Designing an Advanced Laparoscopic Surgery Training Center

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The explosive development of minimally invasive surgery has had a staggering impact on the hospital, operating room, and surgeon, as well as on the medical equipment industry and insurance carriers. As a result of (1) the overwhelming demand by the public, (2) the potential of future developments of this modality, and (3) the progressive geometric influence that has spread to the various surgical subspecialties, unprecedented pressure has been placed on our systems for training, credentialing, developing, supplying, and evaluating changes in surgical technique.

While most advances in surgery relate to new applications of existing skills, magnified surgery—whether microscopic or laparoscopic—entailed the acquisition of new, more complex skills. As previous developments in operative laparoscopy have already demonstrated its tremendous practical value (i.e., reduced morbidity and shortened recovery time), more advanced procedures will be of interest to many surgeons. Once the proper skills have been attained, their application can be made clinically under supervision of an experienced preceptor. After skills have been mastered, the evolution of new applications can continue in the classic fashion.

Laparoscopic surgery involves inherent limitations and risks; therefore, training and regular practice are essential. Operating in a two-dimensional field, viewing anatomical structures from an unaccustomed perspective presented through video-imaging, depending substantially on advanced technical instrumentation, their non-intuitive remote-controlled use, and reduced tactile feedback—all these add to the need for thorough, formal training. In addition to the surgeon's developing his own skills, he must also organize a team to be successful. This includes training the assistant surgeon, camera operator, biomedical technician, and other operating room personnel.

Conventional intraoperative surgical teaching is not recommended, as the high degree of manual dexterity required
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cannot be learned casually. Rather, the surgeon, desiring to become a skilled laparoscopic surgeon, has to develop special skills through hours of practice in the laboratory, using basic experimental models and exercises developed for each technique and procedure. A revival of interest in animal laboratories has occurred which has provided an ideal environment for skill development. A revival of interest in animal laboratories has occurred which has provided an ideal environment for skill development.7

Clinical proctoring on laparoscopic cholecystectomy in the private sector provided the initial training grounds for the early generation of laparoscopic surgeons. Later formal courses involving “animal labs” were developed by a few leaders of this group, and eventually the academic community joined in to regain its leadership role. Involvement by the medical industry has been an integral part of this training, and provided their involvement was supportive (i.e., providing equipment and instrumentation) and not dominating (i.e., converting the training of procedures and techniques into the training of product use and the development of dependence on them), a harmonious relationship existed and surgeons were not driven off track.8

The hospital or university intent on establishing a full-service minimally invasive service needs to provide not only the clinical service but a full-time surgery laboratory permanently equipped with high-quality instrumentation and clinical video equipment. The factors that distinguish a dedicated facility from a multipurpose animal laboratory are not only the equipment and instrumentation, but also the staffing of the facility with personnel dedicated to a specific surgical modality (e.g., laparoscopic, laser, microsurgery, etc.), and a structured plan detailing the facility’s organizational policy, planned activities, sourcing, funding, and goals. Such a facility provides a regional center specifically with a convenient and properly equipped setting for a surgeon to attend practice sessions that are convenient to his schedule, or to try new techniques, instrumentation, and equipment. It also provides backup services for the human operating room; it can also serve as a research facility if it has the capability of providing animal housing, whether on premises or at another location. Regulations require that facilities involving animals be in a location that is separate from areas where patients are to be seen and treated.

CONCEPTUAL PLAN

The need for an advanced surgical training facility at Candler Hospital originated from two local surgeons interested in teaching advanced laparoscopic surgery procedures. Since the hospital was planning a redesign process to develop new focused-care services, including specialty centers and an
advanced surgery center, the concept of a surgery training facility was compatible with its redesign goals. Thus, the Center for Advanced Training & Research was initiated as a new project that was to complement the activities of the clinical services.

