

by the general practitioner. This could happen if the original conception of the health centre were introduced. The reduction of pressure on the casualty department would then allow the limited hospital staff to do their work more efficiently and quickly.

In this area much valuable work was done in the cottage hospitals by general practitioners, and this underlines the statement made by various authorities (Lowden, 1956; British Orthopaedic Association, 1959) that peripheral hospitals have an important role in the treatment of casualties.

All serious accident cases must be taken to the main accident centre even if the ambulance has to pass a small hospital on the way, for much time can be wasted and little good result if such a case is taken to a hospital not equipped to deal with it. Since this survey was made a new seven-bed resuscitation unit with separate nursing staff has been established at the Royal Hospital.

The need for building new accident centres is emphasized. Present accommodation in Portsmouth, although of post-war construction, is now inadequate because of the ever-increasing number of casualties.

We thank the Portsmouth Group Hospital Management Committee for its readiness to support the survey and for supplying us with secretarial aid and the required punch cards. We also thank Sister M. F. P. O. McCabe and her staff in the casualty department for their keen interest and great help during the months of the review, and Mrs. M. May who acted as secretary.

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Speaking at a press conference in connexion with the National Industrial Safety Week organized by the Royal Society for the Prevention of Accidents (RoSPA), Mr. W. Whitelaw, Parliamentary Secretary, Ministry of Labour, said: ". . . In mounting this attack, the human implications must, of course, be our primary concern; but the economic results cannot be overlooked. Unofficial estimates have put the annual cost of industrial accidents at something between £100m. and £300m. The average cost of a lost time accident has been calculated at about £300; for a minor accident £10 to £20. This loss of earnings and profligate waste of skilled manpower and resources is a considerable drag on our national efficiency. The majority of accidents can be directly attributed to human failings of one sort or another, such as carelessness or neglect of elementary safety principles; indeed they are anything but inevitable. Too often people think 'It can never happen to me'; but the fact is it can and unfortunately does. Let me put the figures to you in a different way. One in every 300 men working in a factory will be killed at work; the chances are that all of them will have at least one accident serious enough to keep them away from work. In the more dangerous jobs such as construction, shipbuilding or metal manufacture, the chance of being killed is higher at 100-1, and the chance of being badly injured is 3-1 on. In all the circumstances, I am sure you will agree not very good odds! The only real and lasting solution to this accident problem is an acceptance of the importance of safety precautions on the part of everyone in industry from the chairman of the board down to the newest recruit."

HOSPITAL CENTRAL STERILE SUPPLY

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The Nuffield Provincial Hospitals Trust (1958) and the *Journal of Clinical Pathology* (1961) have emphasized that in hospitals the practical difficulties of destroying bacteria and preventing recontamination of sterilized materials are greater than was generally believed. All the techniques are so exacting that they cannot be carried out effectively without a degree of special training and equipment which cannot be provided in every ward and department. Therefore, if the standard of sterilizing instruments and materials is to be improved, central sterile supply departments (C.S.S.D.) must be introduced. The Ministry of Health (1961) advocates this and describes a C.S.S.D. for an area service. Our experience, however, has shown that a hospital C.S.S.D. can be established without elaborate building and with a comparatively low running cost.

Although C.S.S.D.s are not intended primarily to reduce costs, much saving results from economies in materials, in maintenance of sterilizing-rooms, and, of great importance, in the more efficient use of nurses' time. By using materials supplied by the C.S.S.D., and especially by adapting techniques to make the best use of them, the ward nursing staff requires only half the time previously taken to complete dressings. This does not mean that hospitals can reduce their establishment of nurses, but nurses have more time to care for their patients, who have noticed and commented on this change.

