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A brand new hybrid room to treat patients in greater Manchester

With the advent of complex minimally invasive vascular procedures, such as endovascular aortic aneurysm repairs, improved imaging accuracy and safety are needed. Along with hygiene requirements, this need has led to the development of hybrid operating rooms in hospitals with cutting-edge vascular and cardiac activities. The vascular team at University Hospital of South Manchester tells us all about their new hybrid operating rooms.

University hospital of South Manchester (UHSM) in Wythenshawe is a major acute care teaching hospital, offering district general hospital services and also specialist tertiary services to the population of greater Manchester, with a large cardiothoracic and vascular center and a transplant center.

Nine months ago, UHSM opened two new hybrid operating rooms (HOR) equipped with the Discovery™ IGS hybrid angiography system. The HORs are used by many specialties: mainly vascular surgery and vascular radiology, but also cardiology for TAVI procedures. In a couple of months, UHSM is going to expand the use of the hybrid rooms to the urology team to enable joint procedures with radiology for cryotherapy procedures.

UHSM IN NUMBERS:

- 6500 staff
- 634000 immediate population served
- £476 Mio turnover per year
- 944 beds
- Among top 20% of trusts in England for staff engagement

Delivering the best possible care

Donna Young, Director Manager for Surgery at UHSM, explains why UHSM invested in a hybrid room, the challenges they faced with staff training and the benefits that came out of the new hybrid room.

"The main reason for investing in a new hybrid room was to improve the quality of care for patients. What that means is that we are now performing minimally invasive procedure on patients, so we are operating on patients on a daily basis, whereas historically we would admit these patients into a bed, and they would potentially stay for two or three days. Overall, we are now reducing the length of stay for suitable cases, and the HOR has allowed us to do that for the first time ever."

"Previously, vascular surgery had access to a single theater which was not aligned in shape or form with the standards of HOR. Now we have two theaters where we can perform the procedures that we need in vascular surgery and cardiology. We also plan to expand to urology. Our waiting time is reduced because we have two rooms now that can function at that level, so we can treat the patients more quickly as a planned procedure rather than waiting too long and having the patients admitted in emergency."

"I would say, the biggest challenge in introducing the HOR was to commit to a robust training program for the staff, because the HOR was new to everybody, whilst trying to maintain business as usual and to manage emergency cases that were still coming through the door. It is very difficult to commit to training, while balancing daily priorities for patients. We had to make sure that staff were released from their duties to attend training and simulations supported by GE and Maquet, and then teams went to work in a different local trust to experience a hybrid room, but it was not as new as ours. Even after 6 months, we're still learning because the room is not only used for planned procedures between 9am and 5pm, but also after hours for emergency procedures. So, everybody needs to be trained, not only staff working in that room, but also on-call teams, including colleagues from other trusts. We found that to be quite a steep challenge, but staff has responded to it and absolutely loves working in the room now."

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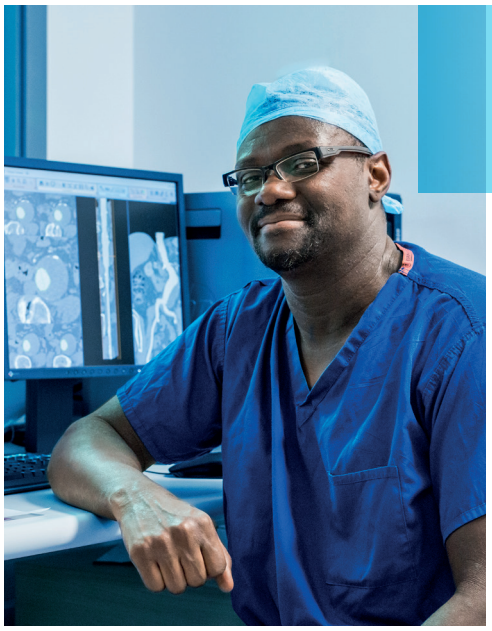
"There is pressure each year for the organization to save money. We can now deliver minimally invasive procedures in the hybrid room, which reduces requirement for beds, and helps bringing hospital costs down. We are already seeing early results in our EVAR patients' length of stay, and expect that it might grow even further.

