The Future Operating Theatre

A SUMMARY OF THE EVALUATION REPORT

Region of Southern Denmark

OUH
Odense University Hospital

New OUH

HEALTH INNOVATION CENTRE OF SOUTHERN DENMARK

FLEXIBILITY

FUNCTIONALITY

TECHNOLOGICAL SOLUTIONS

DESIGN

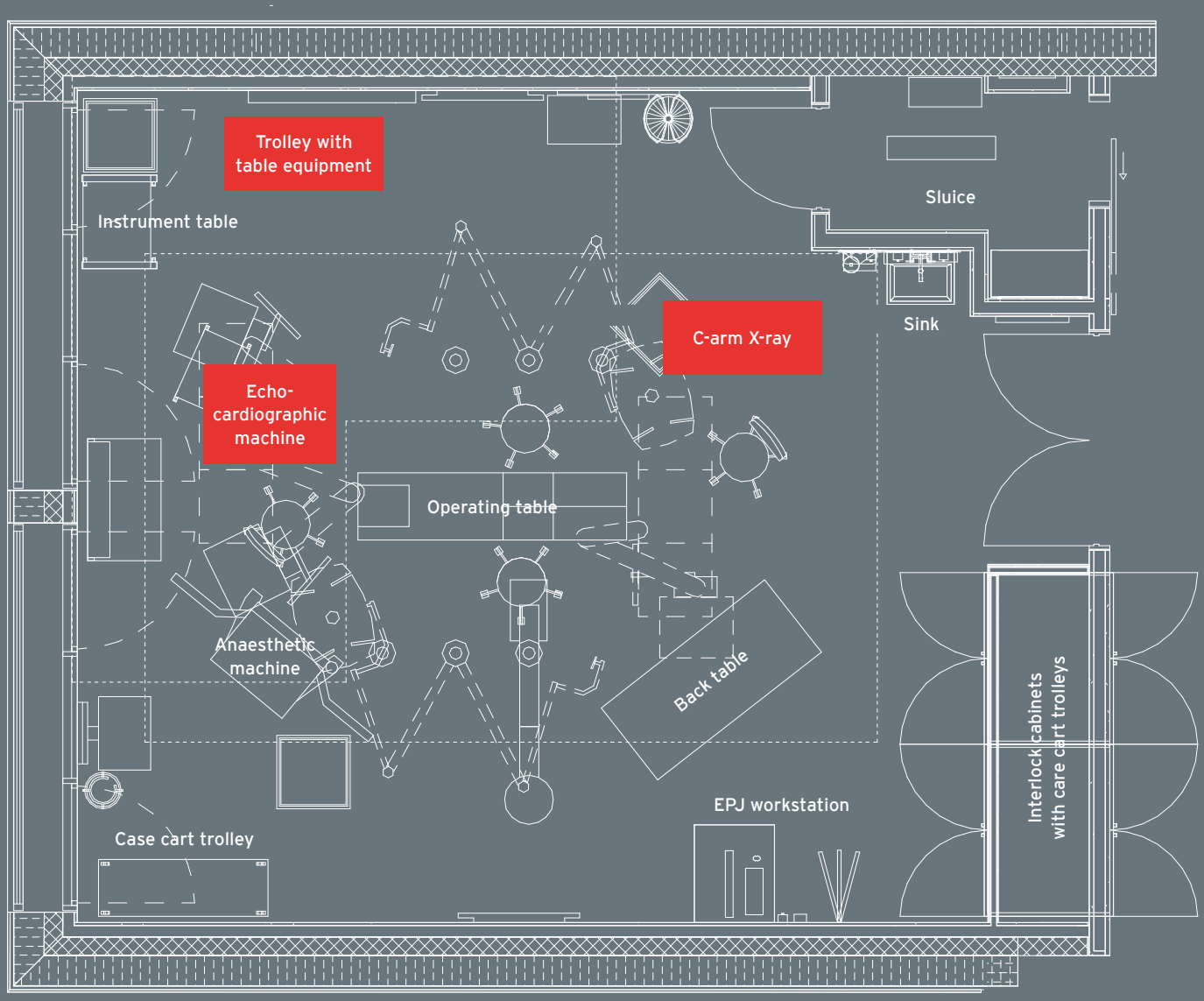
By 2024, the construction of the new Odense University Hospital (OUH) will be completed, and **52 new operating theatres** will be ready for clinical surgery.

