Functional Programming and Planning for the Operating Suite:

Location, Traffic Flow, Supply Lines

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In advanced planning for the operating room suite, functional considerations demand a total, conceptual review of relationships among diagnostic and treatment services. In accomplishing this review, the logic of combining the operating suite with the delivery suite becomes readily apparent, and the addition of a concentrated care center to the new combination creates a highly flexible center which is definitely capable of broadening the dimensions of hospital care.

Combining the operating and delivery suites may be controversial among traditionalists, but when one considers the advantages of the plan suggested here, the net worth of the union becomes evident. Broadly stated, the advantages of the integration are: greater flexibility in the use of space, equipment and personnel; enhancement of the quality of patient care through immediate availability of a diversity of skills; opportunity for increased economy and efficiency in the utilization of health care resources. These advantages will be discussed following a description of the combined facilities and operational work flows.

In addition to integrating the services named, interdepartmental relationships must be considered carefully when the location of the new suite is determined. Contiguity of the surgical-delivery suite (incorporating the concentrated care center), a cystoscopic and orthopedic suite, and cardiac catheterization laboratories (if any), is of the first priority. Close proximity to the department of radiology is also required. These relationships are of the utmost importance, since procedures accomplished in cystoscopic and orthopedic work and cardiac catheterization require the skills of personnel working in both surgery and radiology, and because anesthesia equipment, surgical equipment, and x-ray equipment are utilized.

All these areas should be readily accessible from the ambulant care department and in-patient elevators, and, as well, the new suite must be properly linked to an automatic cart transportation system which emanates from a central supply processing and distribution complex.

It is only after functional relationships are satisfactorily established among the areas cited, through carefully-executed block diagram studies, that detailed intradepartmental planning of the surgical-delivery suite should be considered.

While certain planning concepts are believed to be essentially basic to the integration of these three services, many different layouts can be devised by a project architect. Local preference as to the placement of many of the specific spaces can be given consideration without changing the general functional plan. Figure 1, a layout which has been suggested for a hospital of 300 beds, demonstrates basic concepts.

From an administration communications center (designated ACC), control of all visitor and patient traffic to the suite would be exercised by administrative personnel, thus permitting the professional staff to concentrate on patient care. This center should be equipped with a pneumatic tube outlet and an interdepartmental communications station, as well as a station of a comprehensive intra-suite communications system. Thus, from this point there should be provided instantaneous voice connection with all communications stations throughout the hospital and with every work area within the suite, including all operating and delivery rooms.

Figures 2, 3, and 4, demonstrate typical traffic patterns created within the suite for patients, supplies and staff, respectively.

Upon admission to the suite, patients for surgery would be taken directly to the operating rooms unless temporarily held in designated cubicles of the concentrated care center, and obstetrical patients, when ready for delivery, would be transferred to delivery rooms.

It will be noted that every operating and delivery room opens to both a "clean staff" corridor and a "patient" corridor. The basic purpose served is the facilitation of traffic patterns which will preclude, to the greatest extent possible, all foot and wheeled traffic from soiled to clean areas and all cross-movement between soiled and clean supplies. As an example of traffic patterns made possible by this distinct arrangement, doctors and nurses would enter the clean staff corridor directly from their locker and dressing or lounge areas, scrub, and then enter previously-prepared operating or delivery rooms; patients for surgery or delivery would be entered from the patient corridor on the opposite side. After the completion of surgery or delivery, all used instruments and equipment and soiled supplies would be carried to soiled holding rooms by way of the patient corridor. Doctors, nurses, and patients would all leave the rooms by way of the patient corridor.

All sterile packs, supplies, and instruments used in both operations and deliveries would be transferred to the clean staff corridor by automatic conveyor from the central processing and sterilizing complex located elsewhere, probably on another floor level. Back-up items are to be provided on mobile carts in this corridor, and one flash sterilizer, for emergency use only, and a solution warmer should be installed here. Also, various items of emergency equipment and supplies, including life-saving devices, would be held here on wheeled carts ("shelves on wheels") for use in any part of the entire suite.

