

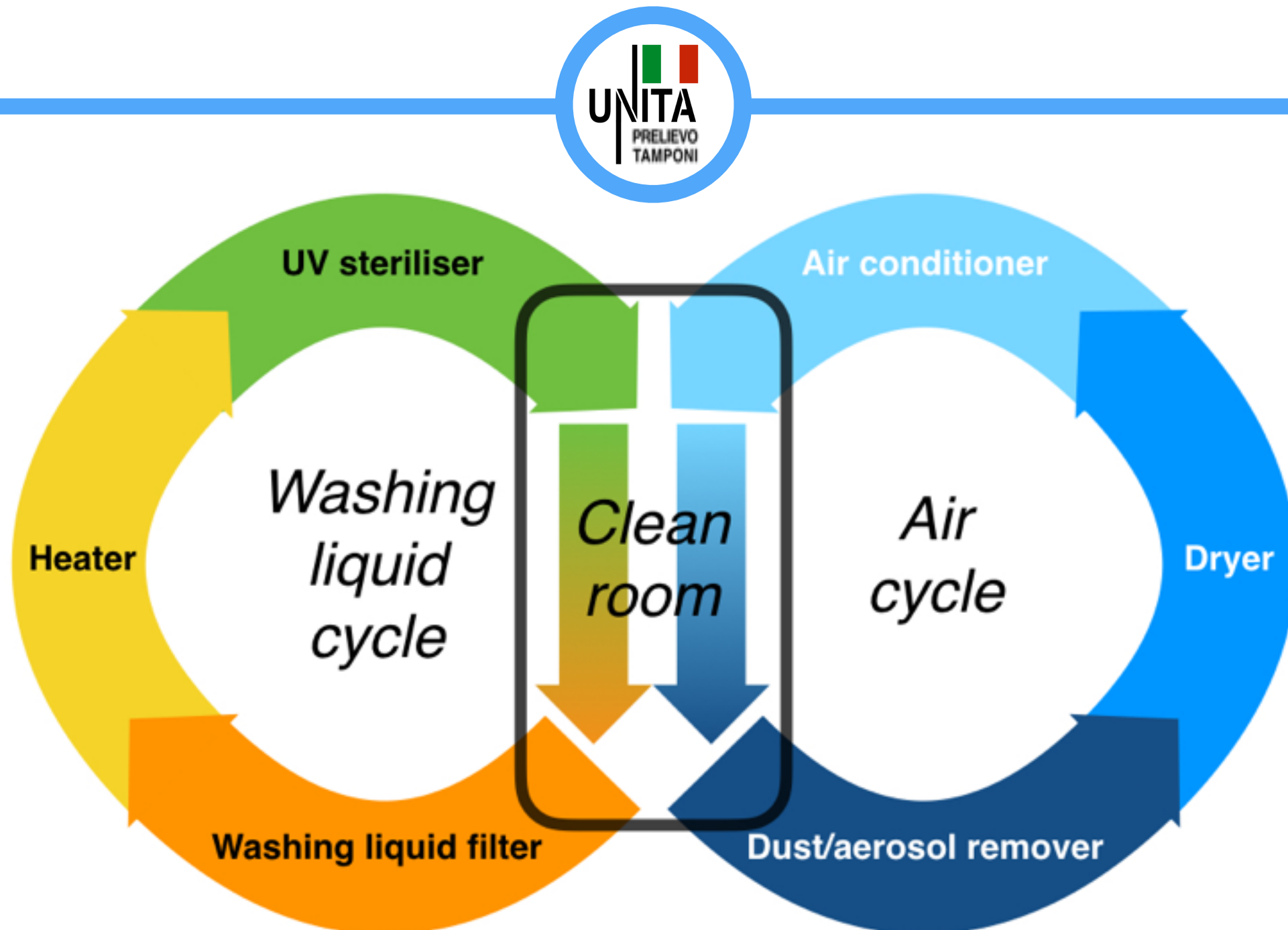


————— **UNITA** —————
Mobile unit for rapid swab sample collection

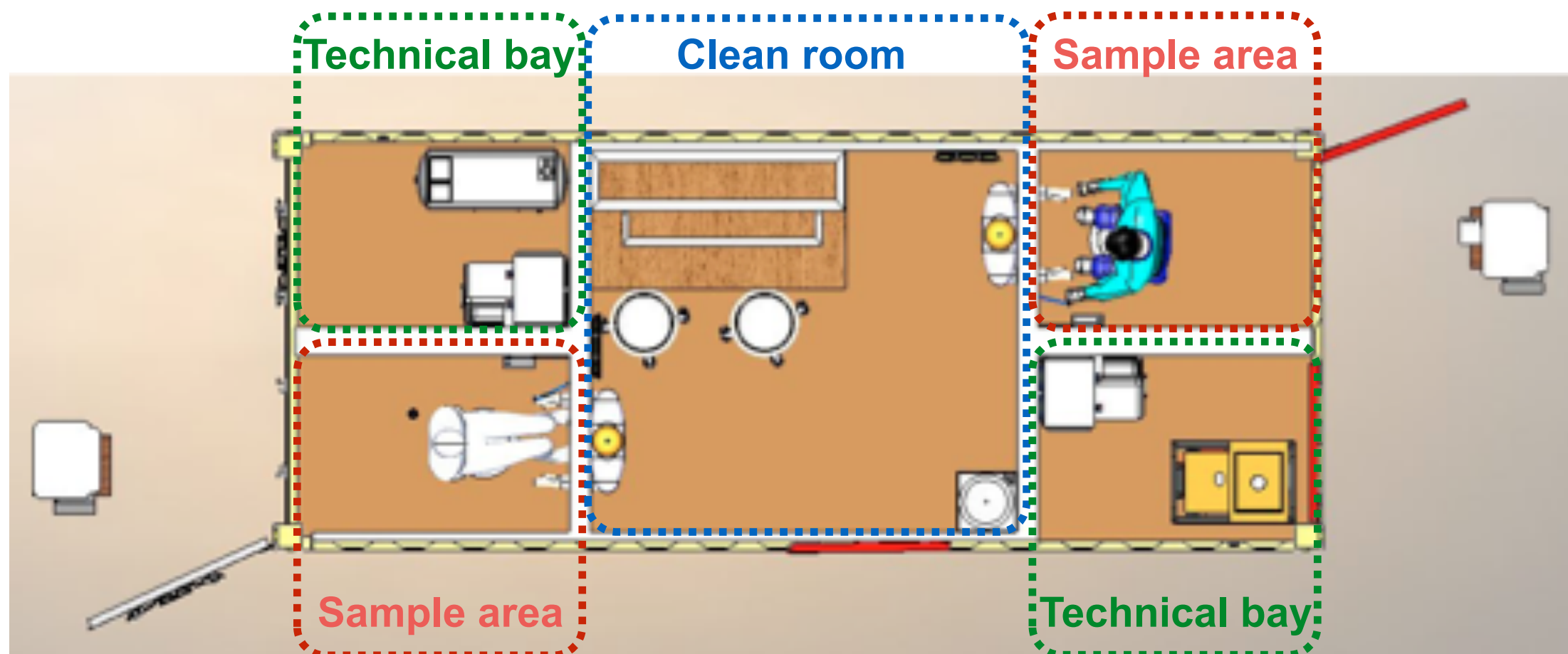
UNITA stands for “UNItà prelievo TAMponi” (“Swab Collection Unit” and also “Unity”) in Italian, as well as “UNIT-A” in English. We believe that controlling the spread of the COVID-19 infection requires a radical change in direction.



The UNITA module is based on a double closed-loop treatment cycle for the fully automated disinfection of rooms and removal of dust, aerosol and gaseous substances (patent pending), housed within a repurposed standard 20ft intermodal shipping container.



Medical personnel inside the unit operate safely from a positive pressure room physically separated from the patient room. They collect oral and nasal swab samples from patients using a full human-sized (1x1x2m) glove-box fitted with a transparent plastic wall and sealed rubber gloves. Patients are guaranteed access to a safe and hygienic room which is quickly and efficiently disinfected every time it is used.



