Hospital Topics

Replanning of an intensive therapy unit

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Abstract

Considerable effort is needed when replanning an intensive therapy unit to avoid repeating mistakes in design, such as lack of windows and an impractical working area. Early consultation with the nursing and medical staff primarily responsible for such a unit is essential. The considerable technological innovations in intensive care will require flexibility in the future if they are to be incorporated into existing facilities.

Introduction

Much has been written in the past 10 years¹⁻¹¹ about the role and need for intensive therapy units (ITU). Detailed guidance for hospitals wishing to plan an ITU is now available,⁷ but some of the published work conflicts with the more established trend in Britain,¹¹ perhaps reflecting differences in medical practice rather than differences in need. Little information has been made available, however, about replanning areas that are unsuitable or whose function has changed. We solved such a problem by re-using existing areas in redesignated roles to minimise cost and structural work yet provide a functional working unit.

The Freeman Hospital, commissioned in 1977, is one of three major teaching hospitals serving the population of Newcastle upon Tyne and specialties provided on a regional basis. The anaesthetic department found itself responsible for a badly conceived and planned ITU that was clearly impractical to operate and unsuited to the needs of those departments actually transferring to the hospital (fig 1). The hospital was commissioned in several stages, each entailing modifications from the original district general hospital design, but it was only when a comprehensive general surgical service was introduced that the overwhelming need for an ITU was accepted, and the original site redeveloped.

The problems

Some basic concepts in design with particular reference to visibility, working area, access, air conditioning, pattern of work, and servicing the unit had not been properly considered.

The unit had been arranged in a rectangular box comprising four beds at one end and five at the other. All the beds were provided as cubicle accommodation, which hampered nursing accessibility; two transplant side wards were equipped with shower and lavatories,

and two side wards were double-bedded rooms. The partition style made communication, visibility, supervision, and audibility difficult. Resources would have had to be stretched over two units, requiring a large, if not two separate, nursing teams. The deep-plan nature of the hospital resulted in the inside rooms, away from the window areas, being oppressive and dark.

Apart from difficulties such as actually getting a bed into the rooms and the already inadequate work space, compromised by cupboards, there were too many sinks, lavatories, showers, and even GPO telephones provided per bed. In stark contrast was the lack of lavatory and shower for the resident doctor, whose room was directly opposite the main entrance, thus ensuring a sleepless night. There was no central nursing station or focal point to either of the two areas (fig 2).

The other most obvious problems were the heat and glare suffered by all departments facing south-west into the afternoon sun, coupled with an inadequate air-conditioning system that made visiting this unit after midday unpleasant even in the absence of patients, visitors, and electrical apparatus. Isolated positive/negative air-conditioning to side wards was not provided.

Access in and out of the unit was difficult. Everything had to pass through a single conventional door in the theatre corridor. Passage of a bed into the unit was also difficult because of the cramped door size and narrow turning circle without room for either error or staff accompanying the bed. The waiting room was in the corridor.

There were some bonuses. The actual area of the unit was just over 418 sq m, so a reasonable amount of room was potentially available. Clean and dirty utility rooms, though smaller than desirable, were mirrored at either end as were kitchen areas. Staff changing rooms with shower and lavatory were provided as was a reasonably sized nurses' rest room. The decor, finish, and pipeline, and electrical services were of a high standard. The lack of carpets, curtains, and colour throughout gave a rather inhospitable feel to the unit.

Planning phase

The extensive problems posed in solving the original defects led to considerable discussion. The major conflict as to whether the unit should be totally or partially rebuilt revolved around the projected use and finance. The users thought that if the basic envelope had to remain unchanged several solutions were possible. Although we thought six beds desirable, in order to achieve adequately sized supporting facilities (essential to the unit's functioning) five were finally decided on. Once the budget allocation was announced a final scheme was submitted by the users. Four months of detailed discussion continued with area officers, and two alternatives were separately produced. Cardboard models to scale gave a clearer representation of the ergonomics, layout, and building changes, and the users' original plan, with detailed modification, was accepted. Work started within two months.