Central sterile supply and associated changes in techniques have been introduced gradually in the Sunderland Royal Infirmary during the past three years, and we have no doubt that these have contributed to a reduction of sepsis and have led to an improvement in the patients' well-being. The original pilot scheme was expanded in 1960 with a grant from the Nuffield Provincial Hospitals Trust to investigate the problems of providing a C.S.S.D. for a 300-bed acute general hospital with associated departments—casualty, chest clinic, dental clinic, E.N.T., out-patient, pathology, physiotherapy, psychiatry, radiotherapy, skin, special treatment, and urology. These methods are now being adopted by the 14 hospitals in the Sunderland Group of approximately 2,800 beds.

Planning

From our experience the initiative for the introduction of a C.S.S.D. should come from the senior medical staff, and only their active and interested co-operation makes possible the establishment of an efficient department. The full co-operation of the matron, sister tutor, and ward and departmental sisters is also essential.

As the materials which a C.S.S.D. must produce are determined by the techniques of the users, planning of

the department must begin in the wards and operating-theatres. The generally accepted technique for dressings has not been altered fundamentally for many years. We therefore started by reviewing the standard ward-dressing procedure with the object of reducing cross-infection, saving nurses' time, and improving the efficiency of supply.

The hospital staff agreed on the basic principles which determined the techniques to be used. These are as follows. No sterilizing should be done in wards or departments. As soon as the staff is convinced that local sterilizers are unnecessary these should be removed and "sterilizing" rooms converted into dressing-rooms if these have not already been provided. Only operating-theatres should sterilize their own bowls and instruments. All other sterilized materials should come from the C.S.S.D. in composite packs containing all the materials required for a single procedure. This eliminates bulk packs which may be contaminated once they have been opened and which require Cheatle's forceps, bowls, other containers, and "sterile" surfaces when they are broken down. As many articles as possible should be disposable to eliminate the handling of used and possibly dangerously contaminated articles. When materials are available from manufacturers, sterile and suitably packed for distribution and use, they should be adopted. Such articles should be supplied through the already established channels—pharmacy or stores—without going through the C.S.S.D., which should supply only those materials which it has to process.

Ward-dressing Techniques

Based on these principles and with the help of the nursing staff a simple ward-dressing technique was devised. A basic dressing pack is provided. This is a cardboard box containing gauze, wool, and disposable gallipots packed in the order of use; dissecting forceps are held upright in a cardboard insert (Fig. 1). For special procedures supplementary packs are supplied in addition to the basic pack. These supplementary packs are designed by the user in consultation with the C.S.S.D. Examples of 51 supplementary packs available are given in Table I. Scissors and other instruments are packed separately in sealed paper wraps or in glass or aluminium tubes. Although we recommend cardboard boxes, they are not necessarily the final solution to the problem of a container for sterile materials. We believe the only practical alternative at present is double

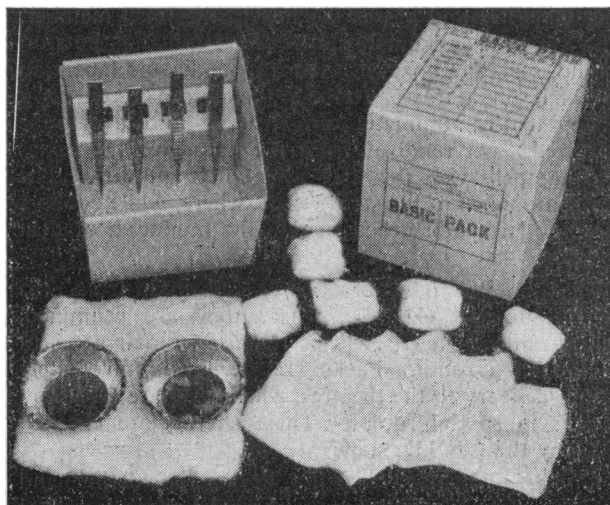


FIG. 1.—Basic dressing pack.

wrapping in paper, but this is time-consuming and more expensive. Cardboard boxes have the additional advantage of providing rigid containers. Metal drums are too easily damaged, so that even the latest types containing filters are not reliable except when quite new.

