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Evaluasi Audit Hand Hygiene dalam Mencegah Healthcare-Associated Infections di RSU Haji Surabaya Tahun 2020

Evaluation Of Hand Hygiene Audit In Preventing Healthcare-Associated Infections at Haji Hospital Surabaya in 2020

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ABSTRAK

Latar Belakang: *Hand hygiene* (HH) merupakan salah satu cara yang digunakan untuk mencegah penyebaran infeksi terkait pelayanan kesehatan. Audit *hand hygiene* digunakan untuk menilai kepatuhan *hand hygiene*. Kepatuhan *hand hygiene* di Rumah Sakit Haji Surabaya pada tahun 2020 mengalami peningkatan yang signifikan sebesar 93,65% dibandingkan tahun sebelumnya. Hal ini tidak sesuai dengan angka kepatuhan pelaporan audit yang mengalami penurunan sebesar 77,5% dari tahun sebelumnya.
Tujuan: Penelitian ini bertujuan untuk mengevaluasi pelaporan audit kepatuhan *hand hygiene* sebagai upaya pencegahan HAIs di RS Haji Surabaya.
Metode: Penelitian ini merupakan penelitian deskriptif dalam bentuk studi evaluasi berdasarkan pendekatan sistem (input, proses, output) menggunakan data sekunder laporan audit kepatuhan *hand hygiene* Rumah Sakit Haji Surabaya tahun 2020. Pengumpulan data diperoleh dari wawancara mendalam dengan Komite Pencegahan dan Pengendalian Infeksi (PPI) dan IPCLN (*Infection Prevention and Control Link Nurse*) di RS Haji Surabaya. Data dianalisis dengan membandingkan dan mendeskripsikan target dan capaian laporan audit kepatuhan *hand hygiene.*
Hasil: Hasil penelitian ini menunjukkan bahwa berdasarkan komponen input, fasilitas sudah tersedia dengan baik, sedangkan SOP terkait penggunaan aplikasi *healthy plus* dan jumlah IPCLN belum terpenuhi. Berdasarkan komponen proses, pengumpulan data sudah sesuai dengan pedoman WHO tahun 2009, sedangkan pengolahan data, analisis data, pelaporan data belum belum sesuai. Berdasarkan kompenen output, angka kepatuhan *hand hygiene* berdasarkan waktu, tempat, dan orang telah dilaporkan sesuai dengan pedoman WHO tahun 2009 dan telah mencapai target yang ditentukan, sedangkan ketepatan pelaporan mengalami penurunan dan masih jauh dari target yang diharapkan.
Kesimpulan: Ketepatan pelaporan audit kepatuhan *hand hygiene* di rumah sakit haji Surabaya masih belum baik, sehingga disarankan untuk membuat SOP terkait dengan penggunaan aplikasi *healthy plus*, mengatur jam kerja IPCLN, dan memperbaiki sistem pada aplikasi *healthy plus* khususnya pada item penilaian hand hygiene yang tidak terinstal di dalam komputer setiap ruangan di rumah sakit.

Kata kunci: Audit, infeksi terkait pelayanan kesehatan, kebersihan tangan, pelaporan

ABSTRACT

Background: *Hand hygiene (HH) is one method used to prevent the spread of Healthcare-Associated Infections. Hand hygiene audits were used to assess hand hygiene compliance. Hand hygiene compliance at the Haij Hospital Surabaya in 2020 experienced a significant increase of 93.65% compared to the previous year. This is not in accordance with the number of audit reporting compliance which decreased by 77.5% from the previous year.*

Objectives: *This study aims to evaluate the reporting of hand hygiene compliance audits as an effort to prevent HAI in Haji Hospital Surabaya.*

Methods: *This research was a descriptive research in the form of evaluation studies based on system approaches (inputs, processes, outputs) using secondary data of the audit report on hand hygiene compliance of*

Haji Hospital Surabaya in 2020. Data collection obtained from in-depth interviews with the Prevention and Control Committee (IPC) and the IPCLN (Infection Prevention and Control Link Nurse) at Haji Hospital Surabaya. The data were analyzed by comparing and describing the targets and achievements of hand hygiene compliance audit report.