To make this sort of investment in a brand new HOR for the hospital sends a really important message to patient and staff. It suggests that we are serious about delivering quality care. It is also critical for staff retention. The teams love working in a state of the art environment, knowing that they are delivering the best possible care."



Perform complex EVAR procedures in one go

The department of vascular surgery of UHSM performs a variety of vascular interventions, such as open aneurysm repair, endovascular aneurysm repair, all range of peripheral interventions, carotid stenting and arteriovenous malformations.
Dr. Dare Seriki is a consultant vascular radiologist at UHSM, specialized in challenging EVAR procedures.

Tell us about your new hybrid operating room at UHSM

We're quite lucky at UHSM. We were one of the first hospital in the UK to have the Discovery system which has been integrated with the Magnus table from Maquet. This means that we can perform endovascular procedures using an endovascular table and that open procedures can be performed on a state-of-the-art breakable table that is suited for these procedures.

What has changed in your practice since the opening of the Discovery IGS 730 hybrid OR?

The use of the Discovery system in the hybrid theater has changed our practice quite dramatically. Before the hybrid was opened, we performed our combined procedures with vascular surgeons in their normal theater using a portable C arm. There was always a risk of it overheating and it was difficult to get steep angulations, so we were limited in the range of procedures that we could take. Complex procedures really were very difficult to perform unless you had two C arms available. So now, we're taking on much more challenging procedure and a lot more combined cases. For example, we'll perform common femoral endarterectomy, and then we'll do peripheral intervention on the leg, and we'll even go down to do ballooning procedures.

What benefits do you see in using the Discovery IGS hybrid OR?

First, the Discovery is not in a fixed position; it can be positioned anywhere within a horse shoe shape configuration. But if you're performing a purely open procedure, then you can park it in several parking positions, which means that the surgeons have unlimited access to the operating theater.

The Discovery is a state-of-the-art imaging system with advanced image fusion solutions, which means that we can plan our endovascular procedures beforehand from a CT or MR dataset, and then use that information to guide the intervention. Because procedures are planned beforehand, you know exactly what you're going to do before you enter the operating theater. Therefore, the procedure time itself is reduced, and most importantly the radiation delivered to the patient and to the staff is reduced[1]. And this means the procedure is much safer for everyone involved. You can also reduce the amount of contrast that you are giving to the patient. Overall, it improves the procedure in terms of efficiency, radiation dose, contrast usage, and procedure time.

> *"The throughput is improved so we can sometimes perform three EVAR procedures in one day, and be finished by five o'clock"*

What are the most important outcomes after 6 months use of the Discovery IGS hybrid OR?

I'd say the major impact is that we are now able to treat all the patients who present themselves to UHSM with complex pathologies without compromising any aspect of their care. We're performing more prolonged procedures under general anesthesia, and we know that we can image

1 Impact of Hybrid rooms with image fusion on radiation exposure during endovascular aortic repair, Eur J Vasc Endovasc Surg. 2014 Oct;48(4):382-90

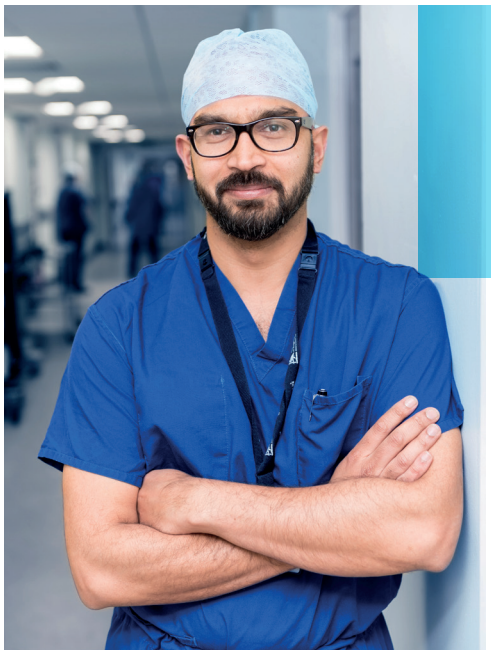
without encountering problems. There's no compromise at all.