The dressing-room is cleaned with antiseptic by the ward orderly; the nursing staff have nothing to prepare. The dressing box is placed on top of the dressing trolley; no towel is required, as the inside of the box is the sterile surface. Each article is picked up with the forceps from the insert, used immediately, and discarded. Nothing is laid down and picked up again. Enough instruments and dressings are supplied, so that no article need be used more than once. Liquids, supplied by the dispensary in quantities sufficient for a single procedure, are poured into the sterile disposable gallipots which are placed directly on the trolley top. No box is regarded as sterile once it has been opened and used.

After use disposable items are discarded into a paper bag placed near the patient, and at the end of the dressing the bag is folded and put into a paper sack for incineration. Non-disposables are dropped immediately after use into a plastic bucket containing an antiseptic solution. The unused contents of the box are untouched and are returned in the box to the C.S.S.D. to be reissued. This elimination of waste requires no effort by the ward staff. The wards and departments hold only half a day's stock of dressing packs because these are always immediately available from the C.S.S.D.

TABLE I.—Supplementary Packs

Venesection set (cardboard box 5 by 10 by 6 in.—12.5 by 25 by 15 cm.): 3 pairs Mosquito curved artery forceps; 1 pair fine dissecting forceps; 1 pair fine toothed dissecting forceps; 1 pair suture scissors; 1 aneurysm needle; 1 needle-holder. In small separate heat-sealed bags: 2 cutting needles in anticorrosive paper; 1 piece blue nylon thread. Attached to outside of box: 1 scalpel with blade attached; 1 tube catgut.

Lumbar puncture set (cardboard box 5 by 5 by 6 in.—12.5 by 12.5 by 15 cm.): 6 assorted lumbar puncture needles, varying bore lengths from 3 to 4½ in. (7.5 to 11.5 cm.), packed in constricted glass tubes; 1 two-way tap in heat-sealed bag; 2 Luer adaptors with 2-in (5-cm.) translucent tubing attached—in heat-sealed bag; 1 manometer packed separately in glass tube.

Supplementary wool and gauze for large dressings (cardboard box 5 by 5 by 6 in. (12.5 by 12.5 by 15 cm.): 6 gauze swabs 4 by 4 in. (10 by 10 cm.); 1 piece of wool 6 by 6 in. (15 by 15 cm.).

Sixteen articles are individually wrapped in heat-sealed bags, including: Packing gauze (various sizes), 3–6 per box sized 5 by 5 by 6 in. (12.5 by 12.5 by 15 cm.). Rubber gloves, disposable, 6 per box sized 5 by 10 by 6 in. (12.5 by 25 by 15 cm.). Safety pins, 6 per box sized 5 by 5 by 6 in. (12.5 by 12.5 by 15 cm.). Tubing and connexions, 4 per box sized 5 by 10 by 6 in. (12.5 by 25 by 15 cm.).

Fifteen articles are in aluminium containers or glass tubes, including: probes, scalpels, suture scissors, syringes.

Tracheotomy dressing (cardboard box 5 by 10 by 6 in.—12.5 by 25 by 15 cm.): 2 pairs dissecting forceps, non-toothed; 2 pairs Spencer Wells artery forceps; 1 pair sinus forceps; 1 pair aural forceps; 2 foil gallipots; 6 wool swabs; 6 gauze swabs, 3 by 3 in. (7.5 by 7.5 cm.); 2 white lint keyhole dressings, 5 by 5 in. (12.5 by 12.5 cm.); 3 narrow tying tapes—1 yard (91 cm.) long, ¼ in. (6 mm.) wide.

Tidal drainage (cardboard box 10 by 10 by 6 in.—25 by 25 by 15 cm.): 1 Dakin flask, wide rubber tubing Y connexions; 2 gate clips. All fitted ready for use. Open ends wrapped in paper.