Results: *The results of this study showed that based on input components, facilities are well available, while SPO related to the use of Healthy Plus applications and the number of IPCLN has not fulfilled. Based on the process component, data collection is in accordance with WHO guidelines in 2009, while data processing, data analysis, data reporting haven't been appropriate. Based on the output complement, hand hygiene compliance figures based on time, place, and person have been reported in accordance with WHO guidelines in 2009 and have reached the specified target, while the accuracy of reporting has decreased and is still far from the expected target.*

Conclusions: *The accuracy of hand hygiene compliance audit reporting in Surabaya hajj hospitals is still not good, so it is recommended to make SPO related to the use of healthy plus applications, regulate IPCLN working hours, and improve the system on healthy plus applications, especially on hand hygiene assessment items that are not installed in the computer of every room in the hospital.*

Keywords: *audit, healthcare-associated infections, hand hygiene, reporting*

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INTRODUCTION

Healthcare-Associated Infections (HAIs) are infections that occur while receiving treatment in hospitals or other health facilities (Alemu *et al.*, 2020). The condition can first appear 48 hours or more after hospital admission, or within 30 days after receiving health care (Haque *et al.*, 2018). Healthcare-Associated Infections can cause material harm namely increased treatment time to cause long-term disability (Mitchell, 2017). In addition, it may increase antibiotic resistance from HAI pathogens (Caselli *et al.*, 2018).

The most common way of transmitting infection is through contaminated hands (Haverstick *et al.*, 2017). Infection-causing organisms can be carried away when doctors, nurses, and other health workers when providing treatment directly to patients (Nasution *et al.*, 2019). This is by following the results of the study mentioned that there is a significant relationship between hand hygiene compliance and HAIs incidence rate in clinical areas (Ragusa *et al.*, 2018).

Hand hygiene (HH) is the main step to prevent infections obtained from health service and the spread of resistant bacteria (Quilab *et al.*, 2019). Hand hygiene can be done by hand rub that is by antiseptic liquid or by handwashing by using soap and running water (Alzahrani *et al.*, 2018). There are five moments or five critical times to perform hand hygiene, namely: 1) before contact with the patient, 2) before aseptic action, 3) after aseptic action, 4) after contact with the patient, and 5) after leaving the patient's environment (WHO, 2009).

Poor adherence to hand hygiene practices remains a challenge for Infection Prevention and Control (IPC) committees around the world (Pittet, 2017). RSU Haji Surabaya has many committees that are in charge of their fields, one of which is the IPC committee. The program of the IPC committee is to protect patients, officers, visitors, and families from the risk of contracting HAIs by applying Standard Operating Procedures (SOP) in every action performed by medical personnel in hospitals (Nurani and Hidajah, 2017).

Audit and feedback are some of the strategies used to improve hand hygiene compliance in health workers (Livorsi *et al.*, 2018). Data obtained from hand hygiene compliance audits are used by IPC committees to track the success of interventions or identify units that have problems or have not reached the target (Masroor *et al.*, 2017). In the modern era, application-based electronic monitoring systems can make it easier to monitor the performance of health workers (Pong, Holliday and Fernie, 2018).

Infection Prevention and Control Committee (IPC) of Haji Hospital Surabaya has developed an innovation in terms of reporting application-based hand hygiene audits called healthy plus application. Where items available on the application adapt from WHO 2009 guidelines related to 5 moments hand hygiene (WHO, 2009). A well-reported hand hygiene compliance audit can be used to make policies to prevent HAI at Haji Hospital Surabaya. This study aims to evaluate the reporting of hand hygiene compliance audits as an effort to prevent HAI at Haji Hospital Surabaya.

METHOD

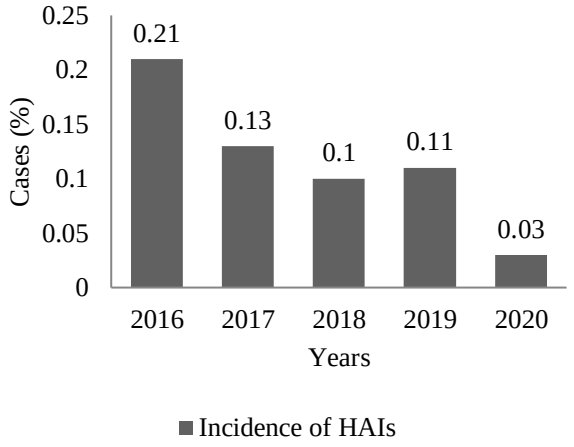
This type of research is descriptive research in the form of evaluation studies. Evaluation research conducted using approaches (inputs, processes, outputs). The subject of this study is IPCLN compliance in collecting hand hygiene audit report every month in 2020. This study was conducted from January 18, 2021-February 26, 2021. Respondents to the study were Infection Prevention and Control Committee (IPC) and Infection Prevention and Control Link Nurse (IPCLN).

