

HOSPITAL AND WARD DESIGN WITH PARTICULAR REFERENCE TO OBSTETRICAL WARDS*

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Architecturally speaking, the design of a hospital is a most involved problem, since it comprises self-contained but interrelated departments, the whole creating a complex group of varied functions. There is a great danger that each person who contributes to the final design will consider only his relative part without defining its relationship to the whole. Too much knowledge in a particular field may in fact be a handicap, for under its pressure the mind finds it only too easy to confine its vision to the things it has previously been conditioned to look for. This tends to the statement of requirements in terms of loose isolated items, particularly those parts previously experienced as unsatisfactory.

Unless the architect's approach is understood and he is equipped to ask the right questions, users will attempt to explain their needs in terms of their own ideas of plan arrangement, instead of tabulating their functional requirements. Doctors and nurses tend to be influenced in their opinions by conditions in the hospitals

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in which they trained, or by the conditions in the building where they consider the best medicine to be practised. No one doubts the value of a good building in assisting the staff in their work, but the extent to which the quality of the medical treatment is due to the men and women practising there, and the extent to which it is due to the building, must be examined. The architect may lose himself in acquiring a competent knowledge of detail unless he is aware of a basic rational approach to the problem. A sound basic design can always be modified in detail, but perfect details do not lend themselves to alteration in principle. The ideal relationship between architect and client would be similar to that between doctor and patient; an explanation of the symptoms, followed by examination, leads to diagnosis, and treatment is prescribed accordingly.

Differences in medical opinion and practice, and the continual development of medicine and treatment techniques, will demand a change of plan for efficient operation. The hospital designed for today will not necessarily function correctly tomorrow. To allow

for this necessary change, the basis for the design must be a denominator common to all phases of development.

PLAN FORMS

The plan should encourage the highest amount of work output and should permit progressive changes in organization to maintain optimum efficiency. Too much emphasis should not be placed on the separate departments, but they must be well integrated in the whole and flexible within themselves. Future needs should be anticipated in such a way that a wrong initial assumption will not affect the plan adversely to any great extent. Planning should not be bound to a specific function; a solution is required which will allow flexibility.

An analysis of the plan forms which resulted from the techniques practised at different times will show the changes that have taken place and indicate the pattern of future tendencies. The hospital as we know it began in 1846 with the development of anaesthetics by Morton. During the Crimean war, Florence Nightingale laid the foundations of nursing reform and hospital construction and management. The work of Pasteur and Lister from 1860 to 1875 established the principles of our antiseptic system.¹ The concepts of discipline, hygiene and ventilation were easy to understand and express clearly architecturally. Each ward worked for itself and performed no external functions. This independence, coupled with the danger of cross-infection, resulted in the pavilion plan. The further development of medicine and nursing practice changed the basic needs of the hospital; the centralization now possible required the pavilions to be linked by corridors, which gradually became shorter. The lift and the necessity for concentration resulted in the block system of planning, which is a completely inflexible arrangement. This multi-storey solution allows for no easy extension and no change internally. All departments are equally related and a number of compromises are forced upon the architect.

In principle, all new developments in medicine, its techniques and their application, tend to reduce the length of stay in hospital, and this results in an increased load on diagnostic and treatment departments. There is a tendency to split functions progressively and form new units within the sections, aiming at a greater usage from a medical or economic point of view. Clearly therefore, the plan form must allow for flexibility of function, and flexibility for expansion and for contraction. When these facilities are arranged in a multi-storey wing, even if it is devoted entirely to the various treatment departments, the plan supposes a simultaneous parallel growth in each department which would not occur in practice. For example, if the X-ray department happens to be on the third floor, its extension affects the floors above and below it, which may require no change.

Some combination of block and pavilion system is indicated in which the departments are directly related to their frequency of usage, to enable a closer concentration of the more interdependent sections.

