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Meenakshi Hospital designs low cost respirator

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This ingenious design is named Tanjore Air Purifying Respirator (TAPR)

Meenakshi Hospital, multispecialty hospital in Thanjavur and a part of Meenakshi Mission Hospital and Research Centre, Madurai, has designed a cost-effective purifying respirator system that provides 100% protection from Covid-19 infection for surgeons and other healthcare professionals in operation theatres.

This ingenious design is named Tanjore Air Purifying Respirator (TAPR). Essentially, the system securely delivers compressed medical grade compressed air, already available in operation theatres for administering anesthesia and operating pneumatic drills, to healthcare professionals through a hood.

A TAPR unit can be set up at as low as Rs 3,000 per person. In comparison, the conventional air purifying system, known as Power Air Purifying Respirator (PAPR), costs Rs 1.2 lakhs per person.

Commenting about TAPR, Dr Guru Shankar, Chairman, Meenakshi Hospital, said, “Experts are of the opinion that the novel coronavirus - SARS CoVID -19, is going to be there for a long time. Hence, the likelihood of a surgeon having to perform an elective surgery such as hip replacements or cataract extraction and other common, emergency surgeries on a patient who is infected with Covid-19 is going to be more. In this context, there is a need to provide personal protection equipment for all healthcare professionals who will be present in Operation Theatres during surgeries.”

“While surgical masks can block large droplets, they cannot provide a reliable level of protection from inhaling smaller airborne particles. Today healthcare professionals use N95 respirators that can filter out over 95% of airborne particles that are as small as 0.3 microns. For a higher level of protection, they use PAPR systems. Though a PAPR is safe and reusable, there is a risk of contamination. However, TAPR supplies the users with medical grade air from a central compressor located far away from the operation theatre. Hence it guarantees 100% protection”, he added.

Comparing the mechanism of TAPR with PAPR, Dr Kesavamoorthy Bhoopalan, M.D, D.M., Senior Consultant - Cardiology, Meenakshi Hospital, Thanjavur, who designed the new system, said, “Our objective with TAPR is to come up with a cost effective yet improved air purifying system. The conventional PAPR takes air from the Operation Theatre and cleans it using a filter before sending it to the user. But TAPR uses air that has gone through multiple filters and frequent quality checks. It is like operating amidst the desert storm of Sahara with fresh air supply from Switzerland.

There is no chance of contamination. Unlike PAPR that requires meticulous cleaning after every procedure, TAPR requires no cleaning at all. Further, PAPR runs with a battery and hence needs constant recharging. But TAPR can work endlessly as there is no battery. PAPR is bulky because it has many components but TAPR with just an air flow regulator and a simple long tube is weightless. Healthcare professionals can wear operation theatre gowns comfortably over TAPR.

Talking about how TAPR achieves cost effectiveness, Dr Kesavamoorthy said, “TAPR uses already existing infrastructure for the delivery of much cleaner medical grade air at the place where it is very critical. PAPR per person would cost about Rs 1.2 lakhs. However, TAPR with an imported hood costs Rs 17000, and the same with an Indian hood could cost as low as Rs. 3,000 – about forty times lower than the cost of PAPR.”

He explained that when the medical grade compressed air is available in the operation theatre, all that the hospitals have to procure is a hood - either imported or Indian made. Any biomedical engineer can assemble TAPR without much effort. Meenakshi Hospital is not planning to patent the design. It intends to make the design open for any hospital to use it at this critical moment. The hospital is planning to invest in manufacturing hoods in India and deliver them to hospitals to assemble TAPR at low cost.