True Innovation: The Hybrid Room

Synergies do not only save time and money.

They also pave the way for novel approaches, and modernization. This concept was readily put into practice at Westdeutsches Herzzentrum in Essen, Germany, which combined its angiography and heart surgery suites in a single room. *Medical Solutions* spoke with Professor Raimund Erbel, MD, cardiologist, and Professor Heinz Günther Jakob, MD, heart surgeon.

By Hildegard Kaulen, PhD

MEDICAL SOLUTIONS: You have certainly entered new territory at the Westdeutsche Herzzentrum (West German Heart Center) in Essen by putting a hybrid room into operation. This room is the first of its kind in the world, and it would be fascinating to hear what you are planning to do with it.

ERBEL: German specialists have repeatedly crossed over into new frontiers when treating cardiac diseases. Dilation, bypasses, and stents are only three groundbreaking developments no clinic could do without today. The installation of the new hybrid room follows this tradition. Since combining coronary angiography and open heart surgery in one room, we have been able to merge diagnostic and therapeutic efforts at one table. This provides us with completely new possibilities. In a single intervention, we do the work of the two previously required interventions. We can take care of patients with reduced cardiac functions who could not possibly undergo two interventions. And the number of these patients is increasing steadily. We have to offer them a treatment alternative. Not only is this our ethical duty, but as a university clinic we are also the pacesetters for others. I do believe that we met

»We merge diagnosis and therapy at one table.«

Professor Raimund Erbel, MD, Westdeutsches Herzzentrum, Essen, Germany

THE HYBRID ROOM offers many new possibilities for physicians at the Westdeutsche Herzzentrum in Essen.

our obligations by creating the hybrid room.

JAKOB: I think it's best to provide a number of examples that show how we added new options for the benefit of our patients. Recently we transplanted a donated heart with a high-grade stenosis, which we dilated with a heart catheter immediately after the transplant. Both were performed as one procedure and at the same table. Not too long ago this heart would have been considered unsuitable for a transplant. However, the hybrid room now makes it possible to transplant this type of heart because the narrowed vessels are opened immediately after surgery.

This method allows us to access completely different organs – and, as a logical outcome, reduce casualties on the waiting list. Recently we simultaneously performed a classic bypass operation together with our angiologist, Professor Rodowski, on an unstable patient with a pelvic aorta percutaneous transluminal angioplasty to avoid any kind of danger to the extremity involved. Today, the patient is in excellent condition.

MEDICAL SOLUTIONS: The requirements to be met by workstations for angiography and heart surgery are completely different. How did you manage to meet these requirements within such limited space?

ERBEL: This was not easy by all means and a constant struggle to reach a sustainable compromise. We would not have been able to cope with the situation if the three departments – interventional cardiology, represented by me; as well as cardiac surgery, represented

THE CONCEPT of merging angiography and open heart surgery in a single room is deemed extremely seminal by Raimund Erbel, MD.

by my colleague Heinz Günther Jakob; and anesthesiology, represented by our colleague Jürgen Peters – would not have worked closely together. Siemens Medical Solutions provided the technical solutions without which our pioneering work would not have succeeded either. But allow me to go back one more time to emphasize the uniqueness of the hybrid room. The idea goes back to the mid 90s, when we were unexpectedly given a few rooms that needed to be reassigned. We received the financial means through a number of different sources. The focus of our objective never wavered, it was always to develop synergies and promote clinical research. When we started to look for room layouts for our hybrid room, we realized rather quickly that the concept had not been put into operation anywhere else. The only place where we came across a system installed by Siemens that combined angiography and vessel surgery in one room was at the university clinic of Malmo, Sweden. This persuaded us to develop a hybrid system in close cooperation with Siemens. It proved to be an excellent decision. As in the past, we are still the only center with a hybrid room for coronary angiography and heart surgery. Our colleagues look at our design with great interest. And our American colleagues are simply fascinated by it.

JAKOB: I would like to add a few words here about the difficulties we encountered in equipping the room. A cardiac surgeon needs a stable, stationary table that cannot be too wide and can be tilted in all directions. In addition, the surgeon needs to be able to move freely around the operating table even while he is handling surgical instruments. Another essential feature is the ventilation field located above the operating table to generate a sterile environment. After all, we are talking about open heart surgery. The cardiologist's needs are different. He requires a floating tabletop that can be moved back and forth with a joystick. He also needs a lead plate to protect himself against X-radiation. To us as heart surgeons this plate is more of a handicap than anything else. For the cardiologist, the X-ray tube has to be mounted to

»We prevent critical time loss by not having to reposition patients or not having to transport them into an OR.«

Professor Raimund Erbel, MD, Westdeutsches Herzzentrum, Essen, Germany

the ceiling to provide for a whole-body view. However, ceiling mounting is out of the question because the ceiling has to remain free for the ventilation field and the surgical lights that are mounted there. And anesthesiology has requirements, too. We had to take all of this into account. Plus there had to be room for all support staff. During surgical invasion, at least eight to ten people are in the room, and at times this number may increase to even more people.

MEDICAL SOLUTIONS: What was the compromise you found for these problems?