Several individuals were involved in developing an overall plan for formal activities, facilities acquisition, development, funding, equipping, sourcing, and staffing. After three potential sites were identified and studied, the hospital’s board of trustees agreed to purchase a building adjacent to the hospital. The criteria considered were the building’s accessibility to the hospital, low traffic area, low public visibility, costs, and availability. Consultations between the authors, each representing the clinical services (EDB), teaching and research activities (ZS), and the operating room (NJK) was conducted to determine the exact needs and best overall design for the given site. Other surgeons on staff, as well as other hospital personnel, veterinarians, etc., were also consulted as the architectural plans were being drawn and building permit applications submitted.

**LAYOUT**

The final blueprints (Figs. 1-4) involved modifications from the original plan to include a larger classroom (to accommodate 24 participants) (Fig. 5), a smaller reception area which allowed room in the director’s office for a conference table, a reduction in the size of the food preparation area, and the inclusion of a pass-through area (Fig. 6). Two unisex bathrooms with shower and lockers were included, as well as clean and soiled utility areas and a janitor’s closet. The facility was designed similar to a recovery room setting. The laboratory area allowed for six separate surgical stations, with half-height walls between each to allow some privacy which is conducive to focusing the surgeon’s attention (Figs. 7-9). Special attention was paid to providing adequate space and to create an uncluttered operating environment.

The laboratory included scrub sinks, counter space, and cabinets which accommodated the storage of supplies and an area for the video equipment, obviating the need for video carts. The air conditioning/ventilation system was designed to accommodate increased air flow necessary to eliminate the odors usually associated with animal laboratories. Appropriate plumbing and electrical needs were also planned.

The holding area was designed to have a private entrance, with limited visibility from surrounding properties. The entire facility is fenced, including a privacy fence around the animal delivery area. The cages (Fig. 10) were planned with waste drainage in mind. A flushing system would allow for easy cleaning at the end of the day.

The building is equipped with an alarm system and motion detectors for security of equipment and facilities. The rooms were keyed to allow use of the classroom and kitchen area without enabling access to the laboratory area.

**FURTHER PLANNING**

Once the blueprints were finalized and the renovation scheduled to begin, development of the operating budget based on projected courses, supplies, salaries, etc., could be determined. Since so much time was absorbed in the initial phase of planning, courses were scheduled to begin shortly after construction was due to be completed.

Much planning is required to develop an annual calendar. Physician assessments were performed to determine...
their specific training needs and other programs were recommended by laparoscopic surgery commercial representatives. A preliminary calendar was established and efforts were initiated to formalize course programs, directors, faculty, and other logistical arrangements.

Since Candler Hospital was not a provider of continuing medical education (CME) credits at the time the project was developed, joint sponsorship of programs has been established with other accredited organizations. The hospital had identified sponsorship of CME programs as a corporate goal for 1995 and has therefore been endeavoring to become its own provider.

**EQUIPMENT AND SUPPLIES**

Liaison with Instrument Companies: Developing a working relationship with the local and regional representatives of medical equipment and instrument companies was vital, not only to defray operating expenses but also to make available for the program a great variety of new and innovative instrumentation and for hands-on evaluation and side-by-side comparison for the surgeons. Basic equipment and instrumentation was sought from top companies and a uniformity was sought to minimize confusion that may arise with mix-and-match equipment. Karl Storz Endoscopy America agreed to provide video equipment, cameras, non-disposable instruments, and irrigation pumps based on the types of courses given. Major items to be ordered included veterinary tables, electrosurgery generators, OR equipment (back tables, mayo stands, stools, etc.) Inhalation anesthesia equipment, although a more costly setup than intravenous anesthesia, was associated with lower mortality in animals, and was therefore included on the acquisition list. The overhead surgical lights and anesthesia machines were provided by the hospital’s operating room, as it had recently purchased new equipment.

An inventory list of necessary supplies was prepared as well as arrangements made for catering, marketing, veterinary services, suture supplies, etc. The operating room at Candler Hospital was instrumental in providing supplies at no cost to the Center, including disposable items which were opened but not used. These supplies included items such as gloves, drapes, tubing, anesthesia circuits, water bottles, and catheters. Purchased supplies involved anesthesia drugs, dietary items, scrub clothes, and office items.