Did the hybrid operating room change the way you perform your complex cases?

The use of Cone Beam CT has been accelerated since the opening of the hybrid OR. We use it to perform a completion angiogram at the end of our EVAR procedures to verify that the patient does not have an endoleak and that the graft is situated appropriately. We can be more confident that we can discharge the patient without performing further follow-up imaging during that admission, the patients can go home, and we're confident to have them enter a normal ultrasound surveillance program.

How would you describe your first months using Discovery?

I would say that there is a steep learning curve and that staff training is very important. But once you're over the learning curve, the staff really enjoys working in this state-of-the-art facility. The procedures are done a lot quicker and the throughput is improved so we can sometimes perform three EVAR procedures in one day, and be finished by five o'clock. And for everybody it's the job satisfaction, you know that you're performing the procedure in the safest possible situation and environment for everybody, so you're not compromising between the anesthetic, surgical or endovascular approach. I would recommend Discovery in hybrid theaters. It is state-of-the-art technology, it is relatively simple for the radiographers to use, the training program is approximately one week for those that are used to using endovascular rooms, it is intuitive, it is simple, and I would recommend it to anybody.



The benefits of the hybrid room for combined procedures

The hybrid ORs are used by the cardiac surgery and vascular surgery departments for open as well as endovascular procedures.
Mr. Jonathan Ghosh, vascular surgeon, and Mr. Isaac Kadir, cardiac surgeon, both working at UHSM performed their first combined procedure in the hybrid room together and shared their experience.

Mr. Ghosh, what type of procedures do you perform in the HOR?

JG: With our Discovery™ IGS 730 hybrid room with the Magnus™ table from Maquet, we perform a full range of vascular procedures. I do all my open operations, from carotid surgery and open aortic surgery to peripheral bypass surgery. About 50% of my peripheral work is in combination with interventional radiology. What has been of particular interest to me is the opportunity to do more complex work with other specialties, such as cardio-thoracic surgery, plastic surgery and surgical oncology. The HOR allows us not to have to compromise any aspect of the operation for combined cases. We have excellent imaging together with the advantages of a modern operative ward.

What are the benefits of having a mobile system in the hybrid OR?

JG: We built it to have different

working positions and to be able to fully retract the gantry when we're doing open surgery, because it opens up the full operating environment. But also when we're doing combined cases, it allows for easy access for the open surgical part of the treatment as well as excellent imaging for the endovascular part of the treatment. It's very easy to change the table tops with the Magnus system from Maquet, so we use the flat table top for all our endovascular work (our EVARs, TEVARs and lower limb reconstructions), and for the open cross and aortic surgery, we move to the breakable table top.

Do you routinely use image fusion?

JG: We do all our EVARs and TEVARs in the HOR using image fusion. The EVAR ASSIST 2 solution (GE Healthcare) enables easy planning and good communication with the gantry to guide the procedure. The image fusion reduces our screening time; our radiation dose has fallen down for each case, and our contrast usage is more efficient. We also routinely use cone beam CT as a completion image. This allows us to do a 360° assessment of the stent graft, make sure there's no deformation of the prosthesis nor any endoleak.

What are the key outcomes after 6 months of using your new hybrid rooms?

JG: We are now able to perform more complex cases and treat more challenging anatomies thanks to the expert imaging level. It provides an excellent treatment to patients and the patient flow has become more efficient. It is a fabulous working environment to operate in, the collaborative work that we do is improved, and it's just a pleasure to operate in that room.

> *"The image fusion reduces our screening time; our radiation dose has fallen down for each case, and our contrast usage is more efficient."*

Can you describe today's combined procedure?

