COST ASPECTS OF AMPUL MANUFACTURE.*

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It is the purpose of this discussion to demonstrate the soundness of being sound, particularly in departmental economy, specifically in the manufacture of ampuls.

The operation of most hospitals, regardless of character, has necessarily reached the status to-day of a business in a true sense of the word. Efficient and economical operation is the constant goal of the administrators. The development and application of a method of accounting by which efficiency and economy may be ascertained in the department of Pharmacy of a hospital is important.

The department of Pharmacy is a true service department, but, simultaneously, represents a potential, if not actual, source of revenue. There are three major units of service offered by most hospital pharmacies, two of which are rendered directly to the public and these two are the revenue producers. The department supplies all nursing floors with the medical material necessary for routine operation as well as the routine care of the patients. Private, semi-private and, on occasions, ward patients are supplied with special medications which are designated as "charge medications." Ambulatory patients are supplied with treatment medications through the medium of an out-patient department. For the latter two mentioned services monetary compensation must be exacted.

Recently one of the Middle Atlantic States apportioned among all of its *privately endowed* hospitals several hundred thousand dollars of the taxpayers' money to help these hospitals clear their operating deficit for the fiscal year 1939. It is the opinion of the author and others that whenever any hospital department deals directly with the public and charges for the service rendered, the charge should be so adjusted that at least the actual cost would be represented by the reimbursement. If so, the particular department concerned would not be adding to the deficit burden of the entire institution and the cost for these direct-to-the-public-services would be obtained from the taxpayers who are immediately benefited. Unfortunately this plan cannot be extended as far as to cover patient-day costs of a hospitalized patient, but it can be applied to departments of Pharmacy where the costs of services rendered are decidedly lower.

Hospital pharmacists, as a rule, have been grossly indifferent to actual cost when setting prices for the sale of medical supplies to the public. These prices are set with little or no concern for direct material costs let alone the multitude of indirect costs which arise from the operation of a pharmacy in a hospital. It becomes necessary, therefore, to reduce every unit of medical supplies dispensed as a service to nursing floors, in-patients, or out-patients to an actual cost figure, which figure must include both direct and indirect costs. By so doing, the department is immediately placed on a potentially sound accounting and administrative basis.

The formula costs, in the large variety of manufactured products in a pharmacy, change because of a fluctuating market for basic drugs. Maintaining

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actual costs under these conditions would be too great an accounting burden although the accurate method. To eliminate the necessity of changing costs with each market fluctuation a system of "standard costs" is advocated, which applied to materials is as follows.

Applying these costs to the formulas for the preparation of finished products will give the standard material costs upon which are based the final values of all units of material dispensed. Differences between the predetermined values and the actual cost will be accumulated in a variation account until the end of the period of operation. At this time, the difference, which may be a surplus or deficit, will be spread over the services supplied by the pharmacy. Incidentally, this difference and its character will gage accurately the market trend—whether up or down. It will also indicate whether or not good judgment has been used by the individual responsible for purchasing.

Consider some of the "intelligent" uses to which the system of standard costs may be put: The value of all materials on hand at any one time may be estimated with a great degree of accuracy. This gives all the desirable features derived from a perpetual inventory. The department of Pharmacy can definitely operate its two revenue-producing services so that at least no loss is experienced.

By using standard cost prices to price the requisitions from the nursing floors for supplies the hospital accounting department may determine the exact cost of medical supplies used on the nursing floors and may use this figure for building up the patient-day costs. Thus by means of standard costs the department of Pharmacy can ascertain that its two revenue producing units are paying their own way and can turn over to another department all the figures necessary from the pharmacy to make income from hospitalized patients cover the cost of patient days. In this way the department of Pharmacy cancels its financial obligations to its institution satisfactorily.

Standard costs present figures, devoid of all guesswork, which are either in favor of or not in favor of a program of manufacturing. If standard costs are favorable as compared with market costs and continue favorable, as the manufacturing program progresses, the pharmacist has a strong platform upon which to stand in proving to his institution the value of the functions of his department. Standard costs, simultaneously, eliminate any false conception of economy. Many hospital pharmacists perform their duties with an inflated conception of the economy effected.

