Pharmacy Infection Control: Quality Perspective

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ABSTRACT
Objectives: This study aimed to declare the total quality management of infection control policy in pharmacy practice as a new initiative in Saudi Arabia. **Methods:** This is a narrative review of pharmacy infection control. The literature search was performed using various databases, including PubMed, Medline, and Google Scholar, about specific pharmacy practice infection control policies and procedures. The search period was from the 1960s until October 2021. The terms were in English and included narrative review, systemic review, meta-analysis, and guidelines across all hospitals and community pharmacy services. The national and international guidelines in hospital practice guide pharmacy infection control activities. The committee of pharmacy research formulated and consisted of various experts, including clinical pharmacists, drug information pharmacists, and infection control specialists. Some authors drafted the policy guidelines, and the others author reviewed and corrected them. An infection control specialist revised the final document. The study emphasizes the quality management of pharmacy infection control policies and procedures. **Results:** The quality management of the pharmacy infection control policy consisted of various items, including quality management steps in pharmacy infection control. The quality management of pharmacy infection control policy contained five models, namely, patient care, research skills, communication, professionalism, and continuous professional development. Each model has various activities, key performance indicators, and optimal targets per indicator. **Conclusion:** The quality management of pharmacy infection control policy is a new initiative aimed at improving the quality of care provided. The quality management of infection control policy is aimed to improve the efficiency of infection control in pharmaceutical care services at various locations in the public and healthcare organizations. Therefore, the quality management of infection control policy is highly recommended for pharmacy career professionals worldwide.
Keywords: Infection control, Policy, Pharmacy, Quality management, Saudi Arabia.

INTRODUCTION

For the past 20 years, the central quality management committee for healthcare organizations in the Makkah region has been well-established. Later on, the central committee became the Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI). The CBAHI recommends basic standards for healthcare institutions, updated in 2015.[1] The standards covered all healthcare departments and sections, including medical, nursing, surgical, radiology, pharmacy, and laboratories.[1] The CBAHI provides guidelines for implementing the standards across all hospitals and primary healthcare centers. If the healthcare organizations pass the minimum implementation scores, then the CBAHI gives them full or partial accreditation. The accreditation period is for 1–3 years, after which the CBAHI staff regularly revisits the healthcare organization for follow-up and reaccreditation. All healthcare organizations should set up quality management measures for each healthcare section, department, or program and set up key performance indicators. The new initiative program of pharmacy infection control demands quality management measures or tools which need to be followed for the performance and improvement of pharmacy infection activities. Various studies have discussed the quality management indicators of infection control programs.[2-4] However, studies regarding the quality management of pharmacy infection

control are scarce so far. To the best of our knowledge, there are no studies on the current topic in Saudi Arabia, the Middle East, or the rest of the world. Therefore, in this review, we aimed to explore the quality management indicators for pharmacy infection control.

MATERIALS AND METHODS

This is a narrative review of pharmacy infection control. The literature search was performed from various databases, including PubMed, Medline, and Google Scholar, about specific topics related to infection control in pharmacy practice. The search period was from the 1960s until October 2021. The terms were in English and included narrative review, systemic review, meta-analysis, and guidelines. Policies of the last ten years were searched across all hospitals or community pharmacies. The pharmacy services in the search included inpatient, outpatient, and ambulatory care pharmacy, satellite pharmacy, extemporaneous preparation unit, repackaging unit, pharmacy store, drug information center, and clinical pharmacy services. The national and international guidelines of infection control in hospital practice[5-6] include the Centers for Disease Control and Prevention (CDC) of the United States of America, the Saudi Center for Diseases Control (SCDC), American Society of Health-System Pharmacist (ASHP), World Health Organization (WHO), and the United

States Pharmacopeia (USP) as guiding of pharmacy infection control practice. Besides, the CBAHI quality management standards.[7-20] The committee of pharmacy infection control consists of various members, including clinical pharmacists, community pharmacists, and infection control specialists. Some authors drafted the policy guidelines, and others reviewed and corrected them. The third revision, which is an infection control specialist, revised. The policy included topics such as environmental and workplace, staff immunization and occupational safety, pharmacy basic hygiene, quality management of pharmacy infection control, competency of pharmacy infection control, and education and training of pharmacy infection control. The international Appraisal of Guidelines, Research, and Evaluation (AGREE) standard guided the reporting of the results of this study.[21] The current topic emphasized the total quality management of pharmacy infection control practices