The diagnostic and treatment departments will grow or alter in the future, and new treatments may require special accommodation. Unless these departments are arranged on the ground floor the future development of the hospital will be inhibited. This does not mean the bottom floor of a multi-storey block, but a free-standing distributed arrangement on either side of a main circulation 'street' in accordance with the degree of interdependence.

Studies of inter-departmental frequencies at 4 Transvaal hospitals indicate that the relationships between the various sections are better satisfied by this arrangement than by the multi-storey plan. However, wards should not also be placed on the ground floor; such a plan would bring about too great a dispersal from the diagnostic and therapeutic centre. The ward is a fairly static element and can conveniently be stacked vertically; the vertical core of circulation is then linked to the horizontal 'street' at the appropriate point.

Despite the changes in treatment and rehabilitation, the acute patient will still require bed accommodation. Provision must be made in the ward for the patient's physical needs and for simple treatment; it will be necessary to provide sterile supplies and remove dirty materials. A reduction in the length of stay will not affect the ward plan as it does other departments. The only possible future need will be for more private accommodation, resulting from the improving socio-economic status of the population.

The nature of the nurses' tasks in the ward are not of prime importance to the planner, but rather the journeys necessary to perform those tasks. Clearly these should be as short as possible, especially those which occur frequently. The number of beds in the ward should ensure that the service rooms are used with intensity without congestion or waiting. The arrangement of beds around this service core will determine the form of the ward.

In the traditional or 'Nightingale' ward usually about 100 ft. long, 25 ft. wide and 12 ft. high, the beds are arranged at right-angles to the window walls, leaving a circulation way down the middle. The advantages are ease of supervision and direct bed-to-bed journeys for routine work. However, the bilateral lighting causes discomfort to the patient,² and the room size, as well as accentuating the normal working noise,³ makes it difficult to achieve good ventilation and heating.⁴ These disadvantages are obviated by the 'Rigs' arrangement of beds in groups parallel to the window wall, each group being screened from the next by some form of partitioning. In this ward the patient is not forced to look at the window opposite (the point of maximum glare), the smaller room size does not intensify the normal working noise, and the ceiling can be lower. However, with unilateral lighting the room depth is limited by the extent of penetration of natural light to give a reasonable intensity. It is predicted from day-lighting studies at the National Building Research Institute that, with an open site, reasonable natural lighting from one side can be obtained with the beds placed four-deep parallel to the window wall.

NATIONAL BUILDING RESEARCH INSTITUTE STUDY

To determine the most efficient arrangement within the ward, journeys by nurses during approximately 1,800 nursing hours were recorded. Analysis of the results showed that the nursing journeys conformed to the same general pattern; approximately 50% of all journeys were made within the bed area, 30% from bed to service rooms, and 20% from service room to service room. All the wards measured were variations of the traditional plan, and the high percentage of bed-to-bed visits probably results from the present system of organizing the work as a series of rounds from bed to bed—which is a direct result of the inconvenient plan. Accepting the fact that journeys from service room direct to a bed are the most important and urgent journeys, Fig. 1A shows a 32-bed ward arranged on the 'Rigs' pattern, and Fig. 1B a 32-bed 'Nightingale' ward with the same area per bed.

In the study of nursing journeys, the length of the journeys from bed to bed were found to average approximately 15 ft. 6 in. If the distance between service rooms is taken as 20 ft., then the 'Nightingale' arrangement in Fig. 1B represents an increase of 31% in the total distance walked compared with the 'Rigs' plan in Fig. 1A. In the 'traditional' wards measured the average distance walked by a nurse during a tour of duty was approximately

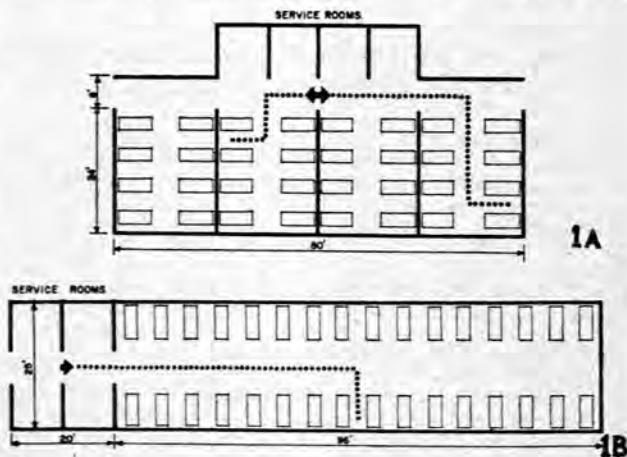


Fig. 1A. 'Rigs' ward. Average journey 42 ft. 6 in.