JG: We operated on an 81-year-old gentlemen that had a very significant coronary lesion, a rapidly enlarging

* EVAR ASSIST 2 solution includes FlightPlan for EVAR CT, EVARVision and requires AW workstation with Volume Viewer, Volume Viewer Innova, VesselIQ Xpress, Autobone Xpress. These applications are sold separately.

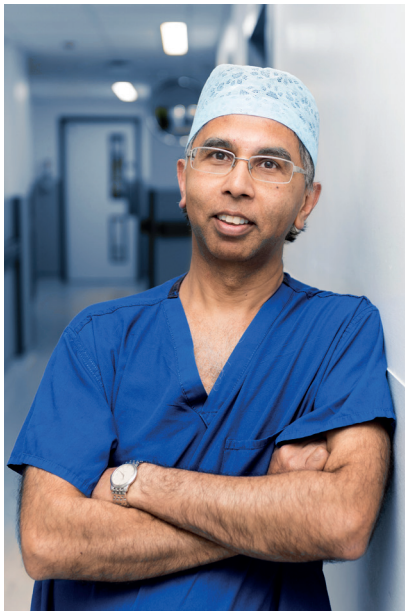
abdominal aortic aneurysm, both of which needed treatment and a background of interstitial lung disease. So, he had quite a limited physiological tolerance and we felt unsafe to treat his coronary artery in isolation because of a risk of rupture from his aneurysm. And treating his aneurysm without stressing his coronary artery would have been unsafe.

IK: This gentleman had an extremely tight proximal right coronary artery lesion. His left coronary artery was a left main stem lesion with a very significant lesion further down his mid left anterior descending artery (LAD). This left main stem lesion extended into his circumflex artery. So, he needed a coronary artery bypass grafting with 3 grafts as well as an endovascular stenting of his large infra-renal abdominal aortic aneurysm. After appropriate multidisciplinary meetings, we decided that a combined approach was best for him.

How would you have done it without the hybrid room?

IK: Without the hybrid room, we would have had to do this in a sequential manner. The traditional way, which is often debated, is that we would have done either his coronary artery surgery first, followed by a short period of recovery and then have his aneurysm dealt with, or we would have treated his aneurysm first. Now, if you were to have any one of these procedures, there would be risks with the disease which is left untreated. For example, following coronary surgery, there is a high rate of rupture of abdominal aneurysm which are this large. If you were to deal with the abdominal aortic aneurysm first, in the presence of such coronary lesion, then the patient would probably have a myocardial infarction at the time of the procedure or while waiting. So, I think with this set up that we have now, the patient is ideally suited. And there are many other advantages, the patient has only one hospital stay, one anaesthesia and his period of recovery is shortened overall, because hospital stay of this patient will just be what his usual hospital stay following a coronary artery surgery would have been: 4 to 5 days. And that's the end of it. He would continue to recuperate at home, and there would not be any separate added recuperation as a result of the endovascular procedure that he's had.

JG: We were able to do perform combined coronary artery bypass and EVAR. The coronary artery bypass was done in conventional manner with the advantages of working in a modern operating environment and the EVAR was performed immediately after under the same anaesthesia with excellent imaging and the benefits of a fixed imaging system, such as reduced radiation and screen time. I think we provided the patient with an excellent operation.