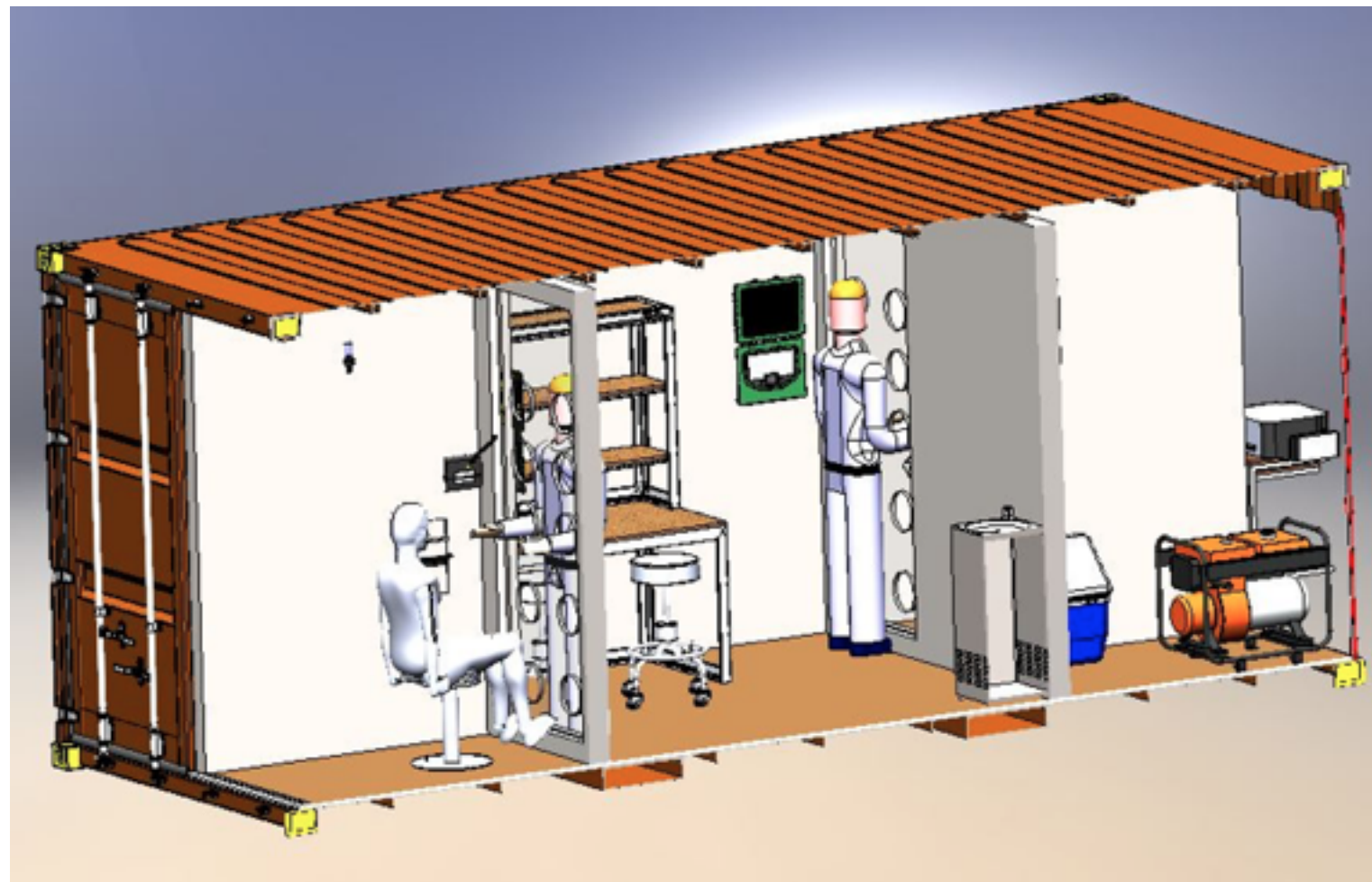
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Each member of the crew can operate independently, there is no need to change gloves or face masks after collecting a swab sample.

Each patient is hosted in an automatically disinfected environment.

Those waiting in line for their turn are not exposed to potentially dangerous aerosols.