Gynaecological pack (cardboard box 5 by 10 by 6 in.—12.5 by 25 by 15 cm.): 2 dressing towels, paper; 2 foil gallipots; 6 wool swabs; 6 gauze swabs, 4 by 4 in. (10 by 10 cm.); 2 foil receivers; 1 Sims speculum; 1 pair vulsellum forceps; 1 pair packing forceps.

Delivery box maternity (cardboard box 10 by 10 by 6 in.—25 by 25 by 15 cm.): 4 dressing towels, linen; 3 foil gallipots; 48 wool swabs; 36 gauze swabs, 4 by 4 in. (10 by 10 cm.); 6 perineal pads.

The techniques for other ward procedures are based on these principles, using the special supplementary packs. Only a very few of these procedures—in our experience venesection in very small infants and the insertion of catheters into the chest—require a slightly more elaborate technique. These would be better classed as minor operations.

As there is no breaking down of bulk supplies, time is saved and the risk of contamination reduced. Bowls, dressing towels, and Cheatle's forceps are not required. There is no setting of trolleys and no cleaning up at the end of the session. Ward sterilizers with their accompanying steam and noise are eliminated completely.

Theatre Techniques

Theatre bowls and instruments are sterilized in the theatres. Bulk packing of other materials is avoided and they are supplied in quantities sufficient for one operation. There are three basic packs, containing materials for a laparotomy, a lithotomy, and an instrument-trolley setting. Four examples of the 36 theatre packs available are given in Table II. Boxes containing a paper towel, a cap and mask if required, a gown, and a pair of gloves are provided. These are produced in all sizes of gloves used. Two sizes of gown are provided, the larger being packed with glove sizes $7\frac{1}{2}$ and 8. The surgeons and theatre staff take these materials direct from the box. There is no trolley setting for these, and the articles are not exposed or handled before use. Packs may be varied slightly to suit individual requirements.

TABLE II.—Theatre Packs

Laparotomy pack (cardboard box 10 by 10 by 6 in.—25 by 25 by 15 cm.): 1 abdominal sheet, 1 draw-sheet, 1 dressing towel, 2 nylon sheets.

Lithotomy pack (cardboard box 10 by 10 by 6 in.—25 by 25 by 15 cm.): 1 lithotomy sheet, 2 dressing towels, 1 nylon sheet.

Trolley setting pack (cardboard box 10 by 10 by 6 in.—25 by 25 by 15 cm.): 6 draw-sheets, 4 nylon sheets.

Mobilization of stapes pack (cardboard box 5 by 10 by 6 in.—12.5 by 25 by 15 cm.): 24 wool swabs; 1 wool roll; 24 gauze swabs, 4 by 4 in. (10 by 10 cm.); 3 $\frac{1}{4}$ -in. (1.3-cm.) rolls ribbon gauze; knitting wool.

After use fabrics are sent to the laundry by the theatre staff. Unused materials in opened packs are taken back from the theatre by the C.S.S.D. staff for repacking.

The C.S.S.D.

The central sterile supply department in the Sunderland Royal Infirmary is in the only space available—

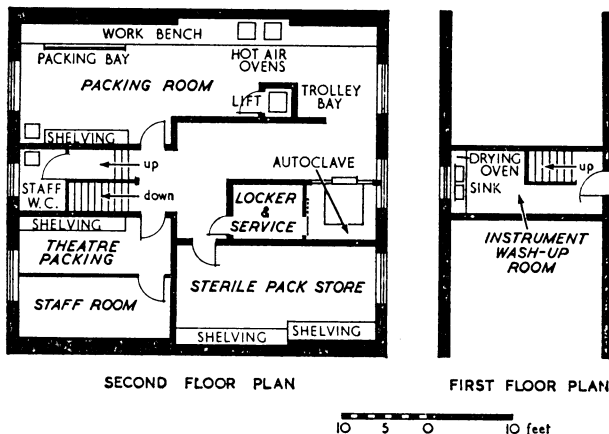


FIG. 2.—Plan of the C.S.S.D., Sunderland Royal Infirmary.

