Effective Disinfecting Of Protective Devices Used In The Course Of Treating Sars-cov2 Suspected Or Positive Patients

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BACKGROUND

Powered Air-Purifying Respirators (PAPR) were part of the existing PPE supplies during the COVID-19 outbreak in Sengkang General hospital. Increased disposable PPEs utilized and disruptions to global supply chains made maintaining supply challenging. PAPRs were prioritized for high-risk areas and aerosol-generating procedures (AGP). Ensuring a consistent and sustainable supply of clean and safe PAPRs became paramount.

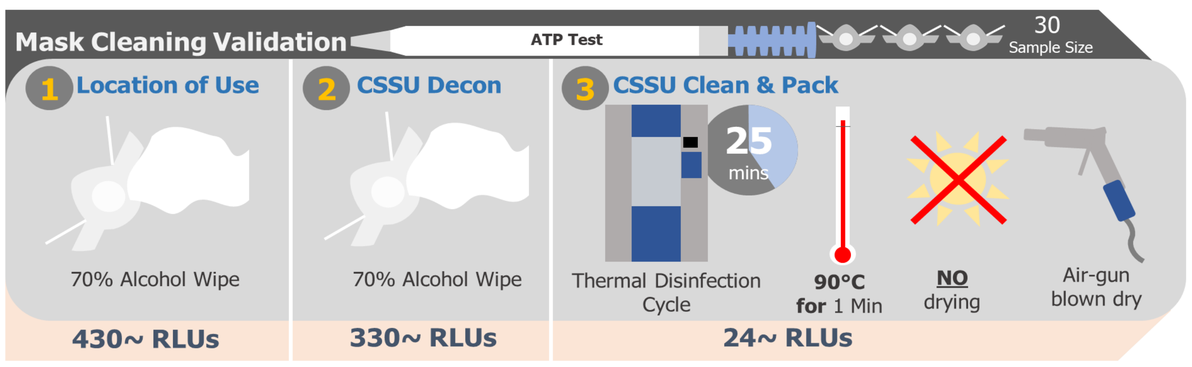
Immediate concerns were heightened when gross stains were visible on surfaces of masks after cleaning with alcohol wipes. The Central Sterile Supply Unit (CSSU) evaluated the efficacy of current cleaning methods before adopting disinfection best practices. The identified thermal disinfection process was subsequently expanded to include harnesses and eye protection goggles. Utilization and inventory management can also be tracked by the CSSU instrument management system, increasing the traceability of this critical resources within the institution.

AIM

Determine an effective disinfection method for protective devices used in the course of treating SARS-CoV2 patients within the SKH facility.

METHOD

The manufacturer recommended PAPR masks to be wiped with at least 70 percent ethanol-based wipes after use. Consistent and effective cleaning is subjected to end users' practice. In addition, crevices of mask areas were difficult to reach. "Cleaned" masks were observed to retain hairs and were visibly stained. A substantial number of masks have been discarded by frontline staff. A comparison study was conducted between the effects of surface disinfection to thermal disinfection.



Pic 1: Mask Cleaning Validation

30 PAPR masks samples *(Pic 1)* were tested for the presence of adenosine triphosphate (ATP) at different points (Table 1. Swab test RLU results). Living cells produce adenosine triphosphate (ATP). Relative Light Units (RLU) quantify the amount of detected ATP. The higher the RLU, the more contaminated the sample (Department of Health, U.K. 2020).

RESULTS

Adenosine Triphosphate (ATP) Results for 30 Masks

Comparision between Wipe down with 70% Isoprophyl Alcohol versus Thermal Disinfection @90◦C, 1 Min

Location	Method(s) of Cleaning			ATP Range		
	70% Isoprophyl Alcohol Wipes	70% Isoprophyl Alcohol Wipes	Thermal Disinfection @90◦C, 1 Min	Min	Max	Mean
Area of Use (Assumed Wiped after Use)	√			281	630	431
CSSU Decon (Gloved hands)	√	√		166	521	329
Clean & Pack Area	√	√	√	9	46	24

Table 1. Swab test RLU results -
CSSU Decontamination : 10x on the interior of the mask & 10x on the exhalation valve

The modified thermal cycles emerged as the recommended disinfection method, further enhancing the understanding on the risk imposed by frontline staff who perform surface disinfection for these masks for reuse during the work shift.