Search: **pharmacy infection control[Title/Abstract]** Filters: **Full text, Humans, English**

(("pharmacie"[All Fields] OR "pharmacies"[MeSH Terms] OR "pharmacies"[All Fields] OR "pharmacy"[MeSH Terms] OR "pharmacy"[All Fields] OR "pharmacy s"[All Fields]) AND "infection control"[Title/Abstract]) AND ((fft[Filter]) AND (humans[Filter]) AND (English[Filter]))

Translations

pharmacy: "pharmacie"[All Fields] OR "pharmacies"[MeSH Terms] OR "pharmacies"[All Fields] OR "pharmacy"[MeSH Terms] OR "pharmacy"[All Fields] OR "pharmacy's"[All Fields]

Search: **infection control pharmacy[Title/Abstract]** Filters: **Full text, Humans, English**

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infection: "infect"[All Fields] OR "infectability"[All Fields] OR "infectable"[All Fields] OR "infectant"[All Fields] OR "infectants"[All Fields] OR "infected"[All Fields] OR "infecteds"[All Fields] OR "infectibility"[All Fields] OR "infectible"[All Fields] OR "infecting"[All Fields] OR "infection's"[All Fields] OR "infections"[MeSH Terms] OR "infections"[All Fields] OR "infection"[All Fields] OR "infective"[All Fields] OR "infectiveness"[All Fields] OR "infectives"[All Fields] OR "infectivities"[All Fields] OR "infects"[All Fields] OR "pathogenicity"[MeSH Subheading] OR "pathogenicity"[All Fields] OR "infectivity"[All Fields]

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Search: **pharmacy infection prevention[Title/Abstract]** Filters: **Full text, Humans, English**

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Search: **pharmaceutical care infection control[Title/Abstract]** Filters: **Full text, Humans, English**

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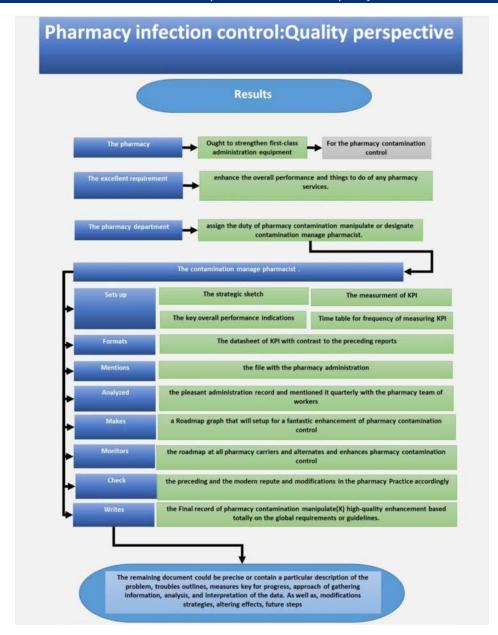
Figure 1: Follow chart of steps of total quality management for infection control pharmacy.

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Search: **infection control Saudi Arabia[Title]** Filters: **Full text, Humans, English**
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"saudi arabia"[Title]) AND ((fft[Filter]) AND (humans[Filter]) AND (English[Filter]))

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infection control: "infection control"[MeSH Terms] OR ("infection"[All Fields] AND "control"[All Fields]) OR "infection control"[All Fields]
Search: **Infection control quality pharmacy[Title/Abstract]** Filters: **Full text, Humans, English**
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Translations

Infection control: "infection control"[MeSH Terms] OR ("infection"[All Fields] AND "control"[All Fields]) OR "infection control"[All Fields]
Search: **Infection control quality[Transliterated Title]**Filters: **Full text,**

