A wearable UV-LED medical device for automatic disinfection of stethoscope membrane

The medical literature has demonstrated the importance of healthcare-associated infections (HAI), which are an huge worldwide problem because of health complications, mortality (EU + USA 140.000 death/year), length of hospitalization and costs for treatments (EU + USA 40 Billions/year). HAI are often due to inadequate management of cleaning, disinfection and sterilization.

Fig. 1. Increasing level of bacterial contamination in three physical examinations made with a stethoscope which was not disinfected between every examination.

The stethoscope is the most used medical device in the world. The lack of stethoscope hygiene favors the transmission of microorganisms and can be a potential source of HAI. The stethoscope membrane, directly in contact with the patient skin, must be disinfected before each visit. In Figure 1 it is shown the increasing level of bacterial contamination in three physical examinations made with a stethoscope which was not disinfected between every examination. Every white dot (Colony Forming Unit: bacteria) on the discs (Petri dishes: special surfaces which allow to identify the presence of growing bacteria) highlights the presence of bacteria if the stethoscope membrane is not disinfected.

Our device, Figure 2, allows to break down/eliminate the transmission of microbes caused by the stethoscope, killing the bacteria after every use.

The device is a micro-electronic instrument, applicable to the operator’s coat, equipped with a special light (UV-C) emitted by a LED which is able to disinfect/sterilize the stethoscope’s membrane automatically. Health professionals such as doctors and nurses, after every use of the stethoscope, should simply attach the stethoscope’s head to Stet Clean, which in few minutes disinfects the membrane. In addition, the presence of Stet Clean on the operator’s coat, at eyes

level, plays another important role: it remembers the operators to conduct proper hygiene procedures in every context.

Fig. 2. The device on the operators' coat.

The device is lightweight, portable (dockable to the health professional coat), good looking, practical, adaptable to all stethoscopes (universal), technologically innovative, efficient (high operating speed) and effective (up to sterilization), safe for the operator and the patient, cheap (convenient), cost saving, eco-friendly, rechargeable.

The stethoscope, symbol of medicine, sensor and hand extension of healthcare professionals, has been proved to be a carrier of microorganisms. We demonstrated that the stethoscope membrane can be effectively and efficiently disinfected using our device. In 1847 Ignaz Philipp Semmelweis introduced hand washing, a significance step in Hygiene. Our device makes a step further to eliminate stethoscope membrane contamination and to limit its influence on nosocomial infections.

Publication

A new UV-LED device for automatic disinfection of stethoscope membranes.
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