The data collection was conducted by in-depth interview method and document study using hand hygiene audit report in 2020 obtained from IPC committee of Haji Hospital Surabaya. Research instruments in the form of interview questionnaires that have passed the health research ethics requirements as proven by a letter issued by the Airlangga University, Faculty of Dental Medicine Health Research Ethical Clearence Commission, Number: 254 / HRECC.FODM / V / 2021. The variables studied are hand hygiene audit reporting activities using healthy plus applications at Surabaya Hajj hospitals in 2020. The obstacles faced in the implementation of hand hygiene audit reporting activities are also variables studied. The data is analyzed descriptively by comparing and describing the targets and achievements of hand hygiene compliance audit reports based on time, place, person variables.

RESULT AND DISCUSSION

Trend of HAI Incidence and Hand Hygiene Compliance at Haji Hospital Surabaya in 2016-2020

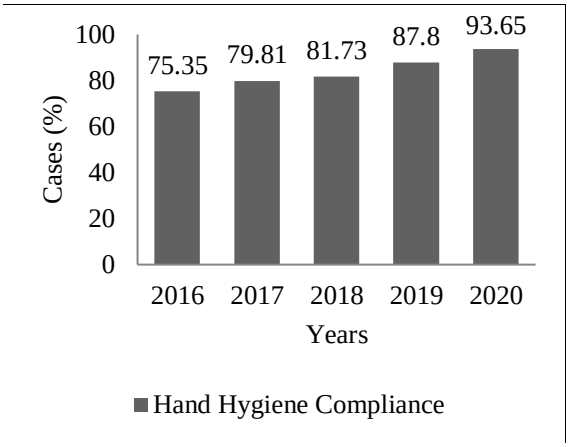
The incidence of healthcare-associated infections (HAIs) is a problem related to health care. The trend of the incidence of HAI in Haji Hospital Surabaya has decreased every year. The decrease in the incidence of HAI is in line with the increasing trend of hand hygiene compliance. Based on the research results, a significant increase in hand hygiene compliance and a decrease in the incidence of HAI at RSU Haji Surabaya significantly occurred in 2020. The results showed that the incidence of HAI in Haji Hospital Surabaya decreased from 2016 to 2020. The incidence rate of HAIs has met the quality standards set at <2%. This is shown in Figure 1.



Source: Haji Hospital Surabaya, 2020

Figure 1. Trend of HAI Incidence at Haji Hospital Surabaya in 2016-2020

The number of hand hygiene compliance in RSU Haji Surabaya increased from 2016 to 2020. It is known that the highest hand hygiene compliance rate will occur in 2020 at (93.65%). The figure has exceeded the target of (≥85%). This is shown in Figure 2.



Source: Haji Hospital Surabaya, 2020

Figure 2. Trend of Hand Hygiene Compliance at Haji Hospital Surabaya in 2016-2020

The research that conduct by Jabarpour et al (2021) that the incidence rate of nosocomial infections has decreased during the COVID-19 outbreak. The level of adherence to hand hygiene in hospitals in the US has increased from 46% to 56% at the start of the COVID-19 pandemic (Moore *et al.*, 2021). The results of another study stated that there was an increase in hand hygiene compliance by up to 100% of medical personnel in the pediatric unit during the COVID-19 pandemic (Wong *et al.*, 2020). Increased compliance with hand hygiene by medical personnel during the COVID-19 pandemic was carried out to protect themselves and prevent the spread of COVID-19 in hospitals. In addition to preventing the spread of COVID-19, this has an impact on reducing the incidence of nosocomial infections. One of the prevention of the incidence of nosocomial infection is also by applying compliance with hand hygiene (Sands and Aunger, 2020). Despite the COVID-19 pandemic. The trend of improving hand hygiene compliance is also happening in Kenya. The research that conduct by Ndegwa et al (2019) which examined related hand hygiene in three hospitals in Kenya, mentioned that two of the three hospitals studied showed a statistically significant trend of improvement in hand hygiene compliance.

