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OR design & construction

Trends in OR design follow calls for safety, evidence-based practice

First in a series on OR design and construction.

Faced with dated structures, an aging baby boomer generation, and demands for new technology, hospitals are in the midst of a building boom. A 2006 report from The Center for Health Design (CHD) estimated that the US will spend $200 billion on hospital construction over the next decade.

ORs generate significant revenue and routinely use new technology, so it's not surprising they are a major part of building initiatives. Elizabeth Brott, principal medical architect for Kaiser Permanente in Oakland, California, says Kaiser plans to build more than 200 ORs in the next 7 years.

Here are some of the trends influencing what those ORs will look like, based on conversations with Brott and other experts in the field.

Building on evidence

Architects are following the lead of health care professionals' focus on evidence-based practice. The CHD says evidence-based design helps architects and organizations create environments that improve the organization's "clinical outcomes, economic performance, productivity, customer satisfaction, and cultural measures."

"Handedness" is an example of a research-based strategy relevant for the OR. In this concept, each OR room is configured the same so staff, surgeons, and anesthesiologists know the exact location of what they need.

"No matter what room the staff is in, they know which direction to turn to open the drawer where they can find what they're looking for," says Brott. This simple strategy can reduce medical errors and increase efficiency.

Blurred lines lead to similar designs, greater flexibility

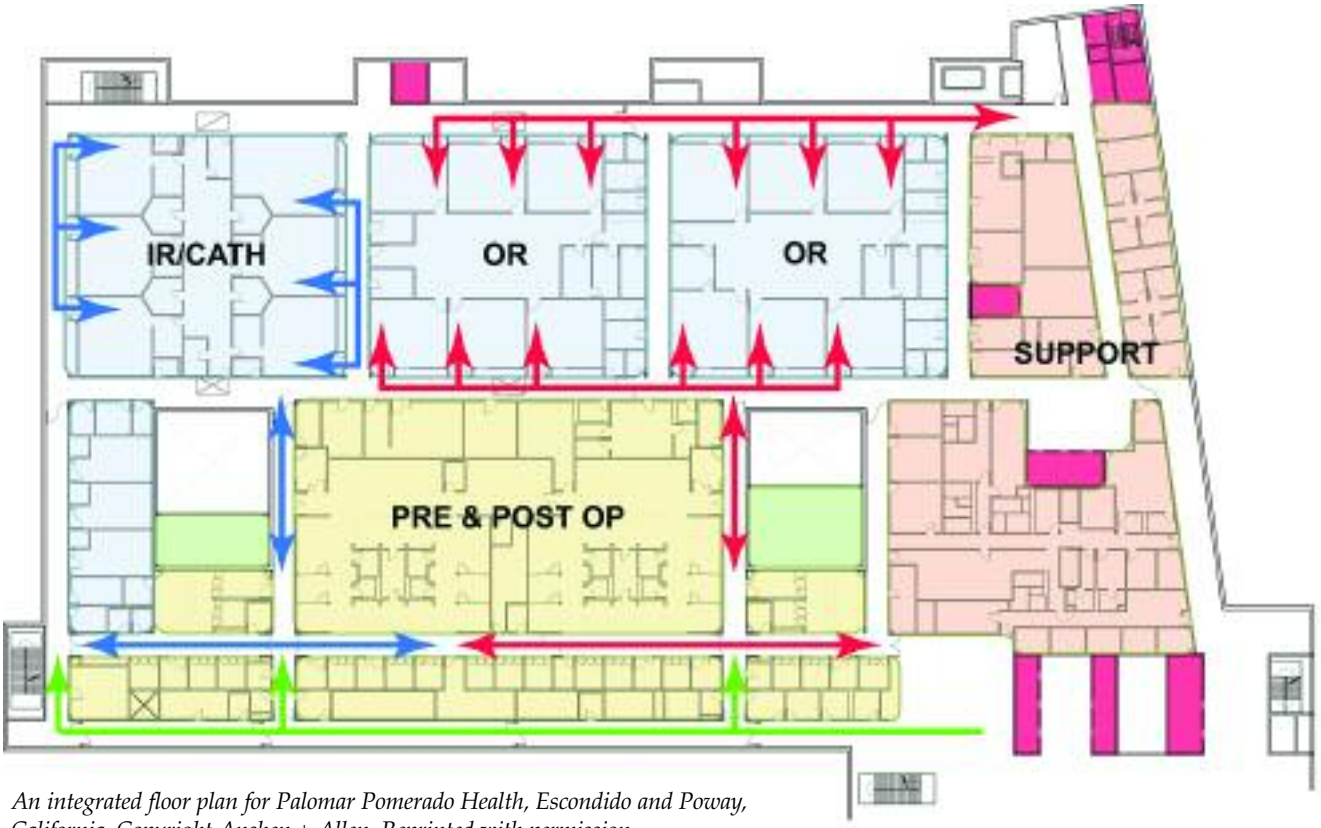
In recent years, the lines between surgery, interventional radiology, and interventional cardiology have blurred, leading to the need for more flexibility in design, according to Bill Rostenberg, principal and director of research at Anshen + Allen, an international architecture firm (www.anshen.com). "Surgery is becoming increasingly reliant on real-time imaging during the procedure," he says. "The OR is becoming increasingly information-technology intensive, with computer processors and servers claiming space alongside more traditional equipment."