Soiled holding rooms, as shown in figure 5, are for the temporary storage of soiled items generated by the various procedures. These are removed at required intervals by supply personnel and returned by a separate automatic conveyor to a central decontamination area.

To enhance further the effective prevention of contamination, the cleaning of all rooms between cases should be accomplished through the employment of a "flooding" technique whereby an aqueous disinfectant is applied to monolithic walls, equipment and floors. The fluid excess is removed by equipment of a centrally-installed vacuum system. In addition, a partially enclosed, negatively-ventilated scrub-up area is provided.

The configuration of the concentrated care center is based on the concept of separating patient and staff, as well as soiled and clean supply traffic. Each cubicle (about 10' x 12') would provide privacy, yet would be partially glassed in for viewing from the staff corridor side; solid walls would be provided on the patient corridor side.

Labor-progress patients would be entered into cubicles beginning at an extreme end of the concentrated care area (as shown in figure 2), and in "accordion" fashion, additional patients could be placed in cubicles in a sequence advancing toward the midpoint of the area. Postpartum care could be given in any cubicle.

Surgical recovery, and possibly postpartum, patients, depending on policies, would be entered into cubicles at the opposite end of the concentrated care center, advancing toward the midpoint in the same accordion style employed for labor-progress patients.

Surgical or other special cases requiring intensive care, then, could be placed in cubicles at the center of the area, and in time of an expanded census could be advanced in either direction.

Although a method of segregating various categories of patients to be given care has been described, policies in this regard should be sufficiently flexible to preclude beltline procedures in the transfer of patients. For example, patterns of care should be developed which would allow a surgical patient to remain in a surgical recovery cubicle until his condition would not be jeopardized by moving.

Postpartum patients, surgical recovery patients, and intensive-care patients, when discharged from the concentrated care center, would be transferred by usual means to appropriate nursing floors.
Fig. 1. Suggested typical design of a combined OR/OB suite with concentrated care center.
Fig. 3. Supply traffic flow pattern in the combined OR/OB suite.
Infants, immediately after undergoing specified care following delivery, would be transferred via the patient corridor out of the suite to nurseries or other designated areas. Special isolation equipment should be employed in this transfer. Depending on policies of the particular hospital, traditional clusters of multi-bassinet nurseries may be eliminated and the infant given care in the mother's room, provided, of course, a private room is utilized. Some medical authorities are now holding the opinion that family immunities are better developed by placement of the normal infant with the mother. Individualized techniques thus can be encouraged and cross-contamination among so-called "well" babies precluded. Premature infants, infants requiring isolation, and other special cases would be given care in a pediatric nursing unit.

All supplies used in the concentrated care center would be provided daily by a complement system, thus eliminating the necessity for nurses to inventory and requisition them. A supply technician would enter the individual patient supply complements from the staff corridors into clean, double-opening Nusrerter cabinets placed in-wall between each cubicle and the staff corridor.

Nursing personnel place soiled items into a separate soiled Nusrerter located in-wall between the cubicle and the patient corridor; these items are removed by a supply technician for return to the central decontamination area. In addition to the supplies provided in the respective Nusrerter cabinets for each individual patient, back-up supplies would also be kept on mobile, shelved carts within each staff corridor.

While it is not considered necessary to describe in detail all of the features of the several areas shown in order to impart an adequate comprehension of the general functional plan, it should be stated that capabilities for placing appropriate physiologic monitoring equipment into every cubicle of the concentrated care center and into every operating and delivery room should be incorporated into the plan. By purchasing this equipment in modules, costs can be reduced and flexibility enhanced. In addition to direct visual observation of monitoring devices, nurses and doctors can be alerted when designated limits of physiologic functions are reached by tying monitors into a pocket page system. Within the concentrated care center, there would be a master monitor control in each staff corridor; for the operating and delivery rooms, there would be such a master control in a room which can be located optionally, but a typical placement is shown in figure 1.