Hand Hygiene Compliance by Wards at Haji Hospital Surabaya in 2020

Healthcare-Associated Infection (HAI) is an issue that concerns patient safety. The proportion of the incidence of HAI is most often found in the ICU. Patients who are undergoing treatment in the ICU are prone to infection because of a decrease in the patient's immune system caused by the severity of the disease (Despotovic *et al.*, 2020). Therefore, medical personnel who work in the ICU are more likely to practice hand hygiene than other rooms. Hand hygiene is one strategy to reduce the incidence of HAIs. However, an increase in the adherence to hand hygiene in the ICU cannot be fully associated with a decrease in the number of HAI (Abdo and Al-Fadhli, 2018). The study showed that the highest number of hand hygiene compliance based wards in 2020 are the outpatient units (OPD) and the ICU, respectively (98%). The lowest hand surveillance was found in the Emergency unit (84.27%). The number of hand hygiene for the emergency room still has not reached the minimum target of (85%). The hand hygiene by wards can be shown in Table 1.

Table 1. Hand Hygiene Compliance by Wards at Haji Hospital Surabaya in 2020

Wards	∑ Rub & Wash	∑ Opportunity	%
Inpatient Unit (IPU)	22,045	23,739	92.86
Outpatient Department (ODP)	12,028	12,270	98.03
Intensive Care Unit (ICU)	9,122	9,306	98.02
Emergency room	3,236	3,840	84.27
VIP room	5,352	5,760	92.92
Total	51,783	54,915	94.30

Source: Haji Hospital Surabaya, 2020

The highest number of room-based hand hygiene adherence in this study was the outpatient unit (ODP) and the ICU. Meanwhile, the room that has the lowest compliance is the emergency room. This is in line with the research that conduct by Abdraboh, Milaat, Ramadan, Al-sayes, & Bahy (2016) show that medical personnel working in the ICU area had better hand hygiene compliance than other rooms. The factor that causes the emergency room to have low hand hygiene compliance is a large number of patients served in the emergency room which causes health workers not to have time to wash their hands according to the procedure before and after taking action against the patient. This study is consistent with the research that conduct by (Shobowale,

Adegunle and Onyedibe, 2016) show that the room has the highest level of compliance with hand hygiene was the ICU unit.

Hand Hygiene Compliance by Personnel at Haji Hospital Surabaya in 2020

Nurses are medical personnel who have contact with patients more often compared to other medical personnel. Nurses who would perform surgery (pre-surgery) were 7.48 times more likely to wash their hands before contact with patients. This is done to avoid transmission of infection while in the operating room Infection-causing organisms can be carried away when doctors, nurses, and other health workers when providing treatment directly to patients (Nasution *et al.*, 2019). The study showed that the highest number of hand hygiene compliance based on profession or personnel in 2020 is a nurse (95.13%). The profession with the lowest number of hand hygiene compliance is other medical personnel (91.30%). The hand hygiene by wards can be shown in Table 2.

Table 2. Hand Hygiene Compliance by Personnel at Haji Hospital Surabaya in 2020

Wards	∑ Rub & Wash	∑ Opportunity	%
Nurse	34,118	35,866	95.13
Doctor	13,681	14,785	92.53
Other	14,701	16,102	91.30
Total	62,500	66,753	93.63

