

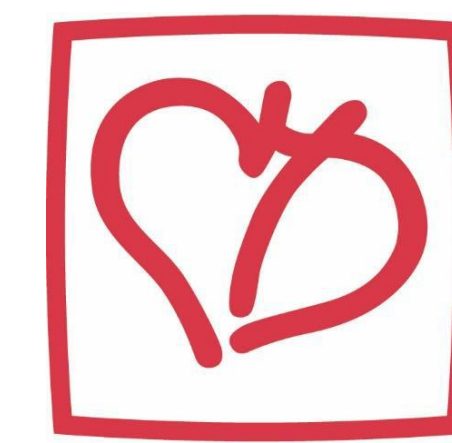


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To Improve the Process for Draining Effluent Fluid from CRRT machines

Koh Hwee Hong¹, Lee Mei Bao Jasmine¹, Low Huiling¹, Lee Xiao Wei Anne¹, Charmaine Ong Xiang Yun¹, Duan Shuya¹, Sharifah Nur Dhabitah Bte Syed Shiekh¹, Alina Ee Min Si¹, Delvin Wong Le Chen¹, Lim Ee Lin Amy², Ng Li Choo²

¹National Heart Centre Singapore, ²Singapore General Hospital



National Heart Centre Singapore
SingHealth

BACKGROUND

Continuous renal replacement therapy (CRRT) is evidently established as one of most common therapy used in the Intensive Care Unit (ICU). It is not limited to the treatment of patients with renal failure but also for patients with septic shock and acute on chronic liver failure. CRRT removes water and waste at a consistent pace to that of native renal function and the waste product is drained into a 5 litres effluent bag. In June 2020, every ICU was allocated new Fresenius Medical Care (FMC) CRRT machines. Besides the marked difference in operation, the effluent bag holds 10 litres of effluent fluid, weighing 10kg (Figure 1).

The process to change and drain the dialysate bags (Figure 2) is labour intensive and time-consuming. Due to infection control guidelines, draining of effluent fluid into the ICU room's sink or inbuilt dialysis pipe is not permitted except for intermittent dialysis. The sheer pressure of wastewater discharging into the sewage pipes causes water droplets and aerosolization. The bigger droplets contaminate the surrounding environment, while the smaller droplets generate into aerosols which can be inhaled by the patients or healthcare workers. Failure to enforce and regulate how medical waste are handled in the healthcare setting predisposes patients to hospital acquired infections.

Figure 1. Different types of effluent bags



Figure 2. Process of effluent fluid drainage



METHODOLOGY

Solution 1. Customized dialysis cover for inbuilt dialysis pipes in the ICU

The dialysis cover was customized to accommodate to the polymerization of 2 different types of dialysis, such as hemodialysis and CRRT. The team enhanced the final design of the cover to have the following features:

- Design #1: Stainless steel cover with an unique lock. The cover will prevent aerosolisation and accidental spillage of effluent fluid into the environment.
- Design #2: During intermittent dialysis, 3 waste tubes are discharged into the inbuilt sewage pipe. The special inlet will secure dialysis tubings when waste water are discharged into the sewage.
- Design #3: Inner adjustable shell to "close" (refer red arrow) 3 outlets. This prevents pests from crawling out.



Solution 2. A customized trolley with adjustable height

The team went through 2 stages of prototypes before finalizing the trolley design. It was customized to cater to the requirements across a spectrum of CRRT machines. Feasibility of the trolley's functions include:

- 4 trolley wheels for easy maneuver
- Knob to release the locking mechanism and raise the height of the stand automatically
- Top surface area wide enough to accommodate both 5 Liter & 10 Liter bag
- Customized cutting of the table top to facilitate the draining of residual effluent fluid for a 5 and 10 litre bag
- Additional hooks to secure the bag from sliding off when the balance of the drainage bag is placed on the top surface



Solution 3. Education Roadshow

Roadshows on the demonstration of operating the customised trolley and pipe cover were carried out. Regular hand-on training sessions were also conducted for current and new staffs.



RESULTS

Enhanced Effluent Drainage Process



The innovation improved the process of effluent fluid drainage. It led to a 100% elimination of trip to the disposal room and time spent in waiting for the effluent bag to complete draining.

BEFORE

12 trips per day*
(avg. 4 trips per shift x 3 shifts)

36 mins / day spent walking to and fro disposal room*
(3 mins per bag x 12 trips)

48 mins / day spent draining of effluent bags*
(4 mins per bag x 12 bags)

*Based on 1 CRRT case / day

AFTER

0 trips per day

0 minutes spent

0 minutes spent

Daily there are average 2 CRRT cases in CCU & 3 CRRT cases in CTICU
Effluent discharged directly in the room

✓ 240 mins/day avoided for time spent on draining of effluent bags

1,460 hours savings or 0.75 Nursing FTE Savings per annum for NHCS!