The flexibility in the use of these cubicles with respect to staffing and the placement of patients, as well as the provision of supplies and equipment, can be seen to be nearly unlimited. Continuous staffing for all functions carried on here would not be necessary as might be the case in traditionally-planned hospitals. A professional staff would be required for intensive care on a 24-hour basis, but certainly this staff could supply the skills inherent to other procedures, such as surgical recovery and postpartum care, during some of the time other than peak demand periods. The placement of patients should best follow an established policy, but the uniformly-equipped private cubicles further strengthen the case for flexibility.

Specific advantages suggested by the integration of the OR/OB/CCC facilities, as described, would include:

1) The ready availability of anesthesia services to maternity patients would be appreciably increased. The necessity to divide anesthesia functions in the traditional hospital has long posed a serious and costly problem, with the result that maternity patients are sometimes in secondary priority if not neglected in this regard. Even if neglect is not evident, either inconvenience or expense inevitably occurs in the transfer of special equipment, personnel and supplies back and forth, or in their duplication.

2) Danger inherent in the overflowing of delivery facilities would be greatly reduced. An adjacent operating room could be used with little inconvenience. Especially in the case of the small hospital, where, for example, only one delivery room might be provided, this flexible arrangement would prove beneficial. Conversely, in the case of required emergency surgery, a delivery room might be quickly made ready for surgical use with the expectation of only little disutility.
**Fig. 4.** Staff traffic flow pattern in the combined OR/DB suite.
3) Better 24-hour supervisory service for each of the elements of the suite would be afforded. The familiar pattern of providing separate supervisory personnel in large institutions or the provision of no supervisory personnel in the smaller hospital can be avoided. In most instances, a perfect organizational hierarchy can be established in such a suite to the preclusion of duplication or nonuse of this personnel.

4) The duplication of administrative and cleaning personnel would be completely obviated, and the frequency of “waiting periods” between chores would be reduced.

5) While it is obviously impossible to expect professionally-trained personnel to be functionally proficient to the point of great versatility, some joint use of such personnel employed in this area, especially in the case of professional nurses, could be depended upon in specific instances. These instances might be rare, but their occurrence could be vital at certain points in time. In the case of the small hospital, the deliberate coordination of some professional functions would prove to be invaluable.

6) The necessity to duplicate costly lifesaving equipment could be avoided, and better utilization of it obtained. The risks involved in transferring shared equipment between widely separated services thus become totally voided. Respirators, monitoring equipment, scarce and expensive treatment trays, heart devices, any and all such equipment would be instantly available for the surgical, maternity, or intensive-care patient.

7) If the necessity arises to expand either the operating or delivery areas, the location of the integrated suite at ground level and on an outside wall greatly facilitates such expansion. The dilemma of expanding either or both the traditional upper-story delivery suite and operating suite is not uncommon. This problem would be prevented from arising through the location and grouping of the two suites on a lower, if not ground, level.

8) If obstetrical services are required to be phased out, an experience not unusual in recent years, delivery rooms could be quickly and economically converted to operating rooms if so needed (and the incidence of surgical procedures is known to be increasing). Cubicles for labor progress and postpartum care would be flexibly used for intensive-care patients and/or surgical recovery at any time. Certainly the phasing out of obstetrics has proven to be an expensive procedure in converting the separate delivery suites at upper levels to bed areas.

9) Although under the plan espoused here, design, per se, will tend to reduce chances for infection, it seems logical to assume that implementation of positive control measures for infections should be more effective in one centralized suite as opposed to three decentralized areas. The provision of better supervision, in most instances, as well as the mere fact of avoiding three bodies of criteria being carried out by three separate personnel organizations, make this assumption seem reasonable.