Swab sample collection process



- **Patient's entry** - The patient walks in the patients' room and gets ready for the swab sampling, to be carried out by medical staff.
- **Swab sample** - Medical personnel, operating from behind the transparent separation wall and using the sealed rubber gloves, collects swab samples from the patient.
- **Swab sample storage and patient leave** - The same operator that picked up the swab sample from the patient, safely stores it within a dedicated chilled area, ready for subsequent transport to the analysis center Any waste is safely disposed of. The patient leaves the room and the patients' room door automatically closes.
- **Automatic disinfection** - The patients' room is automatically disinfected; once the process is complete, the door opens and the room is ready for the next patient.

Double closed-loop disinfection cycle



System description

The system is composed of a number of integrated sub-systems including:

- A closed-loop-cycle for treatment, disinfection and sterilization of the washing liquid;
- A closed-loop system for the pressurized spraying and subsequent collection of the washing liquid;
- A closed-loop system for drying up and air conditioning of the patients's chamber;
- A system for the removal of suspended solids, aerosol and gaseous substances contained within the patients' chamber;
- A system of sensors and actuators for the monitoring and operational control of the whole device.

The sub-systems are automatically managed and the key operational parameters can be controlled and changed using a computerized interface.

Double closed-loop disinfection cycle



Two operating steps

- **Closed-loop wet washing**, by spraying all internal surfaces with a water-based washing solution, to be constantly collected, filtered, purified, heated, sterilised and finally recycled for the next washing cycle;
- **Surface drying and disinfection via closed-loop air blower**, whereby using high-volume forced ventilation the air of the patients' room is used to dry up all internal surfaces. At the same time, such air is channeled through a dust, aerosol and gaseous substances removal treatment, prior to its subsequent reuse.

The size of pumps and the volume of liquids and air to be treated is such so as to allow start and completion of the above phases within a short period of time (about a few tens of seconds).

Operational opportunities



- **Protection of the environment:** the closed-loop cycle system does not release harmful chemicals into the environment;
- **Recycling:** the closed-loop cycle system allows recycling of the washing solution;
- **Automation:** the automatic system guarantees repeatability and high quality standards, simplifies monitoring and control; removes the chance of human error;
- **Process optimization:** the automatic disinfection process does not require manual operators, hence saving on personnel and on individual protection devices wastage;
- **Reduction of process cycle time:** when compared to the traditional manual approach, the whole automatic system is sized so as to allow room disinfection to be completed in shorter times;
- **Reduction of sanitary risk:** the lack of manual disinfection operators and the automatic process reduce sanitary risk for both patients and medical personnel;
- **Ease and flexibility of employment:** the automatic disinfection system can be designed, sized and deployed within both pre—existing structures (buildings) and in mobile units.

Technical challenges



- **Carrying out manually a process that lends itself to high automation** - ancillary operations are needed to safeguard the health of both patients and medical personnel - however, they require dedicated operators, time and wastage of individual protection devices; they are not error-proof and may lead to contamination from the previous to the following patient.
- **Sanitary and environmental risks** - the use of individual protection devices may reduce but does not completely eliminates the risk of contamination from patient to medical personnel.
- **Long swab-sample taking time** - the average number of patients processed by two medical operators operating in a traditional clinic setting is around 6 per hour; the same average for drive-through facilities is around 10 per hour.
- **Setting up new swab collection facilities** - even though swab the sample collection process may seem simple, the complexities and hurdles linked to setting up new facilities for volume processing should not be underestimated.

Opportunities offered by the UNITA module



- **High automation device** - reduction of dedicated personnel, of average cycle time and costs. Process repeatability. Guaranteed process quality with less wastage.
- **Risk reduction** - the closed-loop-cycle safeguards the environment and reduces contamination risk.
- **Reduced swab sample collection time** - we estimate that the average hourly number of patients that a UNITA module can process is at least thirty.
- **Fast setup and flexible deployment** - the UNITA module only requires the physical space for its placement. All devices included in the system rely on the integration of off-the-shelf technology. The double-closed-loop treatment cycle can be designed and sized so as to be retrofitted even within existing structures. Possibilità di retrofitting all'interno di strutture (ambulatoriali/cliniche) già esistenti. The module can be configured with its own power supply and water tank, so as to be completely autonomous and ready for deployment in remote/difficult environments.

UNITA - UNItà mobile prelievo TAmponi

Thanks for your attention