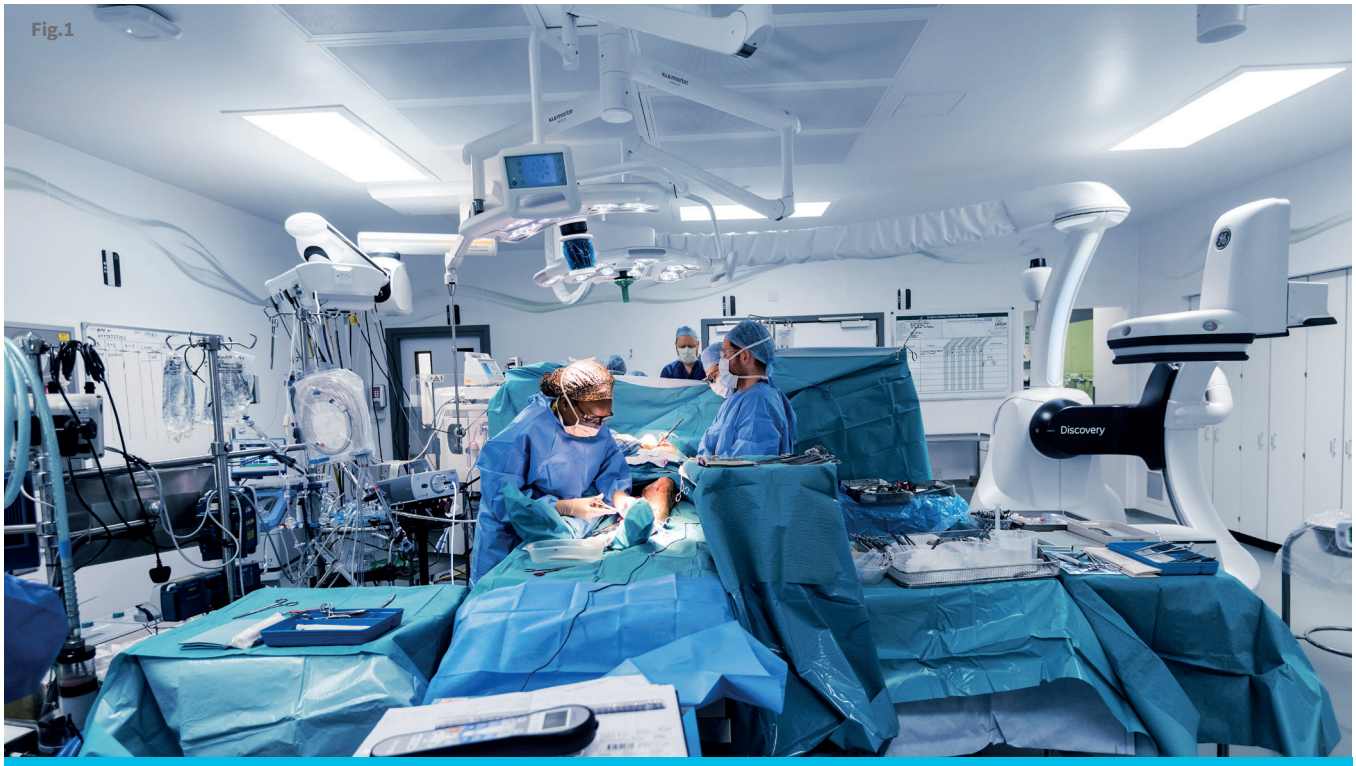


Mr. Kadir, as a cardiac surgeon, can you envision other multidisciplinary procedures that can be done in the HOR?

IK: Yes. As a matter of fact, we are planning another similar procedure, except that this patient needs to have a TAVI. He has an aortic valve stenosis, and he also has a large abdominal aortic aneurysm, which has enlarged by over one cm in the past 6 months. It's above the threshold for traditionally treating this, so that's another procedure that we have planned to do in the hybrid room. I have also been operating in the theatre, not only for hybrid procedures, but also for TAVIs where I needed imaging for direct aortic access. Although it's not a combined procedure, it is a procedure which is well suited for the hybrid room, whereby the patient needs a TAVI and does not have a peripheral access, so you need to do a formal mini sternotomy to access the aorta and then have the imaging to do a successful TAVI. So, it worked well in that situation also. Certainly, this is the way forward, this is the ideal use of a hybrid theatre in my opinion.

> *"I think we provided the patient with an excellent operation."*

Fig.1



The Discover y IGS 730 hybrid oper ating room equipped with the Magnus OR table system from Maquet.