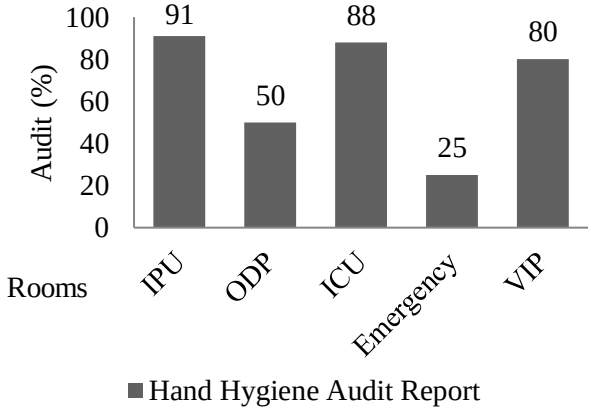
Source: Haji Hospital Surabaya, 2020

The highest number of hand hygiene compliance based on professions in this study was the nursing profession. This is in line with the research that conduct by Shobowale, Onyedibe, Adegunle, & Elikwu, (2017) which mentions that professions that have compliance figures for hand hygiene are the professions of nurses. These results are consistent with the research that conduct by Onyedibe et al (2020) in hospitals in Nigeria that states that nurses have higher hand hygiene compliance than doctors who are on duty at the hospital. The research that conduct by Phan et al (2018) that the nurse and midwives have higher knowledge of hand hygiene than other medical personnel. Basic training activities guided by the concept of five moments of hand hygiene developed by WHO (2009) can increase the knowledge of medical personnel in practicing the correct hand hygiene procedures before and after providing services.

Hand Hygiene Audit Report by Wards at Haji Hospital Surabaya in 2020

Monitoring activities obtained from the results of hand hygiene audits were used by the IPC Committee as evaluation materials to improve hand hygiene compliance. However, in collecting hand hygiene audits, there are still obstacles in reporting hand hygiene audits, one of which is the human resource factor and supporting facilities. Collecting hand hygiene audits in the era of the COVID-19 pandemic is a challenge for medical personnel because most of the resources are diverted to handle COVID-19 management (Stevens et al., 2020).

The results showed that there are still rooms that have not reported hand hygiene audits on time. The quality standard for reporting hand hygiene audits in the Haji Hospital Surabaya is (≥75%). The highest accuracy of hand hygiene audit reporting is inpatient room (IPU) (91%). While the room that has the lowest accuracy of hand hygiene audit reporting is the emergency room (25%). In addition, some rooms have not met the quality standards of accuracy in hand hygiene audit reporting is a outpatient department (ODP) (50%). This is shown in Figure 3.



Source: Haji Hospital Surabaya, 2020

Figure 3. Hand Hygiene Audit Report by Wards at Haji Hospital Surabaya in 2020

Figure 3 showed that not all rooms always submit reports every month. The accuracy of reporting is divided into three categories including: on time if the room collects a maximum hand hygiene audit on the 5th of each month. It is not timely if the room collects hand hygiene audits on the 6th – 10th of each month. Do not report if the room does not collect or collect hand hygiene audits beyond the 10th of each month. Evaluation related to the accuracy of hand hygiene compliance audit reporting can be seen in Table 3.

Table 3. Evaluation of hand hygiene compliance audit report using a systems approach (input, process, output)

Indicator	Information
Input	
SPO on using Healthy Plus Application	Not fulfilled because there is no SPO on how to use the healthy plus application
Human Resources	Not fulfilled because many IPCLNs were transferred to the covid-19 ward
Facilities	Fulfilled
Process	
Data Collection	Fulfilled
Data Processing	Not fulfilled because the hand hygiene assessment items are not yet available in the healthy plus application in some rooms
Data Analyze	
Data Report	Not fulfilled because IPCLN has a double job in charge of their respective rooms and take turns serving on COVID-19 wards.
Output	
Hand hygiene compliance rate at Haji Hospital Surabaya	Fulfilled
Hand hygiene compliance rate based on the room at Haji Hospital Surabaya	Fulfilled
Hand hygiene compliance rate based on opportunity and opportunity distribution at Haji Hospital Surabaya	Fulfilled
Hand hygiene compliance rate based on the personnels of Haji Hospital Surabaya	Fulfilled
The accuracy rate of hand reporting at Haji Hospital Surabaya	Not fulfilled because many IPCLNs submit reports that are not timely or not reported

Standard Operating Procedure (SOP) plays an important role in meeting work standards. Where SOP plays a role in minimizing errors in working on a work process that has been designed (Junita, 2017). The role of leaders in the implementation of SPO is needed in order to participate in monitoring whether all procedures have been implemented properly. The result in this study showed that the unavailable SPO regarding the use of healthy plus applications in hand hygiene audit reporting causes IPCLN to poorly understand the audit filling flow. IPC committee of Haji Hospital Surabaya is expected to conduct continuous control so that the SPO can be used effectively. One of the controls that can be done is to be directly involved in planning and organizing to achieve the goals that have been set.