These changes have led to more similar designs between interventional and OR rooms, a trend Rostenberg says will continue. "The OR room of the future will look and feel like a cath lab. You'll have an electronics control room that allows integration with radiology, endoscopy, and the cath lab."

Interventional rooms are already moving closer to the OR. "The trend is to move interventional radiology and interventional cardiology to the same floor as the OR," says Brott. Both types of interventional rooms look identical, and all rooms are designed to maintain similar levels of aseptic practice.

Location on the same floor makes sense because interventional procedures may need OR backup, and more anesthesiologists are working in interventional rooms, says Brott. At some Kaiser facilities, the staff for the OR and the interventional areas share space, including patient preoperative and postanesthesia care units (PACUs) and staff lockers.

Another effect of blurred boundaries between interventional and OR services is



An integrated floor plan for Palomar Pomerado Health, Escondido and Poway, California. Copyright Anshen + Allen. Reprinted with permission.

more flexibility. Rostenberg says some ORs are "multipurposing" rooms so they can be used as a cath lab or an OR, and he sees that trend continuing.

Flexibility also helps future plans.

"You need to configure the design so that when new technology is available, OR rooms can be converted to interventional rooms," says Zigmund Rubel, principal with Anshen + Allen, San Francisco.

Rubel adds that interventional rooms require more technical support. One way to meet that need is to plan for the ability to convert the sterile core to a technology area for staff who support equipment such as MRI units.

"Space is precious," says Rubel, who notes that the size of both ORs and interventional rooms is increasing.

One of the challenges, he says, is that organizations are focusing on providing for more patient privacy. That goal can compete with efficiency. For example, having dedicated rooms for preoperative and postoperative patients or allowing patients to return to the same room where they were admitted is advantageous from a psychosocial standpoint but creates logistical issues. A better alternative is to convert rooms, for example, changing a preop room that is heavily used in the morning to a postop Stage II room in the afternoon when more patients are recovering.

Learning to share

Optimal use of space creates the need to share, which can be a challenge among surgeons, radiologists, and cardiologists. For example, Rostenberg says intraoperative use of MRI is increasing but not enough to be able to operate a separate MRI in the black financially. Locating the MRI on the perimeter of the OR where nonsurgical patients can access it allows facilities to improve the financial profile. Controlled access is key to making this arrangement a success.

Organizational vision can encourage collaboration among the specialties.

Rendering of new operating room for Palomar Pomerado Healthcare, Poway, California. Courtesy of Anshen + Allen.

"The vision will determine if it's a collaborative or a competitive multispecialty arrangement," says Rostenberg.

He emphasizes the need for collaboration at the highest levels, with the CEO, surgeons, and interventionalists working together. He also suggests having broad representation from user groups but trying to keep the total number as small as possible (usually 8 to 10).

What's the magic number?

In some cases, the PACU is the base for patients recovering from interventional procedures in addition to those recovering from surgery, which makes determining the number of PACU beds an issue.

"You'll need more PACU beds for a cath lab than an OR because procedures are shorter in the cath lab," says Rostenberg. He says a good rule of thumb is 3 to 3.5 PACU beds for each cath lab. That number also depends on the types of procedures done. For example, if a cardiac cath lab does a high number of lengthy electrophysiology procedures, the number of needed PACU beds might be higher.

"That doesn't mean you have one big PACU with patients mixed in," says Rostenberg, "You have zones or pods of beds. But you can gain flexibility by having smaller zones and being able to reallocate beds from one area to another." Typically, different staff members care for each type of patient, although cross-training may become more common in the future.

What you see is what you get

It's difficult mentally to convert a flat blueprint into a 3-dimensional view of what the final constructed area will look like. To make that process easier, architects use computers to create 3-D models. Some organizations are investing in room mock-ups so that staff can test the layout before construction begins.

In 2004, Brott used a mock-up of an OR in the footprint of a hospital under con-

struction so the staff could validate the size and location of equipment and workspaces. Soon Brott will be running simulations in the Sidney Garfield Center in San Leandro, California, a 37,000 square-feet warehouse where full-scale mock-ups of planned designs can be set up.

