RESEARCH PAPER

Efficacy of Infection Control Measures in Reducing Hospital-Acquired Infections: A Systematic Review and Recommendations for Improvement

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ABSTRACT
Nowadays, nosocomial infections and their management is a global challenge in the healthcare settings. Since COVID- 19, hospital infection has gained global level interest. This review will focus on the recent developments that has been developed to prevent and control hospital infections. There are various strategies implemented at the clinical level which includes hand hygiene, personal- protective equipment, environmental cleaning, and novel technologies on the other hand administrative and management strategies includes staffing, training, surveillance, and compliance monitoring and for policy frameworks we have WHO guidelines, national action plans, and accreditation standards. Even though there are various strategies implemented for prevention but there will always remain implementation gaps in the low- resource settings Tomczyk, S., Twyman, A., de Kraker, M. E., Rehse, A. P. C., Tartari, E., Toledo, J. P., ... & Allegranzi, B. (2022)..

Keywords: Healthcare- associated infections, Hospitals, Management, Infection and prevention control, Nosocomial infections, Prevention
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INTRODUCTION

Hospital infection control consists of a set of practices which aimed to prevent and manage infections that are being acquired within the healthcare settings. These infections could be due to various factors which includes invasive procedures, antibiotic misuse, and inadequate hygiene practices. The World Health Organization (WHO) says that every year there are around hundreds of millions of patients who acquired infection in the hospitals. Thus, these infections make hospital stays longer, also causes long- term problems, and make germs more resistant to medicine. Events like the COVID- 19 pandemics, which occurred in the past years have made it easier to see how important was to prevent and control infections. But this review will focus more beyond to COVID- 19, showing the broad framework for the health services to be prepared for and respond to multiple infectious risks.

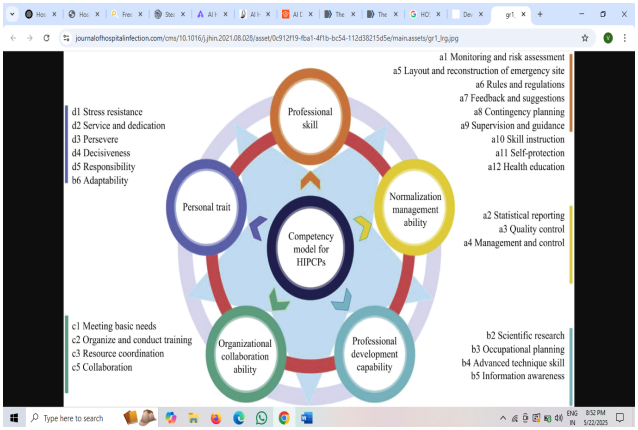

FIGURE: Competency model for hospital infection prevention and control practitioners (HIPCPs). [Source: Cui, L., He, A., Wang, X., Wang, Y., Huang, X., & Ni, Z. (2022). Development and validation of a competency evaluation model for hospital infection prevention and control practitioners in the post-pandemic era: a mixed

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methods study. Journal of Hospital Infection, 119, 132-140.]

As we all are aware about WHO is a core component for the infection and prevention control(IPC) thus build blocks for effective infection and prevention control programmes. These programs are very important for reducing the endemic healthcare associated infections (HAIs) (Cui, L., He, A., Wang, X., Wang, Y., Huang, X., & Ni, Z. (2022)). In the last 10 years, WHO and other agencies had showed need to improve IPCs to reduce global burden associated with the healthcare associated infections and antimicrobial resistance . As we all our well aware that medical institutions are starting point and multiplier for infections outbreaks, which contribute in further transmission in the community. There is need of prepared system otherwise we will not be able to withstand with the shock of an outbreaks that we suffered during the time of COVID-19. Evidence- based interventions is one of the effective measures taken to reduce healthcare associated infections. In this review, we have adopted global perspective on hospital infection control and management. Recent literature and official reports had been identified to check trends, challenges, and opportunities associated with it.

REVIEW OF LITERATURE

Nowadays, nosocomial infections and their management is a global challenge in the healthcare settings. Since COVID- 19, hospital infection has gained global level interest. This review will focus on the recent developments that has been developed to prevent and control hospital infections. There are various strategies implemented at the clinical level which includes hand hygiene, personal- protective equipment, environmental cleaning, and novel technologies on the other hand administrative and management strategies includes staffing, training, surveillance, and compliance monitoring and for policy frameworks we have WHO guidelines, national action plans, and accreditation standards.

- **CLINICAL INFECTION CONTROL PRACTICES**

Nosocomial infections had become common as medical care has grown complex as patients had become complicated. And therefore, HAIs are associated with the increase of mortality, morbidity and, lastly, with the cost (Sydnor, E. R., & Perl, T. M. (2011)).

