NOTES FROM THE FIELD

Sterilization of gowns: making the most of a scarce commodity during the COVID-19 pandemic

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Baylor Clinic in Mbabane, Eswatini, convened a crisis meeting to tackle critical shortages of long-sleeved disposable gowns that resulted from COVID-19 pandemic constraints on available personal protective equipment (PPE). A strategy deemed safe, affordable and sustainable was adopted to autoclave and re-use gowns based on a risk-stratified approach. Key objectives were to ensure essential infection control and prevention (ICP) for medical doctors, nurses, and laboratory teams. Administrative, environmental and personal protective measures for ICP were enhanced through regular staff training. This strategy for gown re-use has been invaluable in motivating responsible stewardship and maximization of available gowns during the COVID-19 pandemic.

The advent of coronavirus disease (COVID-19) globally lead to a sudden surge in demand of personal protective equipment within the health system and among other essential service providers globally. The availability of personal protective equipment (PPE) such as gloves, facemasks, respirators, goggles, face shields, and gowns required to control the spread of COVID-19 within the healthcare systems suddenly became scarce, with prices skyrocketing and hoarding by health care institutions becoming the norm.¹ Global supply could not meet the rapid demand for PPE. This problem was compounded by increased shipping costs and freight limitations due to flight restrictions across continents. Resource-constrained settings globally were the hardest hit by this deficit, as numerous countries tackled the exponential phase of the pandemic.²

Eswatini, a low-middle income country with a population of 1.2 million, declared a COVID-19 State of Emergency on March 17, 2020. Since then, the Eswatini Ministry of Health has reported 18,570 confirmed cases, 673 deaths and a COVID-19 case-fatality ratio 3.6%.^{3,4} A total of 35,227 people have been vaccinated to date.^{3,4} Baylor-Eswatini is a non-governmental organization that provides specialized outpatient health care services to 5,410 children and their adult caregivers living with TB-HIV at three clinic sites. The median age of patients is 18.5 years (IQR 12.5–29.7). It has a staff compliment of 19 clinical frontline personnel (doctors, nurses, social workers, pharmacists, and laboratory personnel), who provide direct patient care and COVID-19 testing services. The Baylor-Eswatini

Infection Control and Prevention (BE-ICP) team conducted a risk assessment in line with COVID-19 guidelines for preventing transmission.⁵ A standard operating procedure (SOP) for autoclaving disposable gowns was developed and implemented according to WHO recommendations for rational use of PPE.⁶

ASPECT OF INTEREST

A trained health care worker (HCW) wearing PPE prepared the used disposable gowns for autoclaving. Torn or visibly soiled gowns were discarded. Selected gowns were inspected for intactness, folded, packaged into an autoclave envelop, labeled and sealed using heat-sensitive autoclave tape. The label denoted the user name, pack contents, autoclave date, time and Baylor Clinic site. The HCW would then doff the PPE used during the preparation of used gowns as per an established protocol. The packed gowns were subjected to gradual temperature increments under high pressure until a temperature of 121°C and pressure of 100 kPa (15 psi) was attained and sustained for 25–30 min.

Integrity test of sterility of autoclaved gowns was performed by checking for changes in the color of the autoclave tape that contained chemical indicator markings. The autoclave package was deemed safe for re-use if the autoclave tape developed brown diagonal stripes after autoclaving. Disposable gowns were autoclaved and re-used twice before disposing. Quality assurance was maintained through increased training frequency from monthly to weekly, weekly risk assessments, root cause analysis and implementation of constantly revised measures to improve safety. All departments ensured conformity to policies related to infection transmission at workplaces. We conducted weekly staff trainings with demonstrations of donning and doffing procedures for gowns.

During the period from March 2020 to March 2021, we autoclaved approximately 40 gowns each week; a total of 552 long-sleeved disposable gowns were autoclaved and re-used for two cycles. The quality and integrity of these gowns did not change after two cycles of autoclaving. The re-use of autoclaved gowns helped conserve the limited stock at all Baylor Clinic sites during the COVID-19 pandemic, allowing for continuity of service delivery.

The study did not require ethics approval, as this was a description of program successes, and was covered under the internal audit protocol.

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KEY WORDS

autoclave; disposable long-sleeved gowns; COVID-19 pandemic

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DISCUSSION

There is limited literature regarding the feasibility of autoclaving and re-using previously used disposable gowns. In our setting, during a period of unprecedented PPE shortage, autoclaving and re-using disposable gowns were feasible, and extended available stock in an affordable, sustainable, safe, and acceptable manner. In low-resource settings such as Eswatini, there are gaps in implementation and monitoring of existing ICP protocols in addition to PPE stock outs.^{7,8} The safety of the autoclaving protocol was ensured by monitoring compliance among users and through continuous review and adjustments by the ICP team on a weekly basis. This strategy was crucial in Eswatini, where 58% of the COVID-19 cases were asymptomatic, at a high-volume health facility that caters for over 40% of the HIV-positive pediatric population in the country. We utilized grant funding coupled with nonpareil use of scarce resources to ensure patient and staff safety as well as continuity of essential health service provision to our clients during the COVID-19 pandemic.

Autoclaving is well recognized as an effective means to decontaminate viruses, microbes and spores that are hard to destroy using conventional disinfectants. Despite limited evidence regarding the effectiveness of autoclaving disposable gowns, HCWs were able to continue working while maintaining infection control at all workstations in our clinics. We successfully autoclaved gowns made of hydrophobic, microfilaments, woven and embedded polyester fabrics. However, autoclaving could not be used for gowns made of plastic resin because they shrunk and melted. A combination of biological indicators and heat-sensitive tape is recommended for validating sterilization; the requisite reagents were not available in our setting. Furthermore, guidelines recommend that autoclaved material be evaluated for sterility in culture

laboratories on a quarterly basis for quality assurance and control. This may pose an operational challenge in resource-constrained settings.

CONCLUSION

Autoclaving disposable gowns was a cost-effective technique that allowed our team to optimally utilize this scarce resource during a period of global stock-outs of PPE ensuring uninterrupted critical services delivery. Our healthcare providers recognized that autoclaving provided a safer method of gown re-use than the re-use of unsterilized gowns.

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La Baylor Clinic de Mbabane, Eswatini, a convoqué une réunion de crise pour remédier à la grave pénurie de blouses jetables à manches longues due au manque d'équipements de protection individuelle (PPE) lié à la pandémie de COVID-19. Une stratégie jugée sûre, abordable et durable a été adoptée pour stériliser par autoclave et réutiliser les blouses en prenant appui sur une approche stratifiée des risques. Les objectifs clés étaient de garantir la prévention et le

contrôle des infections (ICP) pour les médecins, les infirmiers et les équipes de laboratoire. Les mesures ICP d'ordre administratif, environnemental et de protection individuelle ont été renforcées par le biais de formations régulières du personnel. Cette stratégie de réutilisation des blouses a permis de promouvoir une gestion responsable et de tirer au maximum profit des blouses disponibles pendant la pandémie de COVID-19.