Fig. 1B. 'Nightingale' ward. Average journey 68 ft.

4½ miles, and 3½ miles in the corresponding figure for the 'Rigs' ward. If, however, in Fig. 1A the service room core is displaced by 20 ft. from the centre of the bed area, the total distance walked will increase by 12% and generally, therefore, the beds should be arranged symmetrically and as compactly as possible around the service core.

Studies in Sweden show that the smaller the number of beds in a room the greater are the number of visits per bed per day.⁵ A patient in a single room received 60 visits per day; each patient in a 2-bed room received 40 visits per day; in a 6-bed room 20 visits per day, and in an 8-bed room only 16 visits per day. The disproportionately large number of visits to patients in single rooms is partly attributed to the seriousness of their condition and the desire for attention, due to loneliness. In the larger rooms, the nurse, while attending to one patient, can ascertain whether others require it, and in addition some help is given by ambulant patients. Because of the need for extra care of patients in single rooms, they should be placed directly opposite to the service rooms. If economy is important single rooms should only be provided for those patients whose condition requires it.

If patients are grouped in the ward according to their degree of illness, the work of the staff can be further simplified by ensuring that the most frequent and urgent journeys are the shortest. The acutely ill may be provided with single rooms opposite the service-room core, the bed-fast patients in larger rooms on either side of these, and the semi-ambulant and ambulant patients could be placed nearer to the entrance of the ward and the ablution rooms.

The measurements of nursing journeys previously discussed were extended to cover the relative importance and interdependence of the service rooms. It was found that the minor rooms such as store, cleaners' rooms, etc. received only approximately 3% of the visits, and so the study was restricted to the duty room, sterilizing room, sluice room and kitchen. In all except maternity wards, the duty room is the most important service room, accounting for approximately 10% of all journeys. Both the sluice and sterilizing room receive approximately 7% of all journeys each, although their relative importance varies slightly between medical and surgical wards. The importance of the kitchen varies with the method of serving food. If the food is served out in the kitchen, its importance is almost equal to that of the duty room. However, two-thirds of the kitchen visits are connected with serving meals, and if the food is served out in the ward the number of visits to the kitchen does not justify its inclusion in the service core within the ward, and this noisy element can be isolated.

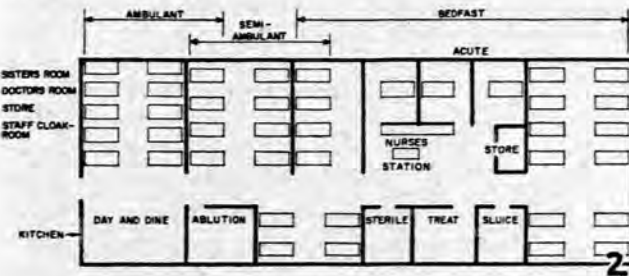


Fig. 2. 41-bed gynaecological ward for a Bantu hospital.

Clearly, only those rooms directly associated with nursing should constitute the service core; the kitchen, sisters' room, doctors' room and all minor service rooms can be placed outside the ward proper and adjacent to the vertical circulation. Some of these rooms could even be shared by another ward on the same floor. Fig. 2 shows a diagrammatic arrangement on this basis.