Fig.2

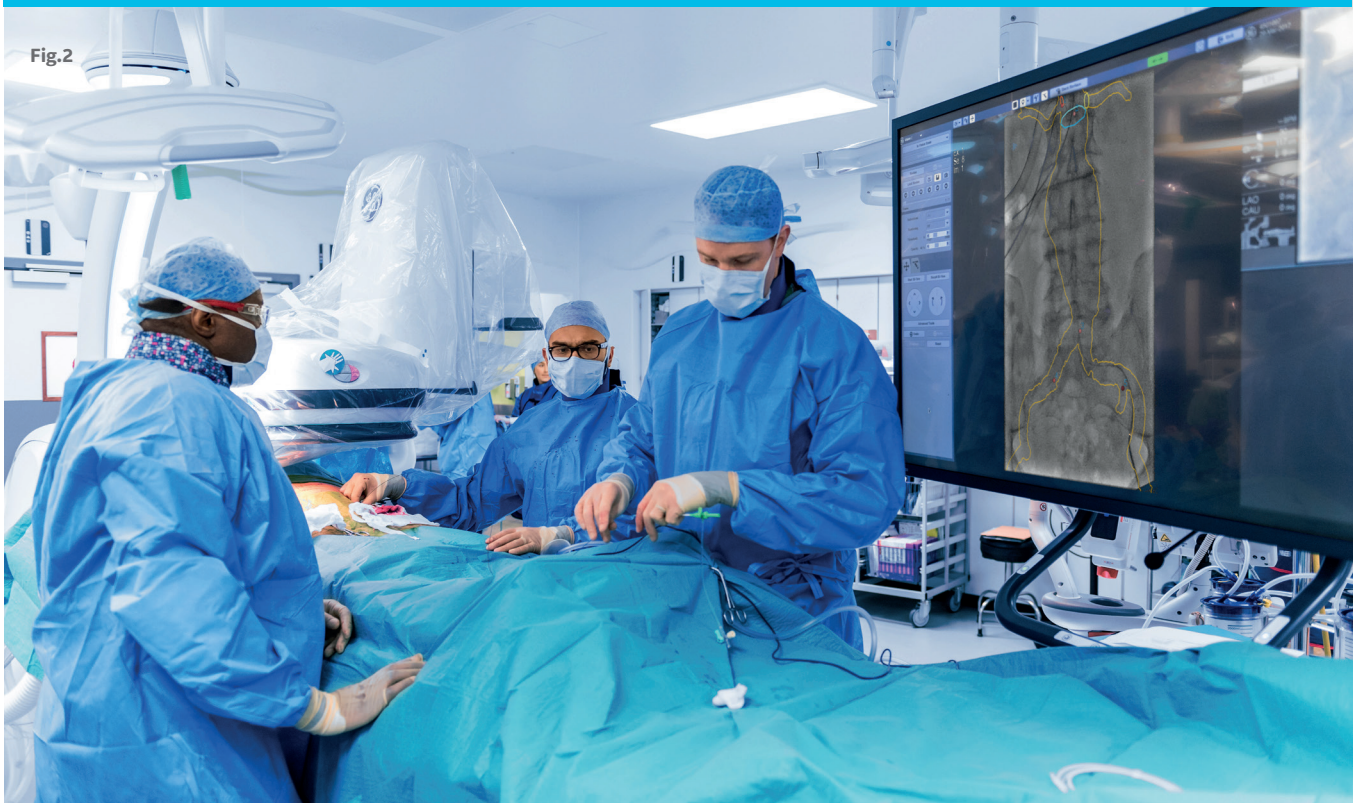


Fig.1 Open surgical procedure configuration, with the breakable table top and the angiogr aphy system parked in a corner of the room

Fig.2 Endovascular procedure configuration, with the endovascular table top and the mobile angiogr aphy system moving freely around the table

The Statements by GE's customers described here are based on results that were achieved in the customer's unique setting. Since there is no " typical " hospital and many variables exist i.e.g. hospital size, case med , there can be no guarantee that other customers will achieve the same results.