Table 1: Quality management Checklist of pharmacy infection control program:[19-20,25,34]	
All healthcare providers must consider the following measures:	
A **Training**	**Check**
Hand hygiene practices	
Respiratory hygiene practices	
Use of personal protective equipment (PPE)	
Physical distancing guidelines	
Cleaning and disinfection practices	
Disease symptoms, procedures to be followed when a possible cause is identified, and guidelines for self-isolation	
Decontamination of medical devices and patient care equipment	
Injection safety	
Aseptic techniques	
Refresher training for all staff	
B **Infection prevention and control standards**	**Check**
Consider appointing a person responsible for the infection Prevention and control standards (IPC)	
Procedures for the prevention and management must be improved and made accessible to the staff.	
A tool to update procedures following the latest recommendations/evidence and inform all staff about the update.	
Consider installing glass or plastic panels; if not possible, use face shields/visors.	
Physical distance must be maintained between healthcare providers and patients. (signings on the ground to indicate the distance can be considered)	
Hand hygiene must be repeated regularly.	
There is the availability of hand-washing facilities, single-use paper towels, and alcohol-based hand rub solutions.	
How to perform, posters on hand hygiene should be available and visible	
All protection standers depending on particular situations should be followed and updated	
PPE must be available in adequate quantities and sizes.	
Commonly touched surfaces must be regularly cleaned with a neutral detergent	
Increasing the number of air exchanges per hour will reduce the opportunity for transmission in closed spaces.	
Staff immunization	
C **Staffing and workplace considerations**	**Check**
Implement a needs assessment based on the IPC standards outlined above.	
The plan must be adjusted to deal with work overload, anticipating possible sick leaves.	
In a unique situation, staff presenting with symptoms should not come to work, self-isolate at home, and be encouraged to contact health authorities	
A device to organize and assign teleworking must be considered, along with a mechanism to give staff the necessary facilities to carry out their normal workload remotely.	
The initiation or revision of methods to diminish physical contact with patients/customers – without compromising the quality of the provided services – should be considered.	
Data gathered and stored should be compliant with the General Data Protection Regulation	
A system to keep track of key supplies	
If feasible, materials, objects, and devices must be stored in a manner that promotes additional environmental cleaning.	
D **Documentation**	**Check**
Name of device, sterilizer number, and the date of sterilization.	
A detailed list of sterilizer load contents.	
Date, time, and results of all tests performed	
Verification shall be documented	
If any indicator fails, the failure shall be investigated. The investigation shall be documented.	
Management roles and responsibilities	
Resources	
Staff training, education, and competency assessments	
National compliance and Reporting Systems: Adverse events/Incident reports, Standards and best practices, Reprocessing cycle management: Policies and standard operating procedures (SOPS), Test/monitoring results, e.g., cleaning efficacy, results for sterilization, and equipment maintenance.	

Figure 2: The five-step cycle to Pharmacy infection prevention and control improvement.[26-27]

No	Topic	Activity	Note	Target
Table 2: Key performance indicators of Pharmacy infection control Quality management.[7-20,25-34]				
1.	Patients care	Radom sample of test product for micro biology test per each pharmacy section per month	Number of sample positive/number of sample	Zero
		Radom sample of patients to check adults and pediatrics immunization	Total number of pediatrics adherence/total sample patients	100%
			Total number of adults adherence/total sample patients	100%
		Radom samples of infected patients at healthcare organizations and test their medications	Number of sample positive/number of medications	Zero
		Check the vaccine stock of out of stock, overstock, understock, and expired stock	Number of out stock / total stock	Zero
			Number overstock / total stock	Zero
			Number of understocks / total stock	Zero
			Number of expired stock/ total stock	Zero
2.	Infection control skills	Radom sample of pharmacy staff of hand hygiene	Number of hand hygiene actions of pharmacy staff/ Number of hand hygiene opportunities	100%
		A random sample of pharmacy staff full applied PPE	Number of pharmacy staff adherence/total number of pharmacy staff sample	100%
		Number of needle-stick injuries	Number of needle-stick injuries per month	100%
		A random sample of pharmacy staff immunization (vaccine-preventable diseases, as per the policy of the healthcare facility).	The number of pharmacists that had complete immunization/ total number of pharmacy staff samples	100%
		Tuberculin Skin Test (TST)/ Purified Protein Derivative (PPD) Skin test (to detect latent tuberculosis among healthcare workers of the pharmacy)	Annual PPD conversion rate	For all pharmacy healthcare workers (100%)
		Random visit of pharmaceutical wastage and follow-up once a month.	The number of pharmaceutical wastage adheres to the guidelines/Total number of pharmaceutical wastage	Zero
		Radom check of spill kit (chemical) contented and documentation quarterly	Complete material Complete documentation No expired material	100%
		Radom check of spill kit (biological) contented and documentation quarterly	Complete material Complete documentation No expired material	100%
		Number of infection control material problems (disinfectant and sanitizers-vaccines-spill kit materials)	Number of adverse drug reaction/ number of utilizations or prescriptions	Zero
		Number of infection control material problems (disinfectant and sanitizers-vaccines-spill kit materials)	Number of medication errors/ number of utilizations or prescriptions	Zero
		Number of infection control material problems (disinfectant and sanitizers-vaccines-spill kit materials)	Number of medication errors/ number of material	Zero
		Monitor and document the outcome of pharmacy infection control	Number of test positive infected pharmacy products	Zero
			Number of patients who test positive	Zero