The concept behind these new operating theatres will be different from the operating theatres known today. In the future, the theatres are going to be installed with the **same basic inventory** and **equipment fitting all of the different medical specialties**, but without having to compromise on their individual needs.

The standard arrangement of the theatres will also be fitted with **moveable equipment** to ensure that the theatres can easily meet these needs.

Standardising the operating theatres across the different specialties is going to support **effective operation**, **efficient patient care**, and a **supportive working environment** at the new OUH.

A standard arrangement of a medium sized operating theatre. The stippled lines indicate ceiling-mounted equipment such as columns, lamps and monitors.



● Examples of division specific equipment

Background

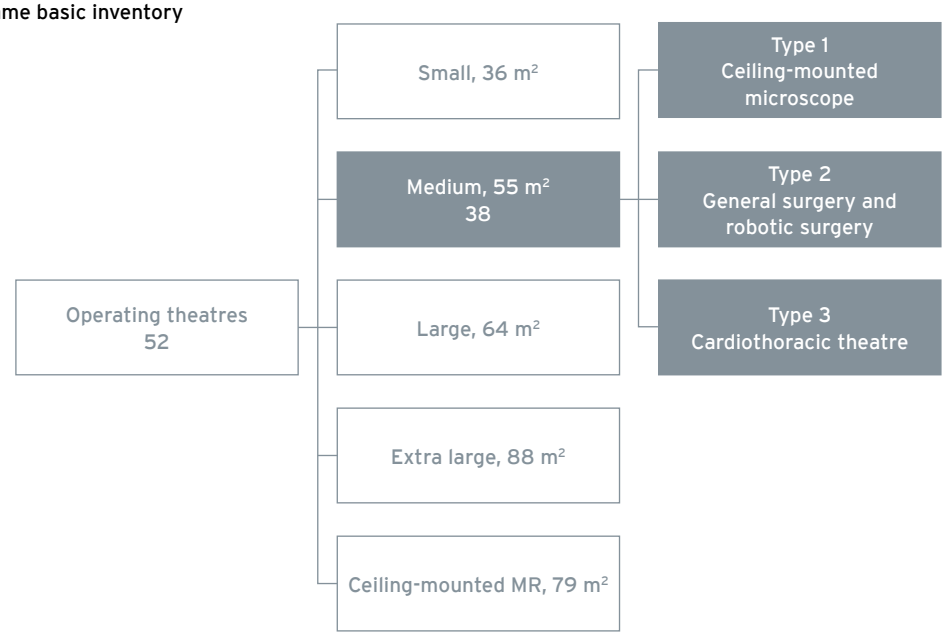
The concept behind standardisation and increased flexibility in future operating theatres is a result of an extensive user involved process that took place in 2015. During this process, a series of mock-up tests were carried out with representatives from medical and anaesthesiological specialities, service management, the Department of Human Resources (HR), and others. The tests were carried out in a medium sized operating theatre, corresponding to the majority of the 52 operating theatres in the new OUH. Of these, 38 will be medium-sized.

Once the user involvement process had finished, the old and the new OUH decided to test and ensure the validity of the concept in practice by building and pilot testing a 1:1 copy of a medium-sized operating theatre in OUH. September 1st 2018, the new operating theatre was finished and ready for testing in real operations. Concurrently, it was named "The Future Operating Theatre".