Solution (fig 3)

BED AREA

The major criticisms had been of nursing access, an unpleasant, dark, and gloomy working environment, and the lack of a central nursing console. By gutting the ITU five-bedded area we created a large (91 sq m) four-bedded working area with a central nursing desk.

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FIG 1—Part of the 1977 intensive therapy unit.

FIG 2—Original cubicle-based five-bed area (plan as fig 1) with nursing area and windows on right and deep-plan cubicles on left.

A side ward (21.6 sq m) was re-created with a new access cubicle to achieve the planned five-bedded area. Included in this part of the unit were clean and dirty utility rooms (each 13.8 sq m), a linen store (6.7 sq m), and a modest store room (17.7 sq m). The result is a striking and successful improvement in design. Privacy and storage for each bed space in this open area is provided by mobile bed dividers, not so large that nurses cannot see one another, and equipment is wall mounted wherever possible (fig 4).

ENVIRONMENT

The problem of solar glare, heat gain, and air-conditioning was approached in two complementary ways. Double-glazed units using Antisun glass (Pilkington) produced a pronounced reduction in solar glare while maintaining adequate visibility to enhance the working area. An enlarged air-conditioning and cooling unit and ducting were installed to ensure correct air changes and temperature levels (HBN 27). This also permitted the installation of positive/negative air-

FIG 3—Replanned working area 1980. Nursing station is now placed centrally.

FIG 4—Replanned area with new nursing console showing deep-plan area.

conditioning to the side ward. It had been hoped because of the proximity of the central sterile supplies unit (CSSU) to install a hatch to allow sterile trays to be handed into the clean utility room and reduce traffic but this proved impossible, partly because of existing fire regulations and facilities and partly because it was beyond the engineering capacity of the air-conditioning unit. Fire regulations have become progressively stricter, resulting in current standards having to be introduced into areas such as this uncommissioned unit.

ACCESS

All doors were widened from 1.6 m to 1.83 m, and in the entrance area the entry lobby was improved by cutting back one wall to provide a reception area and to seal off the waiting area. Rest facilities for the nursing staff were separated from the working unit by doors, and the resident doctor was further separated by another set of doors to ensure privacy and, on a quiet night, a reasonable night's sleep. This room was made from one of the original transplant rooms by using the adjacent shower and lavatory (15.6 sq m). The problem of removing rubbish remained. Based on an idea in the cardiothoracic block a pass-through cupboard inside the dirty utility room was made to allow exit of bags without intrusion into the other areas (fig 3).

REST FACILITIES, ETC

To some extent supporting storage and rest facilities are always compromised and expendable. Our advantage was in having an existing system of rooms that could be redesignated. Thus the nursing staff were put into a large room (previously a double-bed side ward) with plenty of space (44.6 sq m) and refurbished to a high standard with carpets and curtains, and with an adjacent lavatory. We created an interview room for relatives with storage locker space for patients' belongings (8.9 sq m). Any room of uncertain function was made into a store room, so that two additional stores and one maintenance room were available to supplement the ITU store. Outside the ITU work area the problems of glare and solar gain remain, but blinds and, in rest facilities, curtains were installed to overcome this.

OMISSIONS

Inevitably with only a limited area available some compromise on space and the ideal occurs. This unit is no exception. It would have been desirable to have a small laboratory, an x-ray processor, and the waiting room area (7.2 sq m) away from the main patient entrance. Fortunately we are close to the cardiothoracic ITU and can share their blood gas facilities. Space and expense did not permit a computer retrieval system to be installed, but there are obvious advantages in records and monitoring results, research, and teaching. There are also limitations, but we consider this is an important future contribution to patient care.¹² It would have been an advantage, and was suggested at one stage, to have a separate entrance for patients to enter the unit

directly, which would enhance transit time and access in an emergency. Automatic doors, widely used on the Continent, should also be considered. We did not consider these two possibilities practical. A small operating theatre might be a boon, but many rooms such as this and laboratories, if not used regularly, end up as additional store rooms. For heavy beds with special advantages the floor may need strengthening.¹³

ENHANCEMENTS

In the recommendations concerning ITU replanning¹⁻¹¹ not enough emphasis is placed on storage space, which can never be underestimated. The presence of an immediate store, both shelving and free-standing, within the unit itself is obviously useful in size (17.7 sq m), but additional storage areas provide a further 32.3 sq m, one of which can accommodate two beds. The nursing and medical staff must have proper changing, lavatory, and shower facilities. An interview room is one of the most requested features not considered in any ITU plans. A receptionist to supervise the frequent visitors (medical and others) to the unit and a secretary are needed. The consultant should also have office accommodation within the unit. This emphasises his personal involvement in management and care.