some disused attic rooms. Similar accommodation will be available in many hospitals. The attic rooms adapted have a floor area of approximately 1,400 sq. ft. (130 sq. m.) which provides a general storage and packing room leading to the autoclave, a packing room for theatre materials, and a sterile store. An office, lavatory, and autoclave-maintenance room, separated from the rest of the department, are also included. The wash-up room, which is completely separate, is smaller than is desirable but has proved adequate for cleaning the relatively few articles required for the simplified techniques (Fig. 2). There is an emergency cupboard of sterilized packs for general hospital use.

Staffing.—As nurses are the main users of materials from the C.S.S.D. we believe, in principle, that the supervisor of the department should be a member of the nursing staff, preferably with considerable previous experience in wards or departments. She should be at least of departmental sister status and should be directly responsible to matron. With the sister tutor she can ensure that any changes in techniques are made simultaneously in wards and classroom. The remainder of the staff can be inexperienced when they are recruited. We have a part-time staff nurse, three permanent female orderlies, and three part-time cadet nurses who are changed frequently. This has proved to be a valuable and interesting part of their training. Medical supervision of the department should not be left to one person. A small committee of senior members of the medical staff, including a surgeon, a physician, and a clinical pathologist, who can all make their special contribution, should take an active interest in running the department. Meetings should be held regularly; the sister should attend these meetings and have easy access to the chairman at all times.

Technique in the C.S.S.D.

Ward Packs.—The C.S.S.D. staff collects in the buckets used instruments from the wards and leaves them soaking in the antiseptic overnight in the wash-up room. The instruments are then washed, dried, and passed to the packing-room, where they meet unused materials returned from wards and new materials. Two weeks' supply is kept in the department, and this is replenished weekly from a six-weeks stock held in the hospital main store. Packs are made up on a production line. The first member on the line empties the returned packs and passes them to the next member, who puts in the soft materials and passes the box to the third member, who adds the instruments, checks the contents, puts on the lid, seals the box with autoclave indicator tape, and places it on a tray. Trays of boxes are taken on a trolley to the automatic high-vacuum autoclave to be sterilized. On removal from the autoclave the boxes are stamped with the date and batch number. The boxes are taken to the sterile store, where, while cooling, they are left undisturbed so that the minimum of dust enters.

Theatre Packs.—Fabrics are delivered from the laundry to the C.S.S.D., where they are examined, folded, and packed. Articles requiring repair are sent to the linen room. Packs are sterilized immediately before delivery to the theatres, where they are stored on shelves in special rooms. These shelves are checked daily by the C.S.S.D. staff.

Gloves.—Washing, checking, drying, powdering, and packing gloves is time-consuming, and there is a real

difficulty in detecting small perforations. The processing should therefore be eliminated if there is a shortage of nurses. An estimate of the cost of using disposable gloves recently made suggests that in this hospital group the annual additional cost would be less than £1,000. A nurse takes about four minutes to prepare one pair of gloves, so that the nursing-time saved is considerable. The chief difficulty at present is that the disposable gloves are too smooth and slippery for some surgeons. Meantime, all gloves supplied for theatre assistants and nurses and for ward use are disposable.

Sterile water for theatre use is still obtained from boilers, which are frequently checked bacteriologically. This is not necessarily the final policy.

Syringes.—A syringe service can be considered separately from the other services provided by a C.S.S.D. A group service, once the capital costs have been written off and staff have been trained, is thought to be less expensive than other methods of supply. In order to introduce this system in the Sunderland Hospital Group new buildings, equipment, and transport would have been required. Money for this was not immediately available, and sterilizing and cleaning methods are still under discussion.