From September 2018 to October 2019, the Future Operating Theatre was subjected to thorough testing within and outside of clinical surgery. All of the medical and anaesthesiological specialities have carried out surgical procedures in the theatre to give their specialised evaluation of and suggestions on improvements. Service management and other technical divisions in OUH have also been involved in the project as participants during testing, but also as professionals responsible for specific areas. Patients and relatives have been involved with the purpose of gaining knowledge on how they experience the theatre. In total, more than 200 different clinicians, 50 employees from service management and technical divisions, the Health Care Centre of Southern Denmark, and others participated in the pilot testing of the Future Operating Theatre. The commitment and ownership of the partners involved in the project have been unique and of great importance for the results. Besides the internal co-operation, the project continuously collaborated with other projects and hospitals on feedback on the process and for knowledge sharing.

Test and evaluation of the Future Operating Theatre has focused on four parameters overall: 1) Flexibility, 2) Functionality, 3) Technological solutions, and 4) Design. The four parameters are specific areas that were selected by the clinical personnel and service employees during the beginnings of the user involvement process. In this summary, an insight will be given into the many results of the pilot project.

The new OUH will have four different sized operating theatres (extra-large, large, medium and small). The medium-sized theatre will have three variations and all of these have been tested in the pilot project. These were installed with the same basic inventory and equipment.



