQ and IM - 5,000 to 20,000 units every 8 to 12 hrs.

CAUTION: WILL INFLUENCE PROTHROMBIN TIME DETERMINATIONS SO IF BOTH HEPARIN AND DICOUMAROL ARE USED, THE BLOOD FOR PROTHROMBIN TIME SHOULD BE DRAWN 3 TO 4 HOURS AFTER THE LAST IV DOSE OF HEPARIN.

Figure 2. Examples of Med Notes which accompany each unit dose medication

HYDROCHLOROTHIAZIDE

Synonym: Hydrodiuril; Esidrix

Category: Diuretic; Antihypertensive agent.

Dose: Oral 25 to 100 mg., up to b.i.d.

CAUTION: HYPOKALEMIA, WHICH MAY RESULT, WILL INCREASE SENSITIVITY TO THE TOXIC ACTION OF THE DIGITALIS GLYCOSIDES.

Side Effects: Dry mouth, weakness, muscular pains, fatigue, hypotension, tachycardia.

Initial planning called for setting up a drug information center in the decentralized dispensing area. This was necessary because the central pharmacy does not now provide twenty-four hour service and therefore could not be available for drug information services around the clock as would be the personnel in the experimental area.

Small space allotment necessitated compactness of the drug information area (Figure 1). Journals and other periodicals were not included but were available in the central pharmacy reference area when required.

The Drug Information Center

A list of texts used in the decentralized substation to provide drug information is given below.

*Clinical Toxicology of Commercial Products*, Gleason, Gosselin, Hodge
*United States Dispensatory*, Osol, Farrar, Pratt
*Medical Treatment, Lange*
*Poisoning, Lange*
*Physicians Handbook, Lange*
*Side Effects of Drugs*, Excerpta Medical Foundation
*Poisoning, Van Deeningen*
*New and Nonofficial Drugs*
*State University of Iowa Hospital Formulary*
*The Merck Index*
*Physicians Desk Reference*
*Yearbook of Drug Therapy*, Beckman
*Facts and Comparisons*
*The Merck Manual*
*Dorland's Illustrated Medical Dictionary*
*PharmaceuticalDispensing, Husa*
*American Hospital Formulary Service*
*Textbook of Medical Physiology*, Guyton
*Current Therapy, Conn*
*Textbook of Biochemistry, West and Todd*
*Pharmacologic Principles of Medical Practice*, Krantz and Carr
*Drugs of Choice, Modell*
*Documenta Geigy Scientific Tables*
*Pharmacology—The Nature, Action, and Use of Drugs*, Beckman
*Remington's Practice of Pharmacy*

In addition a series of "drug information cards" (see Figure 2) was produced for every drug stocked in the hospital. The cards were produced by the study pharmacists using a variety of texts such as the *American Hospital Formulary Service*, USP, NND, and *The Merck Index*. The purpose of these cards was to provide a rapid and concise source of information about drugs used in the hospital. The cards provide a convenient breakdown of information on various aspects of a drug which might otherwise require considerable searching.

"Med Notes" (see Figure 3) comprise another area of drug information service provided by the unit dose substation. These are small cards containing capsulated drug reviews which are intended to inform the nursing personnel about the drugs they are administering. They were produced with the main objective of providing
facts pertinent at the time of administration rather than long range side effects, detailed mode of action and the like. The brevity of the "Med Notes" was by design because it was thought that a nurse cannot take a great deal of time, while preparing to administer a drug, to read a detailed drug review. A "Med Note" accompanied each unit dose medication supplied to the nurse. The system proved to be particularly useful to graduate nurses for information on seldom used or new drugs and for checking dosage. Student nurses relied on them heavily as introductions to the many drugs with which they were unfamiliar during early training.

The "Med Notes" were prepared by senior pharmacy students and edited by registered pharmacists.

**Utilization**

The results of the efforts in providing drug information services to the medical team were determined by maintaining a drug information log (see Figure 4). The log was designed to obtain as much information as possible and at the same time minimize the amount of time required to maintain the log. The summation of the drug information log for the eight month period September 1, 1964 to May 1, 1965 is shown in Table 1.

![Figure 4. USPHS unit dose study drug information log](image)

<table>
<thead>
<tr>
<th>Call received at Pharmacy by:</th>
<th>Call initiated from Pharmacy by:</th>
<th>PERSONAL CONTACT at Pharmacy received by:</th>
<th>Time Contact RECEIVED</th>
<th>Time Question Answered</th>
<th>CATEGORY of Ind. Outside Contact</th>
<th>Nature of Call</th>
<th>Reference Used</th>
<th>Satisfied with Answer (Specify, Yes, No, n)</th>
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Table 1: Summary of Drug Information Log
Table 1. Unit Dose Substation Drug Information Log Summary

<table>
<thead>
<tr>
<th></th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Call Received at Substation</td>
<td>16</td>
<td>20</td>
<td>15</td>
<td>20</td>
<td>9</td>
<td>51</td>
<td>59</td>
<td>69</td>
<td>259</td>
<td>49.2</td>
</tr>
<tr>
<td>Call Initiated from Substation</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>11</td>
<td>27</td>
<td>5.1</td>
</tr>
<tr>
<td>Personal Contact at Substation</td>
<td>25</td>
<td>17</td>
<td>37</td>
<td>23</td>
<td>12</td>
<td>29</td>
<td>38</td>
<td>59</td>
<td>240</td>
<td>45.6</td>
</tr>
</tbody>
</table>

Amount of Time to Answer:
- Immed. (0-5 min.): 36 38 49 30 20 65 83 104 425 85.2
- Other: 7 4 11 13 2 10 12 15 74 14.8