The separation of the monitoring console from the nursing station prevents a large amount of space being wasted by electrical apparatus. Each bed space has wall-mounted monitoring relayed to a central wall-mounted oscilloscope and paper write-out, which allows manual or automatic recording of any patient data being collected. Several of the beds (including the side ward) can provide haemodialysis facilities, one bed is a fluidised bead-bed¹³ on a specially strengthened floor area, and a weigh bed is also available. Two mobile and interchangeable wall-mounted monitoring boxes provide invasive monitoring facilities to any of the bed areas.

Discussion

The ITU is close to the theatre suite and central sterile supply unit, which planners considered ideal for a surgical ITU. This is, in our view, an over-simplification. The traffic created by an ITU means frequent visitors, porters, stores and maintenance personnel, etc, which causes congestion around the theatre areas and theatre sterile supply unit, which ideally should be cleaner, less exposed, and unobtrusive. Inevitably people lose their way and walk into adjacent areas that should properly have restricted access. Therefore while these areas should be close enough to share engineering, pipeline, and electrical facilities, they should be separated to minimise the disturbance to individual parts of the hospital. We are not convinced that close proximity to a theatre suite is essential or desirable, as many patients are admitted to the ITU from the ward.

The concept of the original cubicle system has its advocates,¹¹ and certainly this is suitable for coronary care units, provided that there is plenty of space; most experts³⁻⁸ in Britain, however, recognise the dilemma and recommend a mixture of side wards to open bed areas of 1:3; mobile bed dividers do much to enhance privacy, ensure immediate availability of drugs and equipment, and reduce cross-infection yet retain the advantage of visibility and flexibility in the open bed area.⁶ Schroeder's work¹⁴ is particularly noteworthy, emphasising the increased stress and wearing effect on nursing staff working in side wards, and one would perhaps expect the same effect on the patient's emotional state. Nevertheless, there must be cubicles available to provide a proper positive/negative isolation of high-risk cases and to isolate the infected from the clean and vice versa.

Placement of the bed head against the wall has also been considered undesirable.¹¹ Nevertheless, in units where a "corridor" is left and floor, or more usually overhead, services are provided there is much wasted space for very dubious benefit; gaining access to the head of the bed has never been a practical problem. Wall-mounting of equipment provides immediate availability yet does not intrude on the working area. We do not support visitors' access to rooms without entering the ITU, or the necessity for bathroom and shower, or individual lavatories, or multibed cubicles.

Clearly, medical and nursing staff working in intensive care see the functioning of the unit in a fundamentally different light from administrators. The first essential is to recruit the doctor in charge and the senior nurse in charge to lead detailed discussions on content and design once the budget is approved and the commissioning process has begun.

No one in the original project team for this ITU has worked or will work in the hospital.

The second essential is to define accurately the function of the unit in the context of the hospital and with the clinicians' agreement to plan accordingly. Dispute will always occur on how and where to plan such buildings; indeed a survey of ITUs showed great individual variation in pattern and needs.¹⁰ All authorities now accept the great psychological and emotional strain placed on nursing, medical staff, and patients,^{14 15} and the importance of sensible design with daylight and adequate rest facilities^{16 17} needs little repetition in medical circles. Its importance must be emphasised to the planners, who in the past years have consistently reduced window areas in hospitals and are not always conversant with the needs of such a unit.