Leveraging on the current expertise from existing instrument logistics, CSSU takes charge of the processing and stock management of SKH's PAPR masks. *(Pic 6)*

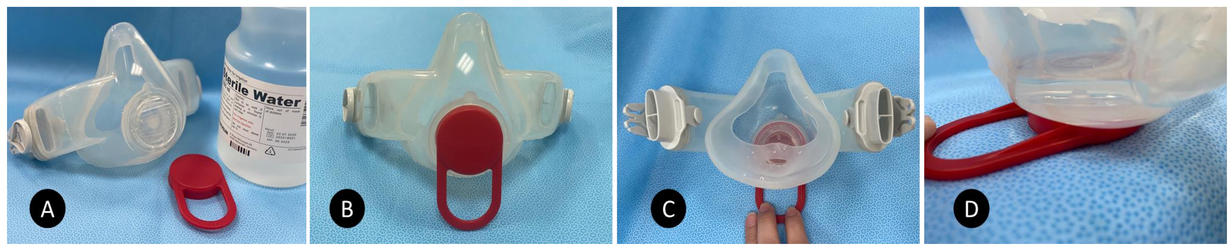
Pic 2: Serialized mask, harness & goggles, individually packing after processing

PLANNING AND EXECUTION

CSSU switched gears from instrument reprocessing to reprocessing of PAPRs during the pandemic with the cut down of electives procedures. A new washing program was customized to achieve thermal disinfection whilst removing drying time due to concerns over mask deformation.

QUALITY CHECKS AND DISTRIBUTION

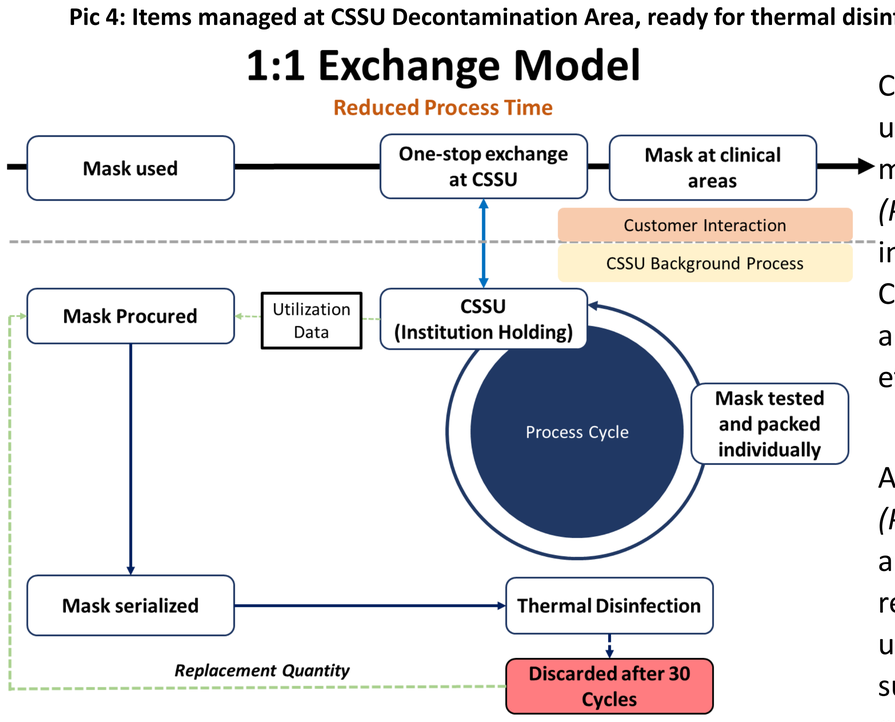
Mask quality checks were put in place to ensure the safety of our users. According to IFU, masks can be used up to 30 thermal disinfection cycles. Triggers within CSSU instrument management system were set to have these masks validated with a leak test at every 10th thermal disinfection cycles or when there is a feedback of a leak at point of use.



Pic 3: Quality Control for mask performed by CSSU staff

Items used to conduct the quality checks include a seal check cap, sterile water and the mask (*Pic 3).* The Red seal check cap is snapped over the exhalation valve. Sterile water is poured into the mask cavity until the valve is fully covered. Seal check is completed when there is no fluid leak from the valve. On a failed test, the faulty mask is removed from circulation and it's unique identification is disbarred from use.

Pic 4: Items managed at CSSU Decontamination Area, ready for thermal disinfection.



Pic 5: Exchange model to ensure sufficient stock at user department

CSSU created multiple pop-up stations and quickly moved to serialize all masks *(Pic 2)* circulating within the institution. This empowered CSSU to manage distribution and inventory control efficiently.

A one-stop exchange model *(Pic 5)* was implemented and masks were redistributed based on utilization to optimize supplies, eliminating exchange lead time.

CONCLUSION

CSSU plays an important role in ensuring processed devices are safe and kept within useful lifespan. This is through understanding the impact of the disinfecting agents that are applied and the thermal disinfection outcome. The recommended method for the processing PAPR masks is through thermal disinfecting with no more than 30 cycles per mask in order to maintain device integrity.

To date, all used PAPR masks were sent to CSSU for reprocessing. Continuous supply of duly processed PPE not only provides physical barriers against infection, it also builds confidence and promotes positive psychology among our frontline staff amid the pandemic.

Pic 6: Mask, Harness & Goggles Storage Area in CSSU, stored in first-in-first-out sequence