Human resources are things that must exist in an organization where the quality and quantity of good human resources are able to support organizational goals (Nurani and Hidajah, 2017). IPCLN resource shortage in Haji Hospital Surabaya causes data processing related to hand hygiene compliance audit to be slower, so there are often delays in reporting. The delay in reporting hand hygiene compliance audits is IPCLN have a dual role, namely as nurses who are in charge of their respective rooms and take turns serving on COVID-19 wards.

Availability of facilities can support the process of activities in an organization in order to run smoothly (Hapsari, Wahyuni and Mudjianto, 2018). Facilities owned by Haji Hospital Surabaya to support the reporting of hand hygiene compliance audits have reached the standards. Each room has been facilitated by 1 computer to input data. But according to IPCLN there is still a queue when inputting data, so sometimes there is a delay in reporting a hand hygiene compliance audit.

The process of collecting hand hygiene compliance data is done using a form that complies with WHO 2009 standards on "Guidelines on Hand Hygiene in Health Care." The results in this study mentioned that the use of Healthy Plus application in Haji Hospital Surabaya to report hand hygiene audit has not worked optimally. Data processing and data analysis is not running well because there are still Healthy Plus applications found in the computer room that has not installed hand hygiene items to input data so the processing data is still done manually. In addition, the processing data that is still done manually results in delays in the collection of reports. The cause of delays in collecting hand hygiene compliance audit reports is the amount of work done by IPCLN

such as serving patients according to the unit where they work, conducting hand hygiene compliance audits, and becoming nurses in charge of Covid-19 wards.

The hand hygiene compliance audit report contains a description of the hand hygiene compliance figures based on time, place, and person and a description related to the accuracy of hand hygiene compliance audit reporting figures. The audit report is used by the IPC committee of Haji Hospital Surabaya to evaluate whether the program has been appropriate or has not reached the target. Based on the results of this study, hand hygiene compliance figures based on time, place, and people are in accordance with WHO guidelines in 2009. However, the accuracy of hand hygiene compliance audit reporting decreased from the previous year and still has not reached the minimum target specified.

The results of the in-depth interview with IPCN and IPCLN stated that the non-compliance in the outpatient and emergency room at RSU Haji Surabaya was due to the limited time for IPCLN to input hand hygiene audits, the unavailability of hand hygiene items in the healthy plus application in the room, and the absence of SPO set about how to input data using the healthy plus application. This causes IPCLN's lack of understanding in operating a healthy plus application to input hand hygiene audit data.

Researchers in the current research assume that the use of applications in the present era to report hand hygiene compliance audits is a solution that can be used to save IPCLN time in reporting hand hygiene audits. Therefore, there needs to be improvements to Healthy Plus and make SPO regarding the use of the application. The preparation of the SPO for filling out the application-based hand hygiene audit forms needs to be done so that it is more focused. Providing posters or videos regarding the audit reporting flow through the application can make it easier for application users to understand how to fill in data through the correct application. This is done so that the data reported is appropriate and minimizes data input errors. In addition, the IPC Committee needs to collaborate with the Hospital Management Information System (HMIS) to monitor each unit in the Haji Hospital Surabaya to ensure that the hand hygiene items in the Healthy Plus application have been installed properly. This aims to prevent delays in the data input process and hand hygiene audit reports.

CONCLUSION

Evaluation of the accuracy of the audit report of hand hygiene compliance of Surabaya Hajj Hospital in 2020 based on input components in the form of SPO and human resources has not fulfilled, while for the availability of facilities has been fulfilled. Based on the process components only the data collection process has been fulfilled while the process of data processing, data analysis, and data reporting has not been fulfilled. Based on the output component of hand hygiene compliance figures based on time, place, people have obtained good results and are in accordance with the guidelines of who in 2009. But the accuracy of hand hygiene compliance audit reporting is known to be far from the target.

The obstacles encountered related to the accuracy of hand hygiene compliance audit reporting are the unavailable SPO in the use of Healthy Plus application so IPCLN does not understand how to input data on the application, hand hygiene assessment items are not yet available in the healthy plus application in some rooms, and IPCLN has a double job in charge of their respective rooms and take turns serving on COVID-19 wards. There need to be improvements to the Healthy Plus application to optimally hand hygiene compliance audit reporting. The preparation of SPO in application usage is also needed to help IPCLN understand the use of applications when performing data input processes.