Total elimination of walking trips to the disposal rooms

✓ 180 mins/day reduction in time spent walking to and fro disposal room

1,095 hours savings or 0.56 Nursing FTE Savings per annum for NHCS!

Time savings & manpower efficiency

✓ 60% overall reduction in time spent on changing effluent bag

2,555 additional hours spent on patient care per annum for NHCS!



TOTAL TIME SAVED

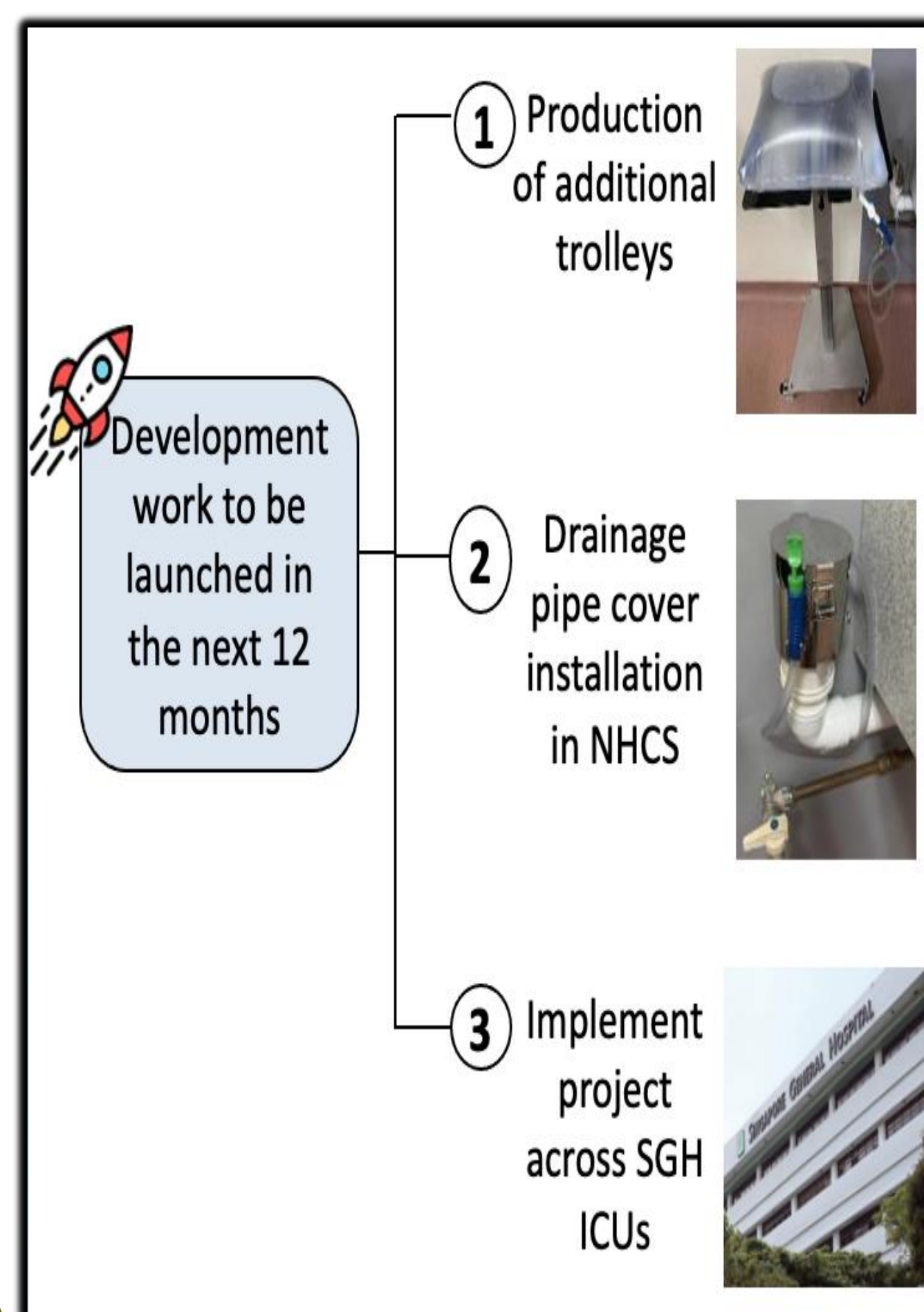
1.31 FTE Savings / Annum



TOTAL COST SAVINGS

\$66,090

PROJECT SPIN OFF



CONCLUSION

The infrastructure of a hospital is an essential component of infection control measure. The use of the customized dialysis pipe cover and trolley enhanced the process of effluent drainage by eliminating the need to manually carry heavy effluent bags for drainage. This in turn translates into better economic viability and productivity for NHCS when the numbers for work related injuries are kept low. By improving workplace safety, it reduces absenteeism, increases productivity and retention and raise employee morale.

Cross contamination and aerosolization of the waste products can predispose patients to hospital acquired infections (HAIs). With the specialized cover, HAIs can be prevented. Hence, decreases morbidity, mortality and avoidable healthcare cost.