HAND HYGIENE AND PPE

Hand washing is very important way to reduce pathogen transmission. It is reported by the WHO that simple handwashing can alone have the potential to prevention HAIs (Allegranzi, B., Kilpatrick, C., Storr, J., Kelley, E., Park, B. J., & Donaldson, L. (2017)).

It is also seen proper use of PPE (Like masks, gloves, face shields) was another critical practice to reduce the effect of outbreak associated with the pandemics. But there remain implementation challenges as there are resource limitations (especially PPE shortage) and also safety fatigue can hinder long- term compliance.

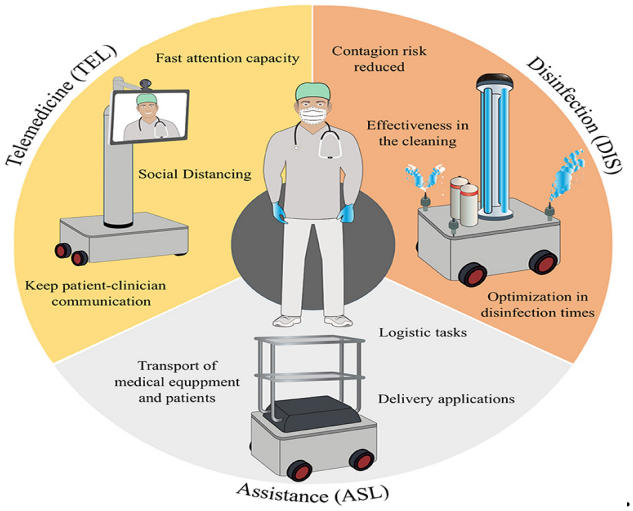

FIGURE: Categories of robotics application considered in this study: (1) Telemedicine (TEL), Disinfection (DIS), and Assistance (ASL). The exhibited characteristics refer to the main advantages of using robots of the corresponding category (i.e., the yellow section for TEL, orange for DIS, and gray for ASL) in clinic environments. [Source: Sierra Marín, S. D., Gomez-Vargas, D., Céspedes, N., Múnera, M., Roberti, F., Barria, P., ... & Cifuentes, C. A. (2021). Expectations and perceptions of healthcare professionals for robot deployment in hospital environments during the COVID-19 pandemic. Frontiers in Robotics and AI, 8, 612746.]

SURVEILLANCE SYSTEM

There is a require for viable observation, as observation makes a difference to decide in what zones we see patterns or episodes of contaminations and where we require to intercede. Observation frameworks can back the reiteration of distinctive sorts of HAIs, such as surgical location contaminations (SSIs), catheter-associated urinary tract diseases (CAUTIs), and ventilator-associated pneumonia (VAP). Customary detailing through reconnaissance can permit wellbeing care organizations to create particular procedures and analyze the adequacy of contamination avoidance and control (IPC). moreover, State-of-the-art wellbeing care organizations are executing innovation for reconnaissance. Wellbeing records (EHR) and calculations, for illustration, may possibly hail an HAI and along these lines send caution to an contamination control group. A few companies are too starting to utilize machine learning to recognize likely flare-up zones or zones where the hazard of contamination is moo. These devices make utilize of charts in a way that is simpler than a conventional manual audit of hailed cases. In all of these cases, the appropriation of these devices has not however ended up broad due to concerns with the quality of the information and how they will work with other program forms.

ENIVRONMENT HYGIENE

As we all know hospital environment plays crucial role for the transmission of pathogens. Clean Hospitals Day 2024 has highlighted six technical domains that are essential for healthcare environmental hygiene (HEH): surfaces, air control, water control, device reprocessing and sterilization, laundry, and waste management. Implementing HEH

programs will significantly reduce the burden associated with the HAIs (Peters, A., Parneix, P., & Pittet, D. (2024)).

TECHNOLOGY AND INNOVATION

During the time of pandemic, it accelerated adoption of cutting- edge tools. Artificial Intelligence (AI) was used for the detection of outbreaks and staffing optimization. AI- driven video monitoring can audit the hand hygiene, compliance or the use of mask, also provide the immediate feedback. Various preliminary studies had showed there was various systems that saw lapses more consistently than the human observers. There has been saw expansion of telemedicine within hospitals: clinicians use video rounds to minimize exposure while still interact with the isolated patients, this will not only protect staff but will also help to preserve PPE (Kubde, D., Badge, A. K., Ugemuge, S., Shahu, S., & Badge, A. (2023)).

Antimicrobial Stewardship: Antimicrobial resistance (AMR) is a developing risk to contamination control. Antimicrobial stewardship programs (ASPs) are outlined to optimize antimicrobials utilize to maximize compelling treatment of diseases and minimize the improvement of resistance. Current rules recommend that anti-microbial treatment can be de-escalated in ICU patients with healthcare-associated intra-abdominal diseases (HA-IAIs) to narrow-spectrum operators based on culture.