Materials flow

Substerile rooms between 2 or 3 ORs are being replaced by a sterile core: 6 or more ORs grouped around a service core that has supplies for the OR.

"A sterile core offers more flexibility and service," says Rubel. "It requires a little more space overall so it's more expensive, but operationally it allows for a quicker turnaround of supplies."

Brott says Kaiser is consolidating sterile processing departments (SPDs) to achieve financial and efficiency advantages. Kaiser has one SPD in the Northwest that serves 131 outpatient facilities and 12 ambulatory ORs. Many Kaiser facilities use a bar-coding system for instrument trays, making it easier for SPD to track down missing items. Flash sterilization is performed in a dedicated room, and materials are transferred in special containers to the ORs by cart.

A family experience

Surgery has become a family experience in ambulatory care centers, and architects have responded by softening institutional edges. "Durability and maintenance aren't always taking precedence over comfort," says Rubel. One example is the use of more indirect lighting and wall sconces so patients don't have to look at bright ceiling lights as they are rolled down the hallway

Induction rooms are particularly popular for pediatric patients. The family member is present during induction, and then the child is moved to the OR. Rubel notes that induction rooms don't need to take up much space. "They are usually in the PACU or preop areas but can even be in a small alcove designed for that purpose."

Natural lighting is making inroads in the PACU and procedure rooms. Use of natural lighting in the OR and interventional rooms is more limited because of the expense due to environmental control and engineering needs, such as insulation for windows and shielding for imaging equipment.

Staff not left out

Architects focus on ergonomically designed workspaces, for example, adjustable worktables. One approach that is becoming popular in the PACU is decentralization. "Nurses are based closer to the patients instead of at a single nurses' station," says Rubel, who acknowledges that such a shift requires a cultural change.

As interventional and surgical procedures overlap, Rostenberg says to expect to see cross-training of PACU staff to be able to care for both surgical and interventional patients, an idea he says is "somewhat controversial."

Some facilities are providing amenities such as showers and bike lockers. "One easy thing to do is to put the staff lounge adjacent to a window," says Rubel.

Getting the most for your money

Flexibility and amenities come with a price tag. Developments such as multipurpose rooms, better IT infrastructure, and the use of "soft space" (space that can be adapted in the future) will raise costs. The alternative, though, is to design space so tightly that it limits opportunity for growth.

"It might cost a little more for the soft space," says Rostenberg, "but one could argue that when you need to grow and change, you'll spend less money renovating." ❖

—Cynthia Saver, RN, MS

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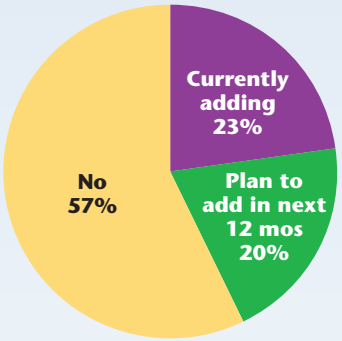
A building boom for ORs

The building boom continues, as ORs add to their space and update their current rooms. The boom is fueled by the need to increase capacity, provide for new technology, and meet structural requirements.

From the 2007 *OR Manager* Salary/Career Survey:

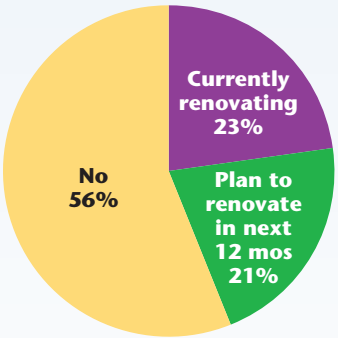
Are you adding or planning to add new ORs?



Reasons for adding ORs

Increase capacity	57%
Accommodate new technology	27%
Replace old facility	25%
Other reason	1%

Are you currently renovating or planning to renovate ORs?



Reasons for renovating ORs

Accommodate new technology	76%
Meet structural requirements	36%
Other	30%

Other reasons include: Adding capacity, updating, adding new services, and improving efficiency or patient flow.

Reference

Ulrich R, Quan X, Zimring C, et al. Role of the Physical Environment in the Hospital of the 21st Century. Center for Health Design. September 2004. www. healthdesign.org/research/ reports/physical_environ.php. Accessed July 27, 2007.

Evidence-based facility design

A report on evidence-based design analyzing 700 articles found links between the physical environment and patient and staff outcomes in 4 areas:

- reduced staff stress and fatigue and increased effectiveness in delivering care
- improved patient safety
- reduced stress and improved outcomes
- improved overall health care quality.

The report and a scorecard on evidence-based design are on the Center for Health Design website at www.healthdesign.org/research/reports/physical_environ.php.

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