ERBEL: Siemens helped us tremendously during our search and found outstanding solutions for the various problems. The most difficult task was to design the table. We now have a fixed table that can be rotated by 30 degrees. This rotation moves the patient out of the sterile operating field for imaging with angiography. The anesthesiologists can tolerate this angle. The C-arm of the angiography device is mounted to a base plate. This provides us not only with angiographic images of the heart, but also with angiographic images of extremities, if required.

JAKOB: We not only had to find compromises when it came to equipment and process sequences, we also had to compromise with respect to surgical preparations. A good example is the coagulation of blood. When we guide a catheter through the vessels, a blood clot may occur, resulting in vascular occlusion. This is why interventional cardiology uses blood-thinning medication. However, surgeons need a reasonable clotting factor so that the patient does not bleed to death. Again, we had to find the middle ground to solve this problem.

MEDICAL SOLUTIONS: In what kind of situations do you decide to use the hybrid room?

ERBEL: We use the hybrid room when an operation is necessary and when circulatory complications or unfavorably located stenoses or vessel damage are expected. Angiography can also be used for diagnostic purposes prior to or during surgical intervention; for example, in case of a pulmonary embolism. We first determine the necessary interven-

HEINZ GÜNTHER JAKOB, MD, thinks it is a good possibility that in the future no one will differentiate between interventional cardiology and heart surgery.

»The hybrid room enables us to save more patients on the waiting list.«

Professor Heinz Günther Jakob, MD, Westdeutsches Herzzentrum, Essen, Germany

Personal Data

PROFESSOR RAIMUND ERBEL, MD, (left) studied medicine at the universities of Cologne and Düsseldorf. He completed his education in internal medicine at hospitals in Leverkusen, Düsseldorf, Koblenz, and at the University Clinic Aachen, and specialized in cardiology. He received his medical degree in 1982 from the University of Aachen and joined the University Clinic Mainz. Initially, he was on the tenure track as C2 professor and later received tenure and a full professorship. Since 1993, Erbel has been Director of the Clinic for Cardiology at the University Clinic Essen and was Managing Director at the Center for Internal Medicine at the University Clinic Essen. He is a member of numerous medical societies in Germany and abroad, among them the American Heart Association and the German Society for Cardiology, where he is active on several commissions. Professor Erbel has been repeatedly honored for his scientific involvements. The American Biographical Institute elected him "Man of the Year 1994."

PROFESSOR HEINZ GÜNTHER JAKOB, MD, studied medicine at the universities of Freiburg, Berlin, and Munich. He completed his residency at the German Heart Center in Munich, the University Clinic of Chicago, the Kanton Hospice in Basel, and the University Clinic in Mainz. In 1987, he became a surgeon and accepted the responsibilities for thoracic surgery at the clinic and at the Polyclinic for Heart, Thoracic, and Vessel Surgery at the University of Mainz. In 1991, he was promoted to professor in Mainz and joined the Department for Cardiac Surgery at the University Clinic for Surgery in Heidelberg as Assistant Medical Director. Since 1999, Professor Jakob has been Director of the Clinic of Thoracic and Cardiovascular Surgery at the University Clinic Essen. He is a member of numerous societies. The current focus of his activities is the expansion of endoscopic heart surgery and the further development of seamless, nitinol-stentend heart valves and aortic prostheses/stent grafts.

tions and address these accordingly – on the same table. We do not lose time due to patient repositioning or transporting into an OR. We can proceed immediately in accordance with our diagnostic findings. This is advantageous to everyone involved. The patient is helped quickly, and we improve our workflow. This is a factor that should not be underestimated in times of rigid austerity. As the head of the clinic, I cannot dismiss the efficiency of my department.

JAKOB: The case-based, flat-rate system in Germany makes it increasingly difficult to develop new procedures because we run the risk of incurring the cost. However, as a university clinic, it is our duty to overcome the limit of treatments and to encourage scientific advances. For this purpose, we should have a budget that does not depend on case-based flat-rates and covers the cost for personnel. If not, we won't be able to afford this type of development much longer.

MEDICAL SOLUTIONS: How will you continue treatment of cardiac disease? And what level of importance do you assign to the hybrid room?

ERBEL: Before I answer this question, I would like to reminisce a little. During the past years, more and more interventions shifted from the heart surgeon's responsibility to the interventional cardiologist. Today many vessel constrictions are no longer bypassed. Instead, they are dilated with a balloon catheter followed by a stent implant. The same is happening with aneurysms and dissections. The majority of these cases are no longer handled by the heart surgeon, but rather by the interventional cardiologist. As a result, cardiologists work more and more invasively, while heart surgeons work less and less invasively, since many operative interventions consist of a little cut or are performed without a heart-lung machine. In the hybrid room, these disciplines converge even more, since they work together hand in hand. This is why I consider the hybrid room to be a highly future-oriented approach.

JAKOB: I can only agree. The rapid developments in interventional cardiology led to a surge of innovations in heart surgery. In the future, classic operations with their known excellent long-term results may be less invasive and possibly performed in combination with interventional methods. Perhaps one of these days we'll no longer differentiate between interventional cardiology and heart surgery. Only the future will tell.

CROSSING BOUNDARIES and entering new frontiers, that is the common motto at the Westdeutsche Herzzentrum.

Author: *Hildegard Kaulen, PhD, is a molecular biologist. After her scientific studies at the Rockefeller University in New York and at the Harvard Medical School in Boston, MA, she has been writing for medical journals and magazines in Germany since the mid 90s.*