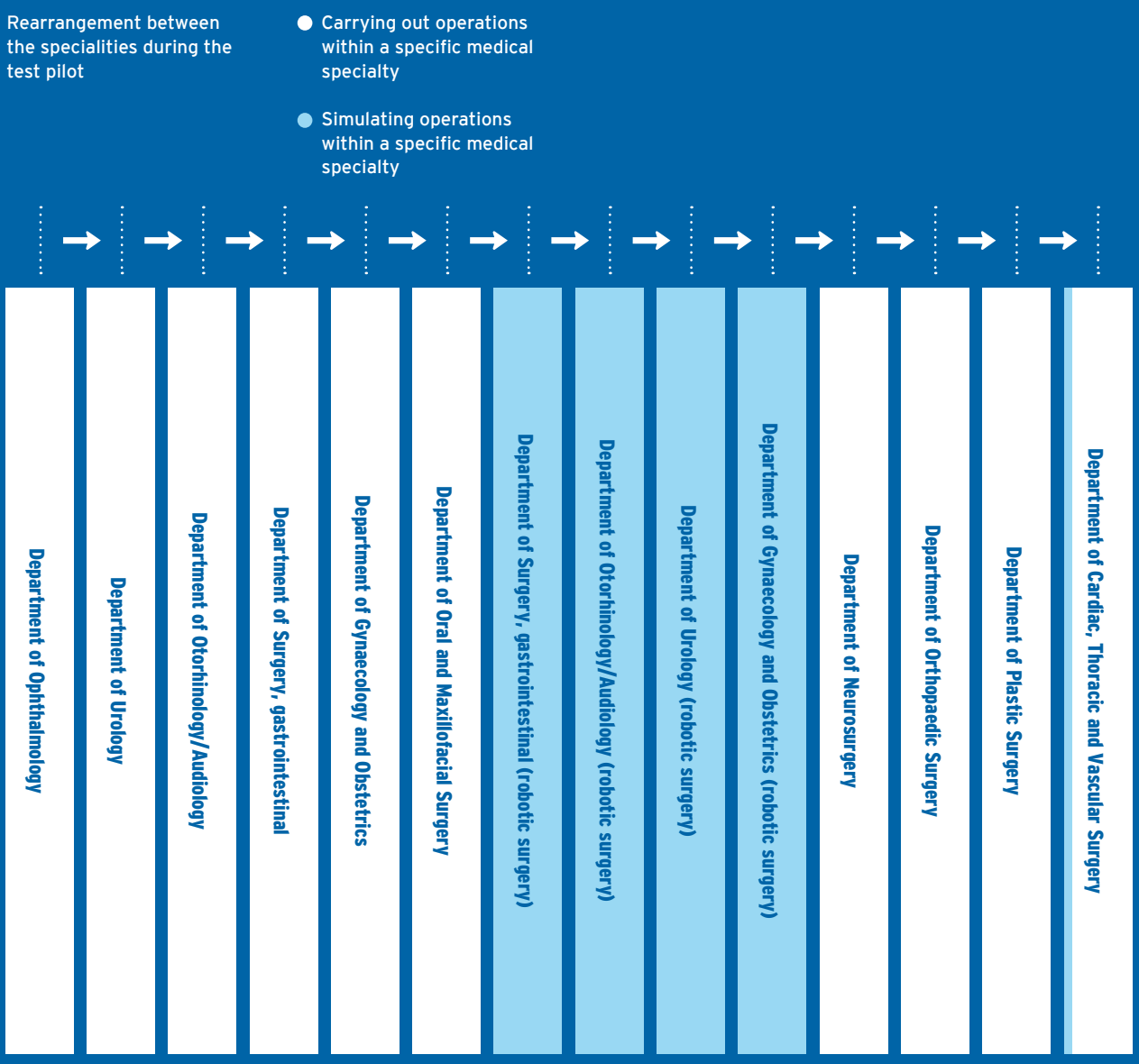
Flexibility

The shift between medical specialties

The concept behind the future operating theatres focuses heavily on flexibility and robustness. This is visible in the way the theatres allow recurrent change between specialties, but also how they are able to adapt more easily to changes in courses of treatment, new legislation, etc. The purpose of making flexibility a standard is the presumption that it brings a range of advantages, such as a decreased risk of error, increased efficiency, user friendliness, a positive working environment via recognisability, and low costs when converting the room from one speciality to another.

Results

When the new operating theatres change from one medical specialty to another, the pilot test has shown that the rearrangement can be done in one or two days with considerably low costs. A premise to ensure an efficient rearrangement is planning, such as booking the necessary supplies in reasonable time. When a rearrangement takes place, it is important to remain in close dialogue with the specific clinic and ensure that they are present during the rearrangement.



Functionality

Ceiling lift

The physical environment of an operating theatre is often characterised by heavy and straining labour when it comes to handling patients. Often, the patients are unable to move or manoeuvre themselves due to being under the influence of pain medication or anaesthetics.

Furthermore, when the clinical personnel themselves move patients that are under the influence of medicine, they risk negatively affecting the patients' tissue. Finally, complex situations, such as patients being in prone position, require additional clinical personnel to be involved.

Results