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REFERENCE

Abdo, N. M. and Al-Fadhli, M. (2018) 'Improving hand hygiene compliance among healthcare workers in intensive care unit: an interventional study', *International Journal Of Community Medicine And Public Health*, 5(9), p. 3747. doi: 10.18203/2394-6040.ijcmph20183558.

Abdraboh, S. N. *et al.* (2016) 'Hand Hygiene and Health Care Associated Infection : An Intervention Study', *American Journal of Medicine and Medical Sciences*, 6(1), pp. 7–15. doi: 10.5923/j.ajmms.20160601.02.

Alemu, A. Y. *et al.* (2020) 'Healthcare-associated infection and its determinants in Ethiopia: A systematic review and meta-analysis', *PLoS ONE*, 15(10 October 2020), pp. 1–15. doi: 10.1371/journal.pone.0241073.

Alzahrani, W. A. *et al.* (2018) 'Study of Hand Hygiene Awareness among Doctors and Nurses in King Abdulaziz Specialist Hospital', *The Egyptian Journal of Hospital Medicine*, 72(11), pp. 5534–5539.

Caselli, E. *et al.* (2018) 'Reducing healthcare-associated infections incidence by a probiotic-based sanitation

system: A multicentre, prospective, intervention study', *PLoS ONE*, 13(7), pp. 1–17. doi: 10.1371/journal.pone.0199616.

Despotovic, A. *et al.* (2020) 'Hospital-acquired infections in the adult intensive care unit—Epidemiology, antimicrobial resistance patterns, and risk factors for acquisition and mortality', *American Journal of Infection Control*. Elsevier Inc., 48(10), pp. 1211–1215. doi: 10.1016/j.ajic.2020.01.009.

Hapsari, A. P., Wahyuni, C. U. and Mudjianto, D. (2018) 'Knowledge of Surveillance Officers on Identification of Healthcare-associated Infections in Surabaya', *Jurnal Berkala Epidemiologi*, 6(2), p. 130. doi: 10.20473/jbe.v6i22018.130-138.

Haque, M. *et al.* (2018) 'Health care-associated infections – An overview', *Infection and Drug Resistance*, 11, pp. 2321–2333. doi: 10.2147/IDR.S177247.

Haverstick, S. *et al.* (2017) 'Patients' Hand Washing and Reducing Hospital-Acquired Infection', *American Association of Critical-Care Nurses*, 37(3), pp. 1–8. doi: 10.4037/ccn2017694.

Jabarpour, M. *et al.* (2021) 'The Impact of COVID-19 Outbreak on Nosocomial Infection Rate: A Case of Iran', *Canadian Journal of Infectious Diseases and Medical Microbiology*, 2021(Cdc). doi: 10.1155/2021/6650920.

Junita, T. D. (2017) 'Peranan SOP Pada Organisasi Pemerintahan Kota Surabaya Dalam Peningkatan Kepuasan Pelayanan Kepada Masyarakat (Studi Di Bagian Umum dan Protokol Pemerintahan Kota Surabaya)', *JPAP: Jurnal Penelitian Administrasi Publik*, 3(2), pp. 858–863. doi: 10.30996/jpap.v3i2.1266.

Livorsi, D. J. *et al.* (2018) 'Evaluation of Barriers to Audit-and-Feedback Programs That Used Direct Observation of Hand Hygiene Compliance: A Qualitative Study', *JAMA network open*, 1(6), p. e183344. doi: 10.1001/jamanetworkopen.2018.3344.

Masroor, N. *et al.* (2017) 'Approaches to hand hygiene monitoring: From low to high technology approaches', *International Journal of Infectious Diseases*. International Society for Infectious Diseases, 65, pp. 101–104. doi: 10.1016/j.ijid.2017.09.031.

Mitchell, A. (2017) 'Hand Hygiene: A Quality Improvement Project', *Biomedical Journal of Scientific & Technical Research*, 1(7), pp. 1985–1988. doi: 10.26717/bjstr.2017.01.000601.

Moore, D. L. *et al.* (2021) 'The impact of COVID-19 Pandemic on Hand Hygiene Performance in Hospitals', *American Journal of Infection Control*, 49(1), pp. 30–33. Available at: https://doi.org/10.1016/j.ajic.2020.08.021.