continued

No	Topic	Activity	Note	Target
Table 2: Cont'd.				
3.	Communication	Monitor the number of educational lectures and number of attendees	Number of educational lectures for pharmacy staff and healthcare professionals quarterly	100%
			Number of attendees of pharmacy staff and healthcare professionals per each lecture quarterly	100%
4.	Professionalism	Respect and share with the healthcare worker on infection control / Cooperate with all healthcare organizations to implement pharmacy infection control guidelines	Quarterly survey	100%
5.	Continuous development	Update the pharmacy infection control annually		Documentation
		Present the annual plan of pharmacy infection control		Documentation
		Monitor the educational posters and stands for pharmacy infection prevention at each pharmacy service	Number of an existed educational posters on pharmacy infection control/ total number of education posters	100%
			Number of an existed educational stands of pharmacy infection control/ total number of educational stands	100%
			Number of pharmacy infection control references and availabilities at each pharmacy unit and healthcare department	100%
		Take a sample of existing references pharmacy units and hospitals.	Number of available references/ total references available units	100%

Humans, English
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Search: **Infection control quality[Title]**Filters: **Full text, Humans, English**
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RESULTS

1. The pharmacy department should follow the steps of implementations of total quality management entirely pharmacy infection control as explored in Figure 1
2. The pharmacy department should develop quality management standards and tools for pharmacy infection control, as suggested in Table 1.
3. The quality standards should improve the performance and activities of any pharmacy services, as addressed in Figure 2
4. The pharmacy department should designate an infection control pharmacist to check pharmacy contamination.
5. The infection control pharmacist should set up a strategic quality management plan for pharmacy infection control enhancement.
6. The infection control pharmacist sets up the key performance indicators for each aspect of care or part of pharmacy infection control competency, as explored in Table 2.
7. The infection control pharmacist set up the measurements of

key performance indicators primarily based on percentages and achieved documentation as appropriate.
8. The infection control pharmacist should prepare a timetable to record the frequency of measuring key performance indicators monthly, quarterly or yearly.
9. The infection control pharmacist should format the quarterly reports of key performance indicators compared to the preceding reports.
10. The infection control pharmacist should discuss the report of quality management of infection control pharmacy with the pharmacy administration.
11. The infection control pharmacist should quarterly present the pharmacy infection control quality management analysis with the pharmacy team of workers.
12. The infection control pharmacist should make the pathway and roadmap strategies for improvement and implantation of pharmacy infection control
13. The infection control pharmacist should monitor the roadmap at all pharmacy carriers and alternate and enhance pharmacy contamination control.
14. The infection control pharmacist checks the preceding and the modern repute and modifications in the pharmacy practice accordingly.
15. The infection control pharmacist writes the final record of pharmacy infection control high-quality enhancement based totally on the global requirements or guidelines. The entire document should be a precise or particular description of the problem, troubles outlines, measures key for progress, approach of gathering information, analysis, and interpretation of the data. Besides the modifications strategies, altering effects, and future steps.[22-24]

CONCLUSION

The pharmacy infection quality management policy and procedures are required for contamination management gadgets in pharmaceutical care services. It is the basis of evaluation and dimension of a fine of pharmacy exercise pharmacy infection control. The pharmacy infection control quality improvement is required to ensure patient safety, prevent pharmaceutical products contaminations, manage the outcome, and keep away from any unnecessary financial burden on the healthcare system. Therefore, the total quality management of pharmacy infection control emphasizing policy and procedures are encouraged implement in Saudi Arabia.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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None