The ceiling lift is considered easy to use, move around and assemble via different components. The expectation for the lift is to optimise and improve the physical labour connected to manoeuvring patients, such as heavy lifting and unhealthy working postures. Potentially, this will help create a healthy and safe working environment.

Additionally, the ceiling lift is expected to improve patient safety through more lenient workflows, such as decreasing the risk of bedsores and falling, and increasing the comfort for patients that need to be moved.

The ceiling lift also works in tandem with the other the medical engineering installed in the operating theatre, such as ceiling-mounted columns, lamps and monitors. To avoid collision and injury to the ceiling-mounted inventory, it is necessary to carefully plan out the work with the lift prior to execution.

The subdivision of HR that are responsible for the working environment on OUH recommend that ceiling lifts capable of lifting 400 kilograms be installed in every operating theatre in the new OUH, so as to accommodate the resources necessary for treating and operating the bariatric patient group.

Simulation of different relocating manoeuvers: The patient is lifted while sitting, and the ceiling lift is supporting the patient's leg during surgery.

Lamps and monitors in the Future Operating Theatre

Lamps and monitors

The placement and reach of the lamps and monitors (ceiling-mounted screens around the operation table showing both 2D and 3D images) in the Future Operating Theatre is different from what the clinical personnel know from theatres today. The intention with the new operating theatres is to create a fixed standard that is usable to most, if not all, medical specialties. Something that has not been tried previously.