Nasution, T. A. *et al.* (2019) 'Effectiveness hand washing and hand rub method in reducing total bacteria colony from nurses in Medan', *Open Access Macedonian Journal of Medical Sciences*, 7(20), pp. 3380–3383. doi: 10.3889/oamjms.2019.427.

Ndegwa, L. *et al.* (2019) 'Evaluation of a program to improve hand hygiene in Kenyan hospitals through production and promotion of alcohol-based Handrub – 2012-2014', *Antimicrobial Resistance & Infection Control*. Antimicrobial Resistance & Infection Control, 8(1), pp. 4–9. doi: 10.1186/s13756-018-0450-x.

Nurani, R. S. and Hidajah, A. C. (2017) 'Gambaran kepatuhan Hand Hygiene Pada Perawat Hemodialisis Di Rumah Sakit Umum Haji Surabaya', *Jurnal Berkala Epidemiologi*, 5(2), pp. 218–230. doi: 10.20473/jbe.v5i2.2017.218-230.

Onyedibe, K. I. *et al.* (2020) 'Assessment of hand hygiene facilities and staff compliance in a large tertiary health care facility in northern Nigeria: A cross sectional study', *Antimicrobial Resistance and Infection Control*. Antimicrobial Resistance & Infection Control, 9(1), pp. 1–9. doi: 10.1186/s13756-020-0693-1.

Phan, H. T. *et al.* (2018) 'An educational intervention to improve hand hygiene compliance in Vietnam', *BMC Infectious Diseases*. BMC Infectious Diseases, 18(1), pp. 1–6. doi: 10.1186/s12879-018-3029-5.

Pittet, D. (2017) 'Hand hygiene: From research to action', *Journal of Infection Prevention*, 18(3), pp. 100–102. doi: 10.1177/1757177417705191.

Pong, S., Holliday, P. and Fernie, G. (2018) 'Effect of electronic real-time prompting on hand hygiene behaviors in health care workers', *American Journal of Infection Control*. Elsevier Inc., 46(7), pp. 768–774. doi: 10.1016/j.ajic.2017.12.018.

Quilab, M. T. *et al.* (2019) 'The effect of education on improving hand hygiene compliance among healthcare workers', *Hospice & Palliative Medicine International Journal Literature*, 3(2), pp. 66–71. doi: 10.15406/hpmij.2019.03.00153.

Ragusa, R. *et al.* (2018) 'Healthcare-associated Clostridium difficile infection: role of correct hand hygiene in cross-infection control', *Journal of Preventive Medicine and Hygiene*, 59(2), pp. E145–E151. doi: 10.15167/2421-4248/jpmh2018.59.2.923.

Sands, M. and Aunger, R. (2020) 'Determinants of hand hygiene compliance among nurses in US hospitals: A formative research study', *PLoS ONE*, 15(4), pp. 1–29. doi: 10.1371/journal.pone.0230573.

Shobowale, E. O. *et al.* (2017) 'An Observational and Trend Analysis Study of Hand Hygiene Practices of Healthcare Workers at A Private Nigerian Tertiary Hospital', *Annals of Medical & Health Sciences Research*, 7, pp. 84–89. Available at: https://www.amhsr.org/articles/an-observational-and-trend-analysis-study-of-handhygiene-practices-of-healthcare-workers-at-a-privatenigerian-tertiary-hospital-4108.html.

Shobowale, E. O., Adegunle, B. and Onyedibe, K. (2016) 'An Assessment of Hand Hygiene Practices of Healthcare Workers of a Semi-Urban Teaching Hospital Using The Five Moments of Hand Hygiene', *Nigerian Medical Journal*, 57(3), pp. 150–154. Available at: https://dx.doi.org/10.4103%2F0300-1652.184058.

WHO (2009) *WHO Guidelines on Hand Hygiene in Health Care*. Available at: https://www.who.int/publications/i/item/9789241597906.

Wong, S. C. *et al.* (2020) 'Is it possible to achieve 100 percent hand hygiene compliance during the coronavirus disease 2019 (COVID-19) pandemic?', *Journal of Hospital Infection*, 105(4), pp. 779–781. doi: 10.1016/j.jhin.2020.05.016.