No one ever economized by lowering quality. Consequently, we must maintain quality in our production. In so doing we are actually and necessarily competing with manufacturers of repute whose products must be beyond question in quality. The ampul we manufacture must be equal or superior to a similar ampul which might be offered the profession by one of these manufacturers. Hospital pharmacy cannot allow itself to descend to the level where ampuls are manufactured in any fashion. There is far more to be considered in the manufacture of an ampul than just the material costs.

Primarily, it is necessary to have the proper type of laboratory, completely equipped with all the essential apparatus. The best materials available must be used and the operator of the laboratory must be skilled in his work and thoroughly grounded in his knowledge of the chemicals used and their peculiarities under

varying conditions. The moment that an ampul laboratory starts to function as a unit of the pharmacy a great number of indirect services are brought into play. Underlying all this must be a continued, never-ceasing, program of research or practical study to constantly improve upon original techniques.

The laboratory must be isolated from all other activities than those directly concerned with sterile or aseptic technique. The space employed must actually be walled off and air-tight to prevent as completely as possible contamination of solutions with pyrogenous material. To allow ventilation and to ascertain that the air supplied is *clean* an intake ventilator is required. The usual exhaust ventilation shaft must be absent. Into the mouth of the ventilator is built a small intake fan backed by a "spun-glass" filter which cleans the air. When the fan is in operation, the laboratory is assured of a constant supply of clean air for it builds up a sufficient air pressure within the room to keep the flow passing from inside out through any tiny crevices. Windows should be weather-stripped and permanently sealed. If the windows are exterior, it may be more desirable to remove a pane of glass and build the intake fan with its filter into this space. The laboratory need not be large—a space fifteen feet square is more than ample. It may be constructed readily by using a corner section of a larger room and walling it off with two walls constructed of large squares of window glass set in partition casements. The laboratory should be supplied with water, waste lines, a sink, electric, gas, air and vacuum outlets if all of these are available. Tanks of compressed air or oxygen may be used to substitute for air lines. Vacuum may be substituted by use of the faucet aspirator pump.

The equipment of major importance includes: a small autoclave or a good pressure cooker, a hot-air oven, an electrically heated Pyrex glass water still of at least 2000 cc. capacity, a small incubator, a gas plate, a blow torch, a laboratory table and a stool. Many other pieces of equipment, especially glassware, which are too numerous to mention here are incidental to ampul manufacture.

Selection of the ampul container to be used is an important detail. The best ampul container available should be used. Select a container composed of a glass which will not when exposed to sterilization or under normal but lengthy storage conditions liberate sufficient free alkali to cause difficulty in the finished ampul. Some ampul solutions can be buffered against the action of alkaline glass; many, however, cannot. Select also a strain-free glass since breakage while sterilizing is a costly experience. From laboratory performance and a review of published reports on ampul glass, we find that certain domestic ampul containers are now superior to the foreign ampuls that have been imported.

In preference to a paper label, an etched or baked pigment label is necessary when the ampul is to be immersed in a sterilizing storage fluid such as 70% alcohol for a period of time before use. An acacia-base glue may be used on paper labels with fair security under these conditions. However, for complete assurance against loss of identifying labels an acid, alkali, alcohol resistant, baked pigment label will prove most successful.

Water to be used as the solvent for an ampul solution must be absolutely pure for reasons of both safety and stability of the solution. The requirements of the National Formulary for "Ampul Water" leave nothing to be desired and should

be adhered to. The distillation of ampul water of these standards is accomplished by the Pyrex glass still mentioned under the discussion of equipment.

When it appears necessary to use a buffer solution in preparing the ampul solution, agents should be used which are both physiologically and chemically compatible. The buffering solution schedule of Clark and Lubs has proved quite generally applicable although not so in every case. It may become necessary to develop a buffering or stabilizing agent for difficult cases.

The grade of chemical to be used in the ampul solution can only be determined by experience. In many instances it will be found preferable to use chemicals which are graded above the U. S. P. or N. F. standards.