Results

The pilot test, carried out via operations by the ten different medical specialties, has shown that the placement and size of the lamps and monitors is functional and satisfying. It is continuously important to maintain a degree of flexibility in relation to how the lamps and monitors can be put together and altered by different components. Furthermore, there should be an opportunity to mount another lamp and monitor onto the surgical column. Smaller adaptations were discovered in relation to further improving the clinical personnel's posture during surgery, such as being able to tilt the screens to prevent reflection, screensaver should be black and within reach of the lamps closets to the clinical personnel operating at the head of the operating table.

The clinical personnel can freely choose what the screens will show; just as patients who are awake can follow the progress of their surgery on the screen, should they wish it. This enables X-rays, patient information, video images from ceiling-mounted cameras, video consultations, and measurement on blood pressure and pulse to be transmitted and shown on all of the different monitors in the theatre. Flexibility in this aspect has proven to be of great importance to the personnel, and necessary for the concept behind the Future Operating Theatre to succeed.

Technological solutions

Touch panel

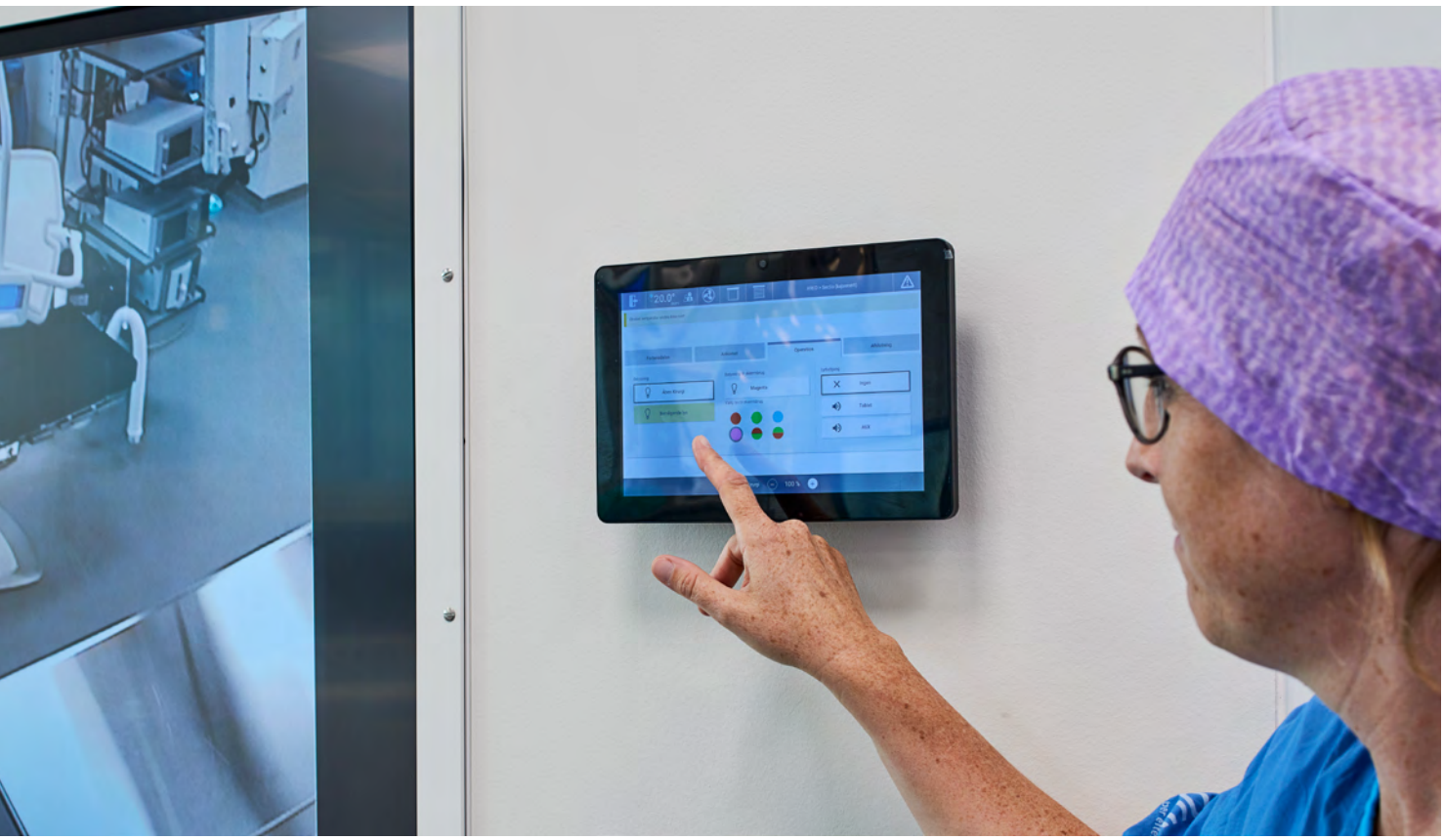
In present-day OUH, it varies how high-tech the operating theatres are and how much elements such as lighting, sound, ventilation, video, etc. can be altered by the clinical personnel. Currently, these are controlled via their own individual units and the technological layout can vary per unit. In the Future Operating Theatre, these will be controlled via the same unit – a touch panel that is developed in connection with the pilot test. The layout of the theatre is predefined and adjusted to fit the specific operation. This means that the clinic gets the same interface to control and adjust elements such as lighting, sound, dimming, etc. As such, the controls will be the same across the various operating theatres.