**PERSONNEL**

The Director of the Center is the one full-time on-site employee. The director’s responsibilities are to coordinate and oversee the day-to-day operations of the Center, as well as act as liaison to the Medical Director, the hospital administration, and other individu-
als involved with the Center. Additional
services are contracted on an as-needed
basis, including veterinary, secretarial,
nursing, janitorial, food services, engi-
neering, and other services.

**COSTS**

The estimated cost of the project was
approximately $300,000 for the property
(building) and $200,000 for renovation
and some furnishings such as an ice
machine, refrigerator, microwave oven,
lockers, tables and chairs in the class-
room, a reception's desk, and a confer-
ence table. The director's office furniture
came from an existing office in the hospi-
tal. Capital expense monies covered the
cost of laboratory equipment, a plain
paper fax machine, and suction machines
for each laboratory station.

All equipment was ordered with an
estimated time of delivery to coincide
with completion of the renovation. The
hospital's legal services department was
consulted to devise contracts with fac-
ulty, caterers, marketing department,
and print shop.

The course preparation process was
streamlined to increase efficiency and
to facilitate training of other personnel
as necessary. Job descriptions and an
orientation program were developed.
Policies to cover administration issues
were written to comply with the U.S.
Department of Agriculture (USDA)
guidelines. Protocols were developed
and procedures written to cover all
aspects of the Center.

Regulations and standards covering
training and research facilities were
obtained from the USDA and were used
to develop the Animal Care and Use
Committee. This committee would
be responsible for approving course pro-
tocols as related to animal use and for
overseeing the general welfare of the ani-
mals used.

With respect to the possibility of
protests from animal rights groups, the
Vice President of Public Relations and
the Vice President of Marketing were
consulted to devise a strategy if such a
need arose. A dialogue was developed
for use when discussing the Center, its
courses, and other activities with any-
one, especially representatives of the
news media. This proved to be a vital
point since members of the local daily
newspaper were present for an interview
on day one of the Center's first course.

One of the hospital's general sur-
geons was contracted to serve as the
medical consultant for the Center's pro-
grams. His responsibilities included
developing long-range goals, overseeing
program development, participating in
teaching programs, and serving as a
member of the Advisory Board for the
Advanced Surgery Center to coordinate
the activities of the Center with that of
the hospital's programs.

The operating budget was discussed
with this medical consultant. Because
the initial budget presented in the pro-
A clinical service supported by a training facility is an indication of the community's and the hospital administration's commitment to enter properly prepared into this new phase of healthcare. The Center for Advanced Training & Research was planned and designed to offer a facility for surgical practice and training to minimize the complications that are inevitable when a new surgical approach is developed and adopted over a relative short period of time. The requisite skills involve classic surgical skills pressed to a higher level due to the modified access. As important as laparoscopic surgery has become, the entire community has not yet become convinced of its relevance (e.g., the medical insurance sector, credentialing committees, etc.). It is therefore vital that any surgeon embarking in advanced laparoscopic surgical procedures be as well trained as possible, starting with participation in a formal training course. Having a facility in which to practice and/or test new or different approaches and to test new devices or instruments outside of the operating room is of great value. The experienced surgeon is then better prepared to apply new concepts, approaches, and technology and is more able to differentiate complications that might arise due to the limitations of the technique or those that arise from its incorrect application or inappropriate use.

The value of live animal surgery in the laboratory setting, especially for surgeons in the community, should not be underestimated. Although the animal's structures differ somewhat from human anatomy a live surgical situation is important, as it involves many of the same challenges as human surgery. These include contending with respiratory movements and the consequences of poor port placements, poor camera imaging, obscuring of the laparoscope lens, anesthesia complications, bleeding, and death. Until virtual reality and/or surgical simulators reach a certain level of realism (and affordability), the training facility remains the only logical choice to gain skills prior to entering the operating room.

### REFERENCES