There is no general solution to the provision of ITU needs in individual hospitals; architects, builders, and engineers need to know how patients will be cared for if they are to provide appropriate facilities, and they should expect to review the plans at the earliest stage with the clinical staff who will run the unit. Professional isolation has no place, and it is important to realise that developments in ITU care continue at a fast rate. Design must keep up with clinical practice and at the very least should not be so rigid as to prevent flexibility in treating patients in the years after commissioning.

The design-commissioning time, like the induction-delivery time, should be as short as possible, compatible with thoroughness and accuracy. Long delays are ruinous to the success of such complex clinical units.

Despite a decade or more of intensive therapy development and a considerable reservoir of experience, much careful planning and thought are needed to ensure that design faults are eliminated and that future developments in this specialty are anticipated. When planning complicated and expensive facilities, models should be provided to help the user and planner understand the role and function to which the unit will be put. Helpful

guidance is available,⁷ but remarkably few units have recorded their individual solutions.

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Some nurses are taught that before they give a dose of digoxin or related drugs to any patient they should feel the pulse and if it is below 60 beats/min not give the drug. Is this advice general in schools of nursing and is it relevant? I have never met a patient who has been taught to count his own pulse while taking digoxin or seen it recommended that he should do so.

It is correct that many nursing schools do teach that if the pulse rate is below 60 beats/min the prescribed dose of digoxin should be withheld until the matter has been discussed with a doctor. This precaution is sensible; although the pulse rate may not be a good indication of the plasma concentration of digoxin,¹ it may serve as a guide to indicate excess dosage. Too much digoxin may cause almost any type of bradyarrhythmia, and in the elderly it may unmask an underlying sick sinus syndrome. For these reasons the precaution of merely withholding the dose of digoxin while awaiting clarification of the situation is not unreasonable, particularly as the toxic effects of the drug can be so insidious and serious. The other question implied in the above query is whether or not this advice should also be given to patients taking digoxin. This is a little more difficult to answer, because many patients taking digoxin for atrial fibrillation may have a pulse rate below 60 beats/min from time to time, indicating adequate control rather than a bradyarrhythmia due to excessive dosage. None the less, bearing in mind the serious consequences of overdosage, an intelligent patient might be instructed that if the pulse rate taken twice daily was persistently below 60 beats/min over a few days that this was an indication for reappraisal of the dosage.—E T O'BRIEN, consultant physician (cardiology), Dublin.

¹ Chamberlain DA, White RJ, Howard MR, Smith TW. Plasma digoxin concentrations in patients with atrial fibrillation. *Br Med J* 1970;iii:429-32.

Does intercourse in young girls increase the likelihood of carcinoma of the cervix developing later and, if so, why? Does intercourse after the menopause carry an increased risk of cervical cancer?

According to epidemiological studies¹ intercourse in adolescence increases the likelihood of carcinoma of the cervix developing later. The reason is thought to be that the process of metaplasia (transformation from columnar to squamous epithelium) is particularly active during adolescence, and metaplastic cells are particularly vulnerable to neoplastic transformation. The oncogenic agent seems to be introduced at coitus, but its exact nature remains unclear: herpes virus and sperm itself have both been suggested as possible carcinogens.² The process of metaplasia is also particularly active in late fetal and neonatal life, and in early pregnancy, but there is no evidence that there is increased activity after the menopause. At that stage the epithelium tends to become atrophic, but I know of no evidence to suggest that atrophic cervical epithelium is more susceptible to carcinogenic influences. So far as adolescent girls are concerned, there is thought to be a latent period of many years between the introduction of the mutagen and the development of an invasive tumour, but it is not known whether a similarly long latent period applies to older women. The epidemiological evidence points to the importance of coitus early in life and does not suggest that coitus late in life is significant in causing cervical or vaginal cancer.—JAMES OWEN DRIFE, senior lecturer in obstetrics and gynaecology, Leicester.

¹ Rotkin ID. Etiology and epidemiology of cervical cancer. *Curr Top Pathol* 1981;**70**:81-110.

² Reid B, Coppleston M. The natural history of the origin of cervical cancer. In: Macdonald RR, (ed). *Scientific basis of obstetrics and gynaecology*. 2nd ed. Edinburgh: Churchill Livingstone, 1978:427-70.