Consent for Publications
It is not applicable in this review

Ethical Approval
This research is exempted from research and ethical committee or an institutional review board (IRB) approval.
https://www.hhs.gov/ohrp/regulations-and-policy/decision-charts-2018/index.html

ABBREVIATIONS

CBAHI: Saudi Central Board for Accreditation of Healthcare Institutions; **CDC:** Centers for Disease Control and Prevention of the United States of America; **SCDC:** Saudi Center for Diseases Control; **ASHP:** American Society of Health-System Pharmacists; **WHO:** World Health Organization; **UPS:** United States Pharmacopeia; **AGREE:** Appraisal of Guidelines, Research, and Evaluation; **PPE:** Personal Protective Equipment; **IPC:** Infection Prevention and control; **SOPS:** Policies and standard operating procedures.

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REFERENCES

1. Saudi Central Board for Accreditation of Healthcare Institutions. National hospital standards. Third edit. Saudi Central Board for Accreditation of Healthcare Institutions; 2016.
2. Balachander B, Rajesh D, Pinhero CL, Paul S, Stevens S, Rao S. Response measures to infection outbreaks during the second year of sustenance phase of infection control quality improvement. Indian J Pediatr. 2020;87(5):333-8. doi: 10.1007/s12098-020-03201-6, PMID 32036600.
3. Steelman VM. Infection control. Quality assessment, improvement. AORN J. 1994;59(2):476-82. doi: 10.1016/s0001-2092(07)70412-x, PMID 8147595.
4. Bradford M, Flynn NM. Ambulatory care infection control quality assurance monitoring. Am J Infect Control. 1988;16(1):21A-8A. doi: 10.1016/0196-6553(88)90016-8, PMID 3369744.
5. Alomi YA, Alyousef AM. Infection control pharmacist: A New Initiative Project in The Kingdom of Saudi Arabia. PTB Reports. 2021;7(2):40-3. doi: 10.5530/PTB.2021.7.8.
6. Alomi YA, Abdullah Hakami LE, Yahya Khayat NA, Bamagaus YA, Rafuden Bakhsh