MATERNITY WARDS

In maternity wards it was found that there was a clear division between the work of labour nurse, ward nurse and nursery nurse. This division of work should be reflected in the planning by three distinct units—admission, delivery, and ward—with the admission unit on one side of the delivery suite and the ward on the other. In this way the nursery facilities would be used to their maximum and the ward and nursery nurses would not be hindered in their

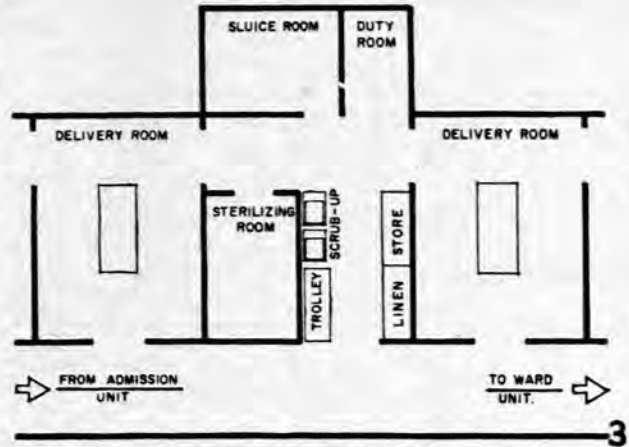


Fig. 3. Delivery room suite.

normal work in the larger wards by patients in the first stage of labour. Fig. 3 shows the ideal arrangement of a pair of delivery rooms based on the recorded measurements.

The journeys by ward and nursery nurses were measured together because of the strong traffic link between ward and nursery, and because this work would also take place in the ward where rooming-in was practised. The high frequency of visits indicates that multiple nurseries could be provided with advantage. The second most frequent journey is to the sluice room, both from the nursery and the ward, which indicates that sluice rooms might with advantage be duplicated. A division of the ward into ambulant and bed-fast groups is not justified, because the work is largely connected with the babies and between babies and mothers. The ward plan should therefore be symmetrical about the service core. The large proportion of ambulant mothers justifies the provision of both day and dining spaces. However, the special requirements of this section as a whole make it impractical to include it in the vertical ward block and it should be arranged on the ground floor off the main circulation street. Fig. 4 shows the proposed maternity unit for a 400-bed Bantu hospital.

CONCLUSION

The proper collation of data for design can only be achieved by close cooperation between architects and doctors and nurses. All the information that has been assembled is from observations of conditions in the 'traditional' ward. The planning conclusions on this basis have been aimed at a reduction of journeys, but it is probable that many aspects of organizing the work are a result of inconvenient plan forms, and the proper working of a new ward plan will require some reorganization of the systems if these new forms are to be properly tested. Re-measurement and comparison will be necessary to assess the effect of the new systems, to enable adjustments to be made free from the prejudice of traditional methods of organization. For a planner to suggest new systems of work to a nursing hierarchy would be heresy; the change must come from cooperation with and possibly by pressure from the medical profession. The work has been based solely on the reduction of journeys to perform nursing tasks. This seems to be the only way to obviate the effects of opinion and changing techniques, but it is necessary to assess this principle very carefully from the medical angle. Care, however, must be taken not to apply examples of details to test a broad principle, because in the development stage a plan can easily be overthrown in detail. Eventually, by cooperation, the complete thesis can be developed to answer all details.

SUMMARY

It appears that the diagnostic, therapeutic and supply departments of a hospital should be planned on the ground floor in such a way as to allow the expansion and alteration that will be necessary to accommodate future changes in techniques and the resulting increased turnover per bed. The wards, however, are a fairly static element and can be stacked vertically, with the ex-



Fig. 4. Maternity unit for a 400-bed Bantu hospital.

ception of maternity and paediatrics, both of which have somewhat different special planning requirements.

The wards themselves must have the beds arranged around the service core in the most compact way; this entails the 'Rigs' pattern with 8 bed units. The efforts in nursing will be further reduced by a division of patients according to their degree of illness, with the acute patients placed adjacent to the service rooms. In maternity wards the plan should reflect a clear division of admission, delivery and ward. Multiple nurseries and duplicate sluice rooms are necessary because of their great usage frequency.

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