10) Greater coordination of all areas of overlapping functions could be achieved, and unnecessary “empire building,” sometimes seen in the case of the separate development of these three services, can be precluded.

11) Apprehensive fathers and families of surgical and intensive-care patients would be removed from the patient floors and corridors. The natural propensity to group in corridors and to unwittingly disrupt routine nursing functions would be overcome through the provision of properly controlled waiting facilities in the immediate vicinity of the combined suite. Administrative personnel could undoubtedly provide necessary services in this area, thus freeing professionally-trained personnel for the pursuit of their duties without interruption. Of course, necessary conferences with
families would be greatly enhanced though the provision of a special conference room; in the case of separate services, it is unusual to see such a space provided at either location due to the expected infrequency of its use.

12) In emergency situations, it seems reasonable to expect a more ready availability of needed disciplines. While this need is almost impossible to meet on all occasions, certainly the probability would seem to be increased where several groups of highly skilled personnel, some of whom, at least (nurses and possibly resident physicians), are under common supervision, are placed in contiguous locations.

Disadvantages can be shown to be more imagined than real, but certainly if traditionalistic ideas prevail in the establishment of criteria for planning, such an integration is doomed in the beginning. Resistance to change is an acknowledged reality, and the success of even the most logical innovation always depends on overcoming the considerable recalcitrance occasioned by the new ideas.

The general concept of this multipurpose center was envisioned as early as 1959, when planning recommendations were formulated for hospitals in Maryland, Tennessee, and Ontario.

In 1959, officials of Carroll County Hospital in Westminster, Maryland, accepted recommendations to plan surgical and delivery suites side-by-side and to construct shared lounge and dressing facilities for surgeons and obstetricians, as well as for nurses employed in the two functional areas. In 1961, Port Hope, Ontario, accepted similar recommendations. The Sisters of Mercy at the Mercy (San Juan) Hospital at Carmichael, California, next elected to pursue this concept in their new hospital which was opened in early 1967. The Scarborough Centenary Hospital, a 575-bed institution which opened in July, 1967, in Toronto, has a side-by-side operating and delivery suite arrangement, and the 300-bed York General Hospital, also under construction in Toronto, has similar plans.

Hospitals which are now actively engaged in planning fully integrated suites, with interdepartmental relationships similar to that here explained, include Etobicoke General Hospital in Toronto; St. Elizabeth’s Hospital, Lincoln, Nebraska, where many of the current ideas regarding the concept have evolved; and St. Anthony’s Hospital, Cheam, Surrey, England. Prince George Regional Hospital, British Columbia, and Kansas City College of Osteopathy, Kansas City, Missouri, are including such a scheme of arrangement in their plans to varying lesser degrees, but each closely approximates the facilities outlined here.

Specific advantages to be realized from the many demonstrated aspects of intradepartmental relationships, both functional and administrative, plus the additional benefits accruing from the carefully-established traffic patterns involving personnel, patients, equipment, and supplies (whereby soiled and clean traffic are separated) would seem to exceed, by far, the bounds of this paper. However, all relate to the prevention of cross-contamination, the upgrading of quality of care, flexibility, expandability, operational efficiency, and economy in construction.

It is sufficient to state here that our espousal of this total scheme, incorporating the conceptual features shown here, is positive and unequivocal, and we foresee the rapid adoption of these planning bases throughout this continent and Europe in the immediate years ahead.

It is a truism that no hospital will be efficient without skilled management. Even the best-planned facilities will be inefficiently operated in its absence. But, certainly, facilities specifically organized and designed to accomplish the functions to be performed therein will make systems and procedures infinitely easier to manage, and thereby the administration and patient care inevitably will be upgraded to some extent under any circumstances. It is more than deplorable to incorporate into brick and mortar of either a new or renovated structure the same problems which have plagued functions for years.

By ignoring dogmas and tradition and accepting the challenge of resistance to change, both the physical facilities and operations of hospitals can be vastly improved. The plan outlined here constitutes a distinct advance.