The ampul container, the label, the buffer solution and the active chemical or chemicals used represent the material costs in the manufacture of an ampul which are usually accepted as the basis for determining the individual cost of a finished ampul, and the economy effected. However, to arrive at the true cost of the finished ampul it becomes necessary to develop the "standard cost" of the unit. Let us, therefore, analyze the costs over and above the material costs, which are commonly termed indirect costs which must be determined to develop the standard cost and which cover services rendered to the pharmacy by other departments of the hospital.

The most important indirect cost is that of labor. Experience shows that to maintain a record of the time each employee spends in making each preparation is costly and the following simpler method is suggested. Each employee during the day will spend some of his time in services to the hospital nursing floors, some for private and semi-private patients, and some for ambulatory patients. If the amount of time spent in each of these three units can be accumulated, expressing this in dollars and cents, a labor distribution can be established as well as the percentage relationship between labor cost so arrived at and the material cost by services. By applying this percentage to the material value of every item dispensed, a cost for material and labor can be arrived at.

Further indirect costs include such items as heat, light, power, depreciation (replacement of equipment), laundry, and so forth.

The final indirect cost of the group is represented by the apportionment of the costs of operating all the administrative departments which function in behalf of the pharmacy such as the accounting department, the purchasing department, and so forth.

For the purpose of this paper a study has been conducted in New York of the 1938 department of Pharmacy figures for six different New York City, privately endowed, hospitals ranging in bed capacity from 300 to 900. The study was made to determine a relationship of indirect costs to labor costs. Interestingly enough all six institutions demonstrated a fairly comparable relationship. An average of 32% of the money spent for labor gives a figure which represents all other indirect costs for the combined institutions.

The application of the described standard costs system of accounting at The New York Hospital has shown that labor cost represents approximately 30% of material costs on every item handled. We therefore have indirect costs reduced to two percentage figures which may be considered fairly average. By applying these two overhead percentages to a material cost of $1.00, the standard cost is

shown to be $1.40. As a concrete example, the manufacture of a thousand 1-cc. ampuls of a 2% solution of Procain Hydrochloride may be considered.

In the manufacture of these Procain ampuls will be used one thousand of the best ampul containers available, 1100 cc. of solution containing 22 Gm. of a Procain Hydrochloride and one thousand paper labels. The material cost for this operation will be approximately $24.50. These might be bought on the open market for $40.00. Without giving thought to labor and indirect costs there is an apparent economy of $15.50.

However, applying the overhead figures presented above the standard cost on these ampuls would be $34.20 a thousand. The *actual* economy is $5.80 or about three-fifths of a cent per ampul. Furthermore out of this saving would have to come any cost for materials used for research and any breakage. These two items can be determined only after a batch of ampuls has been manufactured. The resultant figure must be added to the standard cost.

IN SUMMATION.

In presenting this paper, I have attempted to point out how necessary it is that Hospital Pharmacy firmly establish itself through a system of accounting which is simple, efficient and, above all, applicable. I have reviewed the development of an ampul manufacturing program to demonstrate why all of the components of the described system of accounting apply to this particular phase of Hospital Pharmacy. And, finally, the components of the accounting system have been brought together and applied to a manufactured ampul to demonstrate to what extent the resultant product is affected by indirect cost factors.

This has been done with the one hope that, if you are anticipating the manufacture of ampuls or the inauguration of any new manufacturing procedure, you will not go blindly ahead believing implicitly that you are a "Midas" and that everything you manufacture immediately shows an inconceivably wide margin of economy; that you will find in this analysis the incentive to bring your own activities down to facts and figures for your good in particular and the good of Hospital Pharmacy in general.

One final thought. Do not be discouraged if the economy you might anticipate is not apparent. Professionally, we are pharmacists and as pharmacists it is our privilege and duty to pursue the opportunities granted us as far as it is economically feasible.

A DAY OF THANKSGIVING.

Thanksgiving Day is the most truly American as it is the oldest of all our national holidays, and our celebration of it will not be complete if we forget to give thanks for American ideals as well as for American prosperity. Unique among the nations of the earth, this nation will this year rededicate itself to that Power which guides the destiny of man, and give thanks for the precious things the year has brought. That such a day should have been set aside for national observance was most appropriate. Let us not forget the inspiration which was its inception.