This ensures better recognisability for the clinicians and enables an easier usage of the theatres in their daily work, adding to better and more stabilised patient care.

Results

The test concludes that the touch panel serves its intended purposes. Clinical testing showed that it is easy to use, and that the different specialities are able to use the standardised solutions. Nevertheless, there are multiple wishes for improvement. For instance, many express a wish for gathering the panels and administrative elements somewhere in the room, and being able to lock the doors to the theatre via an inductive button on the touch panel. Some also request greater flexibility controlling the lights, a broader selection of videos for ambiance, including something specifically for children, and being able to transmit the images from the monitors surrounding the operating table.

From the touch panel, you can control lighting, audio source, video ambiance, ventilation and room temperature.



Electrical outlets

The number of power plugs in the current operating theatres is too few and often placed inconveniently. Consequently, wires are spread across the floor and inappropriately hanged from the ceiling, increasing the risk of falling or tripping in them. In the pilot test, 91 types of electrical outlets were installed in a horizontal supply-channel across three of the theatre's walls. The pilot test uncovered different needs in terms of electricity, such as amount of electricity supplies, placement and correct types of outlets. These are meant to ensure flexibility in terms of switching between different operations and medical specialties and to make the theatre better adapt for future equipment.

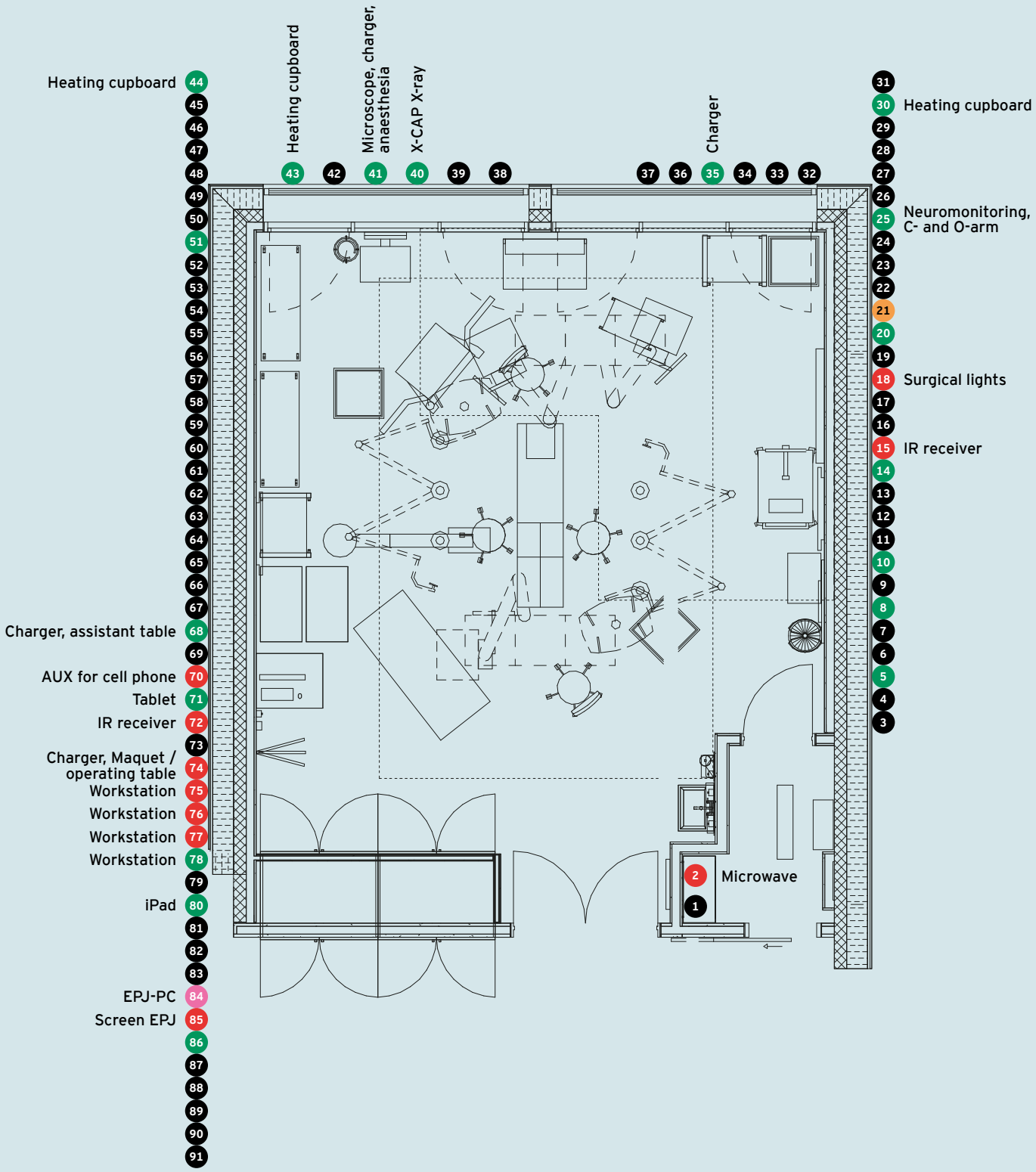
Results

The clinicians express that there are more than enough power outlets in the supply-channel and that the number can be reduced without consequence. The measurements on the consumption rates of the power outlets also show that a number of outlets in the operating theatre are not being used. This is contributed to that fact that many of the instruments are connected to the ceiling-mounted columns, also reducing the amount of wiring on the floor and the subsequent risk of tripping for both personnel and patients. Furthermore, the test shows that the need for electrical outlets on the ceiling-mounted columns exceeds the regional standards.

— We no longer have to worry about tripping over the many wires on the floor

Quote from surgeon on the Future Operating Theatre

A consumption overview of the individual outlets within the test period. The consumption was measured once per operating day (31 days in total).