TM, Adnan Khayat N, *et al.* Mass gathering (hajj) pharmacy infection control: New initiative in Saudi Arabia. IJPCS. 2020;9(1):5-9. doi: 10.5530/ijpcs.2020.9.2.
7. Kastango ES, American Society of Health-System Pharmacists (ASHP). Blueprint for implementing USP chapter 797 for compounding sterile preparations. Am J Health Syst Pharm. 2005;62(12):1271-88. doi: 10.1093/ajhp/62.12.1271, PMID 15947127.
8. United States Pharmacopeia, General Chapter USP <800> Hazardous Drugs-Handling in Healthcare Settings. The United States pharmacopeial convention. 2017. p. 1-20.
9. Al Knawy B, Khoja T, Balkhy H, Pittet D. GCC Infection control manual; 2013. p. 1-324.
10. Ontario Agency for Health Protection, Promotion, Provincial Infectious Diseases Advisory Committee. Best practices for infection prevention and control programs in all health care settings. Public health Ontario; 2012. 87 p.
11. US Department of Health and Human Services, Centers for Disease Control and Prevention. Infection control in healthcare personnel: Infrastructure and routine practices for occupational infection prevention and control services recommendations only. p. 1-8; 2019. Available from: https://www.cdc.gov/infectioncontrol/pdf/guidelines/infection-control-HCP-recommendations-only-H.pdf [cited 16/6/2022].
12. WHO. Infection Prevention and Control Assessment Framework at the Facility Level Introduction and user instructions [internet]. Vol. 2016; 2018. Available from: http://www.who.int/infection-prevention/publications/core-com- [cited 16/6/2022].
13. Beattie M. A guide to infection control in the Hospital. Aust Infect Control. 2001. 102 p;6(3). doi: 10.1071/HI01102.
14. USP, General Chapter USP <795> Pharmaceutical Compounding – Nonsterile Preparations. USP 42-NF [internet]. p. 1-13; 2019. Available from: http://www.usp.org/compounding/general-chapter-795 [cited 16/6/2022]. In:.
15. Ontario: Provincial Infectious Diseases Advisory Committee. Public health Ontario. Best practices for cleaning, disinfection and sterilization of medical equipment/devices in all health care settings. 110 p.
16. Rutala WA, Weber DJ, Weinstein RA, Pearson ML. Guideline for disinfection and sterilization in healthcare facilities. Centers for Disease Control and Prevention (CDC). p. 2019; 2008 [internet]. Available from: http://www.cdc.gov/hicpac/Disinfection_Sterilization/10_0MiscAgents.html [cited 16/6/2022].
17. Update L. Manag Health Care Workers Who Had Contacts Patients COVID. 2020;19 infection.
18. World Health Organization (WHO). Rational use of personal protective equipment for coronavirus disease (COVID-19) and considerations during severe shortages [internet]. World Health Organization. Vol. 2019; 2020. Available from: https://apps.who.int/iris/bitstream/handle/10665/331695/WHO-2019-nCov-IPC_PPE_use-2020.3-eng.pdf [cited 16/6/2022].
19. World Health Organization (WHO). Hand hygiene technical reference manual [internet]. Geneva: WHO; 2009. Available from: http://whqlibdoc.who.int/publications/2009/9789241598606_eng.pdf [cited 16/6/2022].
20. Ministery of health. Employee Health Program. Policy Press 2018.
21. Brouwers MC, Kerkvliet K, Spithoff K, AGREE Next Steps Consortium. The AGREE reporting checklist: A tool to improve reporting of clinical practice guidelines. BMJ. 2016;352:i1152. doi: 10.1136/bmj.i1152, PMID 26957104.
22. Ogrinc G, Davies L, Goodman D, Batalden P, Davidoff F, Stevens D. SQUIRE 2.0 (Standards for QUality Improvement Reporting Excellence): Revised publication guidelines from a detailed consensus process. BMJ Qual Saf. 2016;25(12):986-92. doi: 10.1136/bmjqs-2015-004411, PMID 26369893.
23. Ogrinc G, Davies L, Goodman D, Batalden P, Davidoff F, Stevens D. SQUIRE 2.0 (standards for QUality improvement reporting excellence): Revised publication guidelines from a detailed consensus process. Am J Med Qual. 2015;30(6):543-9. doi: 10.1177/1062860615605176, PMID 26497490.
24. Moss F, Thompson R. A new structure for quality improvement reports. Qual Health Care. 1999;8(2):76. doi: 10.1136/qshc.8.2.76, PMID 10557680.
25. COVID ECDC. 19 infection prevention and control for primary care, including general practitioner practices, dental clinics and pharmacy settings. Eur Cent Dis Prev Control. 2020.
26. WHO. Minimum Requirements for infection prevention and control programmes (The starting point for implementing the World Health Organization core components of infection prevention and control programmes at the national and health care facility level). World Heal Organ. 2019.
27. WHO. Improving Infection Prevention and Controlat the Health Facility (Interim practical manual supporting implementation of the WHO Guidelines on Core Components of InfectionPrevention and Control Programmes). World Heal Organ. 2018.
28. Bearman G, Munoz-Price S, Morgan DJ, Murthy RK, editors. Springer. J Infect Prev. 2018.
29. ECDC. Assessment of infection control, hospital hygiene capacity and training needs in theEuropean Union. Eur Cent Dis Prev Control. 2014.

30. (PIDAC) PIDAC. Best practices for cleaning, disinfection and sterilization of medical equipment/devices in all health care settings. 3rd ed. Public Heal Ontario; 2013.

31. Sydnor ER, Perl TM. Hospital Epidemiology and infection control in acute-care settings. Clin Microbiol Rev. 2011;24(1):141-73. doi: 10.1128/CMR.00027-10, PMID 21233510.

32. WHO. Hand Hygiene Technical Reference Manual (To be used by health-care workers, trainers and observers of hand hygiene practices). World Heal Organ. 2009.

33. Health BCM of. Best Practice Guidelines for cleaning, Disinfection and sterilization of critical and semi-critical Medical Devices. BC Minist Heal. 2007.

34. Chang Y, Lin C, Tsai M, Hung C, Hsu C, Lu P *et al*. Infection control measures of a Taiwanese hospital to confront the COVID -19 pandemic. Kaohsiung J Med Sci. 2020;36(5):296-304. doi: 10.1002/kjm2.12228.