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Passion for Climate

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On the screen!

Continuous online monitoring of the air quality in the operating room during surgery

In Germany, 2 to 10 percent of all patients that undergo surgery are faced with post-operative wound infection. To reduce this risk, laminar flow systems with a low turbulence flow are employed in operating rooms to displace particles and air-borne germs. The decisive period for the danger of infection is the time between the incisions made and skin closure!

Weiss Klimatechnik will introduce a technology at the Medica Fair, that monitors and adjusts the actual air quality, if necessary, during the operation.

It is well-known that those who have to undergo surgery in a hospital often run the risk of developing a wound infection afterwards, even if the procedure was an uncomplicated routine operation. This affects 2 to 10 percent of all patients.

Therefore, hygienic measures in the hospital mainly focus on the surgery. One must prevent particles and bacteria from getting into the open wounds, the operating area and the instrument table, both before and during surgery. The origin of germs varies. The patients themselves and the operating staff introduce them; therefore they are also present in the air.



Air attack by a grain of dust

The latter group of germs cannot be easily averted by standard hygienic measures. While they are unable to fly themselves, they adhere to dust particles which swirl through the air. Their danger is often underestimated. Dust particles are not only a means for transporting germs. They themselves can lead to accretions in the muscle tissue as a consequence of a defensive reaction of the body. Inclusion of dust particles in the tissue can become dangerous in spots where the muscle is attached to the bone. In that case the development of nodes can even lead to immobility.

Therefore it is in general essential to reduce particles, at best eliminate them completely. In surgeries that require very low levels of germs, a constant displacement flow is installed above the operating area to remove them. This technology is proven to be successful, as research (Lidwell et al.) revealed that it can clearly reduce the number of post-operative infections.

The functional principle is simple. A so-called laminar flow system is installed at the ceiling of the surgery room and directs particles and thus germ-free air towards the floor. However, in order not to introduce particle-borne germs by additional air turbulences, the air flow must be appropriate. Hence it must have enough power to carry the particles out of the operating area. The solution is: "low-turbulence displacement flow" („turbulenzarme Verdrängungsströmung“ (TAV). This can reduce the particles to 1% of the concentration of the load that usually exists.



How free from particles is the surgery?

How efficient this technology is at the moment depends on the particular conditions on site and mainly on the actual air quality during the decisive incision to skin closure time, as Rupert Mack, the Mediclean Business Unit Manager of Weiss Klimatechnik, explains. However, air quality is normally only checked thoroughly once, namely before a new or redesigned surgery room is handed over to the user. At this time, the turbulence or the degree of protection is measured according to the specifications of DIN 1946-4. This means that the room is empty when the measurement is being carried out: there is no staff, no operating table and no instruments.

Of course, things are different in practice. The quality of air depends on how many people are present and what they are doing in this room. This is because they influence the low-turbulence air flow. The same applies to the position of the operation table, instrument tables and lamps. How the air quality actually is during the operation, how it changes over time, in brief how efficient the air flow is, remains uncertain.

Measuring, correcting, documenting

Weiss Klimatechnik has developed a method of measuring the efficiency of the laminar flow. That means the low-turbulence air flow is actively measured in the operating area by high-grade sensing elements that record the particle load. In this way the operating team is able to see at any time and in detail whether sufficient particle freedom and thus "air-borne sterility" is ensured in the operating area.

However, a second step is decisive for the air quality. By this step, the developers of Weiss Klimatechnik have brought their method to perfection. The measuring results have an influence on a control loop in which the generation of the low-turbulence flow is integrated. If the particle load exceeds the set values, the system adjusts the air condition.



This is done by regulating the air flow output, its speed and thus the air quantity. Manual control by the staff, alerted by an optical or acoustic signal, is also possible. In this way, the operating team has a unique possibility of assuring the air quality.

„By continuous online monitoring and the correspondingly permanent and situation-related regulation of the air flow, we take care of the particle and germ load during the decisive incision to skin closure time and make sure it is as low as possible“, summarizes Rupert Mack: „In this way we can help to clearly reduce the number of post-operative infections due to air-borne germs“.

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