

Project Title

To improve the process for draining effluent fluid from Continuous Renal Replacement Therapy (CRRT) machines

Project Lead and Members

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Organisation(s) Involved

National Heart Centre Singapore (NHCS)

Healthcare Family Group(s) Involved in this Project

Medical, Nursing

Applicable Specialty or Discipline

Nephrology, Intensive Care Medicine, Infectious Diseases

Project Period

Start date: Aug 2020

Completed date: Apr 2021

Aim(s)

Continuous Renal Replacement Therapy (CRRT) is a common dialysis in the Intensive Care Unit (ICU). During hemofiltration, uremic toxins are removed and drained into 5-litre effluent bags. Changing effluent bag is laborious. Under strict infection control guidelines, effluent fluid cannot be discharged into the sink or inbuilt dialysis pipes inside ICU rooms. The quality improvement project described in this paper aimed to improve infection control practices and workplace safety for ICU nurses.

Background

See poster appended/ below

Methods

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Results

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Lessons Learnt

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Conclusion

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Additional Information

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Project Category

Care & Process Redesign, Value Based Care, Productivity, Time Saving, Manhour Saving, Cost Saving, Safe Care, International Patient Safety Goals, Adherence Rate

Keywords

Infection Control, Renal Intermediate Care Area (RICA), Dialysis, Intensive Care Unit (ICU), Acute kidney injury (AKI), Effluent Bags

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To Improve the Process for Draining Effluent Fluid from CRRT machines

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 a 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*

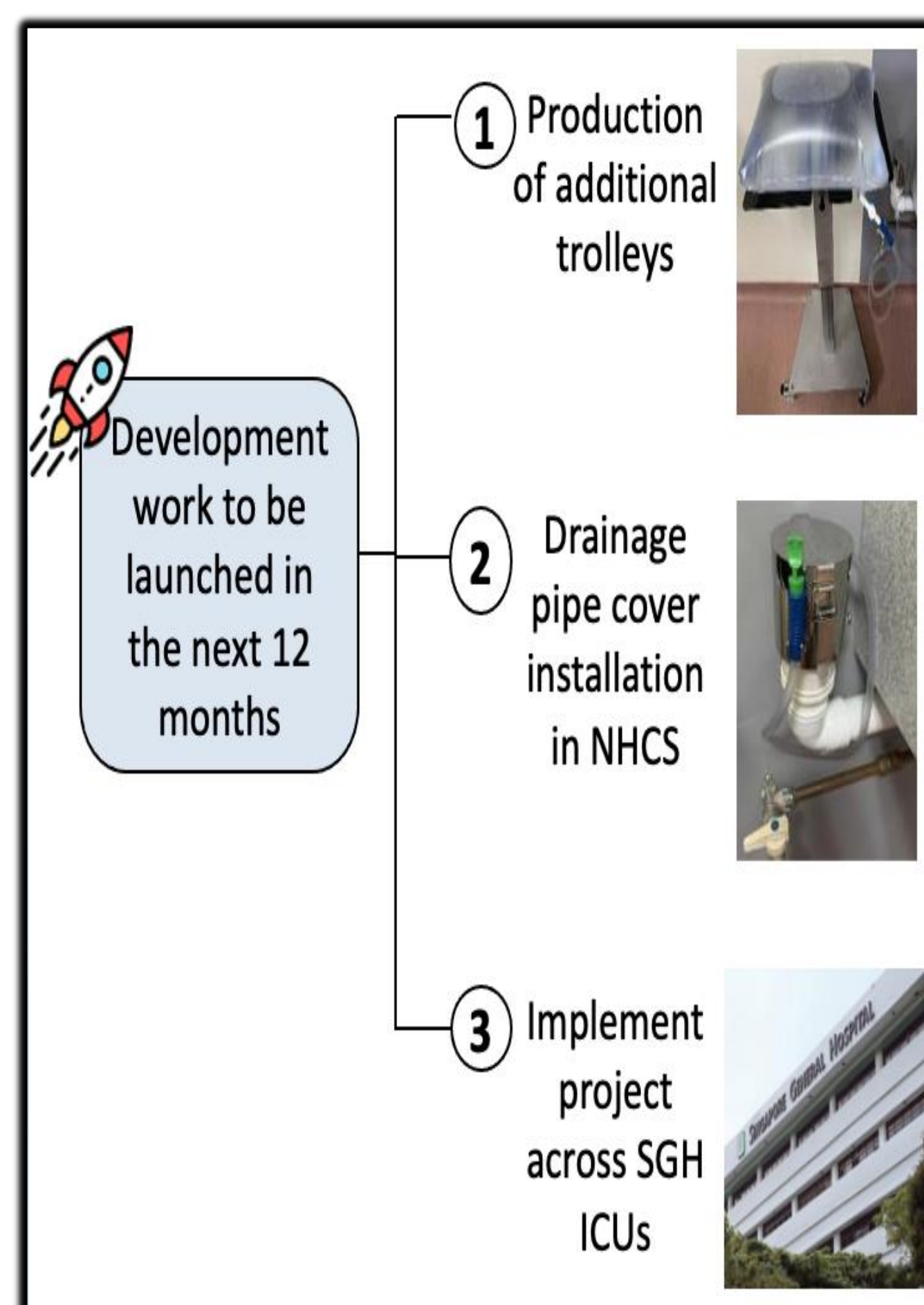
✓ 60% overall reduction in time spent on changing effluent bag

★ 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 customised 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.