Therefore a commercial sterile syringe service was introduced at a general (453 beds) and at a maternity (105 beds) hospital. The cost is approximately 5.75d. per syringe for 2,000 syringes per week. This includes cost of distribution, collection, and accounting within the hospitals. This service functions satisfactorily, but the company could not extend it to other hospitals in the group. These hospitals were therefore supplied with disposable 2-, 5-, and 10-ml. syringes at a total average cost for the Sunderland Royal Infirmary of approximately 6d. per syringe for 1,700 syringes per week. All needles used by both types of service are disposable. These needles and disposable syringes are distributed by the pharmacy departments. The C.S.S.D. at the Sunderland Royal Infirmary has to clean and sterilize all special needles and only syringes larger than 10 ml. and special syringes—haemorrhoid, insulin, and Mantoux. An average of 20 such syringes are required daily, so that no special cleaning apparatus is required. These syringes and needles and all instruments not included in composite packs are sterilized in glass or metal containers in the hot-air oven.

Pack Store.—With a high-speed autoclave there is no need to hold large stocks of sterile packs. At present the department keeps a reserve of two days' supply only. Part of this reserve is kept in the emergency cupboard, which contains all types of materials used. The cupboard is locked to prevent unauthorized disturbance of the contents, but the keys are readily available from the night superintendent and the operating-theatre nursing staff.

Accounting and Distribution

Written accounts are not kept by the ward nursing staff. The staff of the C.S.S.D., if desired, can keep account of the distribution to prevent loss of equipment, to assess demand, and to prevent hoarding during the initial stages before the ward sisters have learned to rely on the C.S.S.D. We have not had any significant deficiencies except for scissors; we now pack these individually so that a special check can be maintained.

The wards, theatres, and departments notify their daily requirements to the C.S.S.D. at specified times.

The C.S.S.D. delivers twice daily, collects the boxes with surplus dressings, and exchanges the used instrument buckets for fresh ones. The C.S.S.D. undertakes the transport because this improves liaison. The distribution staff is trained in the attitude that the C.S.S.D. is anxious to serve in every way possible. This willingly given service helps to overcome any tendency to hoard or to adopt a conservative attitude towards the great changes in techniques that are necessary if cross-infection is to be eliminated.

Development

Our simplified dressing technique was started in a single ward. As soon as it became fully effective in one ward there was heavy pressure from other wards to be included in the scheme, and we feel that this will be the experience in other hospitals, provided the attitude of service is nourished. Our hospital C.S.S.D. has become an integral part of the hospital team, and in this way, we believe, it exerts a much greater influence on the hospital than could a group or regional service. This influence is in our experience one of the major benefits of a C.S.S.D. Acceptance of a C.S.S.D. depends on the hospital staff being able to play an effective part in planning the service; this co-operation would not be so easy with a remote organization.

Summary

A hospital central sterile supply department can be established without elaborate building and with a comparatively low running cost.

The initiative for its introduction must come from the senior medical and nursing staff.

As the materials to be produced are determined by the techniques of the users, planning must begin in the wards and theatres.

The basic planning principles are: (a) no sterilizing to be done in the wards; theatres to sterilize bowls and instruments only; (b) all materials to come from the C.S.S.D. in composite packs for single procedures; (c) as many articles as possible to be disposable; and (d) the C.S.S.D. to supply only those articles which it has to process.

Ward-dressing technique is simplified. Nothing is touched until it is picked up to be used; after use it is immediately discarded. Nothing is laid down to be picked up. Unused articles remain in the pack and are returned to the C.S.S.D. for re-use. This results in a great saving of nurses' time, reduces the materials required, and improves techniques.

Most syringes, being disposable, are supplied by the pharmacy.

The C.S.S.D. is administered by the nursing staff, as they are the main users. The sister in charge is directly responsible to the matron. Medical supervision is by a committee of three consultants, to whom the sister has easy access.

We thank the Nuffield Provincial Hospitals Trust, the Newcastle Regional Hospital Board, the Sunderland Area Hospital Management Committee, and the medical, nursing, and lay staff of the Sunderland Royal Infirmary, without whose co-operation this work would not have been possible.

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