Category of Contact:
- Resident: 21 13 32 37 11 39 67 78 308 62.1
- Intern: 10 9 6 1 7 2 1 0 40 8.1
- Staff: 0 5 9 0 1 1 3 1 20 4.0
- RN: 6 10 10 6 0 18 23 30 105 21.2
- Nursing Student: 0 1 1 0 0 3 2 0 7 1.4
- Med. Student: 4 4 0 0 0 0 0 8 16 3.2

Nature of Information Requested:
- Dose: 12 17 18 14 8 24 26 36 155 26.2
- Therapeutic Use: 8 4 6 5 0 9 17 17 66 11.2
- Side Effects and Contraindications: 7 4 6 8 2 11 9 15 62 10.5
- Drug of Choice: 13 10 16 7 8 24 9 20 107 18.1
- Therap. Comp.: 1 3 2 1 0 2 1 1 11 1.9
- Pharm. Comp.: 4 6 3 3 1 2 3 3 15 2.5
- Identification: 1 5 15 15 6 10 20 36 109 18.4
- Other: 66 11.2

Reference Used:
- AHFS: 3 2 0 0 1 1 5 8 20 6.8
- D.I. Card: 7 5 0 0 2 1 1 1 17 5.7
- Other: 16 23 44 59 20 65 22 30 259 87.5

Satisfaction With Answer:
- Caller: Yes 37 37 54 36 22 72 93 113 464 92.6
- No: 7 4 3 1 1 5 4 6 27 7.4
- Pharmacist: Yes 36 38 52 37 21 72 92 110 458 91.1
- No: 8 3 5 7 2 5 6 9 43 8.0

Individual Requests: 49 46 66 52 24 77 98 124 536

In the following discussion it should be kept in mind that the numerical figures are not completely indicative of the total activity because not all the drug information calls were logged. Failure to record all calls was due, in part, to the busy schedule maintained by the substation personnel. The comparative data within the study is presumed to be a good representation of drug information needs.

A nine week base period was conducted approximately three months prior to instituting the unit dose substation in September 1964. The base consisted of logging, by pharmacists in the central pharmacy, drug information requests received from the four wards to be studied. The central pharmacy is located on the first floor of the General Hospital and is open from 8:00 A.M. to 5:30 P.M. daily, with a slightly reduced schedule on weekends. On-call pharmacists are available at all other times. The inpatient drug distribution system is a combination of ward stock and individual patient orders. Seldom used and highly potent drugs are restricted to individual patient order. A complete periodical and reference section, which is much more comprehensive than that described for the unit dose substation, is maintained in the central pharmacy. In addition, a special phone line is reserved specifically for drug information and poison control calls.

During the subsequent demonstration period, the unit dose substation was located on the third floor of the hospital immediately adjacent to the four internal medicine wards served. Twenty-four hour service was provided with continual coverage by a registered pharmacist. Communication channels to the nursing stations were of two types—intercom and telephone. The intensive care unit was provided with a direct phone to the substation for prn and emergency orders and for information; the ward areas relied mainly on the intercom system. A recording system was provided to double check any messages received over the intercom.

During the base period an average of two drug information calls per week were logged as received from the wards under study. This compares with twenty-two requests per week under the demonstration system after correcting for bed-average served during the eight month period. An eleven-fold increase in drug information utilization is therefore indicated under the experimental system. The total number of questions logged for the eight month period was 536. On the basis of serving an average of 94 beds during the eight months and with a total of 1000 beds in the hospital, the extrapolated value for the hospital is 6,550 drug information requests per year. This figure cannot be defended for accuracy because of many parameters not taken into
Conclusion

The availability of a pharmacist in the ward area, adequately equipped with drug information sources, resulted in an eleven-fold increase in drug information inquiries over those experienced in the hospital’s central pharmacy. Based on these results it is reasonable to conclude that the physician will utilize the pharmacist for drug information if the pharmacist is properly equipped with the necessary information and if the physician is made aware that such a source of information exists. While decentralization of the pharmacy operations was necessarily a part of the overall system, it does not follow that location per se is a critical factor in determining success in providing drug information services. The pharmacist must recognize his role as a professional in providing drug information and must adequately equip himself for that task.

Future plans call for the establishment of a centralized drug information center utilizing microfilm to a large extent for information storage and retrieval. Data processing and computer techniques will be employed whenever applicable and feasible.

Abstract

One of the aims of the decentralized unit dose dispensing demonstration project at the University of Iowa General Hospital is “to improve the availability and thus expand the utilization of the pharmacist as a drug consultant to the physician and nurse.” This article describes drug information services provided by a unit dose decentralized substation located adjacent to four internal medicine wards and serving an average of 94 beds.

The drug information area in the substation was equipped with 25 reference books and 24-hour service was provided by registered pharmacists. Communication to the nursing stations was via intercom and telephone. Drug information cards, intended to provide a rapid and concise source of information about drugs, were prepared for every drug used in the hospital. “Med Notes,” intended to provide facts on drugs pertinent at the time of administration, accompanied each unit dose medication supplied to the nurse.

A drug information log was maintained on the substation to record inquiries received. Compared to a base period wherein similar calls were logged in the central pharmacy, the substation experienced an eleven-fold increase in drug information utilization. The total number of calls logged by the substation for an eight-month period was 536; the extrapolated value for the entire hospital is 8,550 requests per year. Inquiries from residents and interns comprised over 70 percent, and those from nurses 21 percent, of the total. Over 45 percent of the contacts were personal contacts with the physician or nurse. The accessibility of the substation was a major factor in its acceptance as a drug information center. The authors conclude that the physician will utilize the pharmacist for drug information if the pharmacist is properly prepared to serve in this capacity.

References

2. A Study of Patient Care Involving a Unit Dose System, United States Public Health Service, Grant Number HM-00393-01, 1964.