Design

Spatial design

The current operating theatres at OUH varies greatly in design, and many of them show signs of being arranged to meet the demands of day-to-day function, hygiene and technology. In the Future Operating Theatre, focus will also be on aesthetic and design and on how these can contribute towards making operating theatres more inviting, calming and manageable. It is expected that this will stimulate positive thoughts and emotions in the patients, relatives and personnel.

Results

When evaluating aesthetic and design in the Future Operating Theatre one thing is clear: aesthetic and design is a matter of personal taste, and that which appeals to one might not appeal to others.

In general, the theatre is perceived as neat and pleasant when it comes to aesthetic and design. During the evaluation, the basic elements proved most important, such as natural lighting and a clear, counterbalanced colour scheme. However, when it comes to art and decor, it is difficult to find the one size that fits all. Still, it can be concluded that design has a positive influence on those working in the operating theatre, as well as patients and relatives. Nevertheless, the concept still requires adjustments to benefit further.

As design is a highly subjective assessment, the pilot test of the Future Operating Theatre stresses the importance of being able adjust the concept to fit the personnel that operates the room at a given time. For example, adjusting sound, music, colour and strength of the light and video ambience that fits the patient's wishes. The concept of aesthetic and design in the Future Operating Theatre can be fin-tuned and adjusted to further benefit the personnel, patients and relatives.

Daylight from windows that will be in all of the future operating theatres. Ceiling light and prism light are some of the elements meant to create a comfortable and calming environment for the patients and relatives when in the theatre.

Conclusion

Overall, the conclusion is that the concept behind the Future Operating Theatre is applicable and achievable in real practice as well. The theatre is flexible and can change from one medical speciality to another in one or two days, including robotic surgery. The specialities, referred to on page six, are situated in the east wing of the new OUH. Currently, no specific needs have been identified that are subjective to only one specific area performing operations, meaning that the standardisation can be applied to the future operation areas in the east and west wing as well.

In general, the pilot test shows that all of the medical specialties perceive the theatre as flexible and easily adaptable to changes between specialties. Standardising the inventory and equipment fixed to the building, such as ceiling-mounted columns, is easily achievable, while the not-fixed inventory equipment is more difficult to standardise. For this each specialities have different needs, preferences and requirements. In the future, it is necessary to consider what flexible solutions could make the standardisation principle better integrated in practice.

Furthermore, some of the findings from the pilot test effect the construction of the building. For instance, the drain placed beneath the operating table should be moved approximately 30 centimetres further towards the double doors. These findings have been passed on to the responsible parties involved.

In regards to design, the operating theatres in the new OUH have improved aesthetically from the operating theatres seen in the present-day OUH, positively affecting the working environment for the personnel. In general, the room is perceived as open, bright and inviting to the patients, relatives and clinical personnel. It can be concluded that environmental design has a positive effect on the personnel working in the theatre, as well as the patients and relatives. Although, the concept behind the design requires some fine-tuning and adjustment to become even more beneficial, such as focusing more on designing the theatre to accommodate children. Aesthetic and design is a matter of subjective taste and it is difficult to find one size that fits all.

So far, we do not know of previous pilot projects of the same size and scope as the Future Operating Theatre where there has been constructed a 1:1 copy of a planned hospital construction. The project is unique as all of the ten medical specialties, the Anaesthesiological-Intensive Department, and service departments have tested the Future Operating Theatre in practice. The project has been successfully completed and has identified important elements that the new OUH, as well as present-day OUH, can utilize in the future. Besides testing the concept, an additional benefit of the project has been that the clinical personnel, as well as service employees, have shown great commitment, dedication and ownership. They feel that their opinions have been valued and they look forward to working in the new hospital.

What comes next?

The conclusions and recommendations that are a result of the pilot test will be prioritised and implemented as the construction of the new OUH finishes.

Are you curious to know more about the construction, or gain access to the full Danish report, you can scan the QRs down below and get direct access on a tablet.

Website: the-new-ouh

The full Danish report

Thank you to the following for participating in the pilot test of the Future Operating Theatre:

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