- **ADMINISTRATIVE AND MANGEMENT STRATEGIES**

STAFFING AND TRAINING

For our knowledge it is important to know hospital leadership and resource allocation have critical influence on the IPC success. There is need of adequate staffing levels- especially nursing and IPC- trained personnel- are very important. Fewer nurses had significant and direct effect on the increase of the infections. There is need to have stable workforce to mitigate the risk associated with infections and could lead to suffer from the health associated infections. To this end, many hospitals have increased IPC staffing. In reaction to flare-ups amid COVID-19, a few places created IPC groups with quickly adaptable sending. Burnout in the workforce is a genuine issue—the weights of extra IPC measures and expanded understanding volumes focused staffing. It is imperative for directors to think almost simple sending but too approximately staff well-being (for case pivoting staff through IPC, advertising mental wellbeing bolsters) whereas guaranteeing continuous IPC exercises, this is a adjusting act. Preparing and instructive openings for staff are still an range for enhancement. Pre-COVID-19, there was regularly an verbose and detached approach to IPC preparing some time recently and, in a few frameworks, presently numerous have executed continuous, intuitively preparing, with bore and recreations. For case, PPE donning/doffing workshops presently take put on a customary plan, and e-learning modules of hand cleanliness have been made. Tomczyk et al. detailed instruction and preparing as one of the most reduced positioning IPC components all inclusive, showing a require for improvement . Once more, healing centers are working to address this by building up linkages between preparing completion with competency evaluations, and advancing a culture of security where everybody (not fair clinicians) had the nuts and bolts of IPC preparing.

ORGANIZATIONAL STRUCTURE AND MANAGEMENT

Fruitful IPC requires back from the organization. Most clinics have organized Contamination Control Committees and IPC offices with clearly assigned people included. Having administration association in these committees (e.g., clinic administrators or chief nursing officer) is considered a standardized best hone. The WHO IPC center components distinguish a committed IPC group and IPC committee as fundamental to the IPC arrange. Amid the widespread, numerous healing centers made cross-disciplinary Occurrence Command structures (e.g., nursing, drug store, contamination control, senior administrators, quality) to decrease decision-making time on IPC techniques. In a post-pandemic circumstance, the IPC controlling gather can give a fast implies of reacting to future dangers, whereas too creating the program (Zingg, W., Holmes, A., Dettenkofer, M., Goetting, T., Secci, F., Clack, L., ... & Pittet, D. (2015)). Encouraging security culture with shared obligation remains an authoritative objective. Including front-line staff through engagement with medical caretakers, doctors, maids, and indeed persistent agents are ways to advance support in IPC arranging. For illustration, a few healing centers have conducted “IPC ward rounds” whereby ward staff distinguish disease dangers at the neighborhood level and give proposals for anticipation. This bottom-up approach bolsters the top-down approach position. Making formal affirmation such as acknowledgment (grant, certificate) for commendable IPC in units, is a great implies to advance a positive culture.

- **POLICY AND REGUALATORY FRAMEWORKS**

WHO AND INTERNATIONAL GIDELINES

At the around the world level, the WHO is the first organization creating significant arrangement systems. The 2016 WHO Rules on Center Components of IPC Programs recognized eight columns of a useful IPC program. The most up to date WHO Worldwide Activity Arrange on IPC (2024-2030) emphasizes these eight components of IPC and empowers targets and benchmarks for nations to grasp. It focuses out that the source of episodes such as COVID-19 and Ebola, are exacerbated by crevices in IPC. The Worldwide Activity Arrange for IPC centers on high-impact mediations (hand cleanliness, WASH in healthcare offices and reconnaissance frameworks) that can decrease HAIs by up to 70%. It is expected that part states will bring these components forward into national approaches. As a side note, on World Hand Cleanliness Day 2022 WHO propelled it’s to begin with Worldwide Report on IPC which emphasized that one in four cases of hospital-treated sepsis is healthcare-associated, highlighting the pressing require for approach.

Table: Comparison of IPC Guidelines Across Organizations.

ORGANIZATION	KEY FOCUS AREAS
WHO	Standard precautions, surveillance, AMR
CDC	Hand hygiene, PPE, environmental cleaning
MoHFW (India)	National IPC guidelines, training modules
Joint Commission	Revised IPC standards, organizational structure

SUMMARY

Nowadays, nosocomial infections and their management is a global challenge in the healthcare settings. Focus of the review was on the recent developments that has been developed to prevent and control hospital infections. There are various strategies implemented at the clinical level which includes hand hygiene, personal- protective equipment, environmental cleaning, and novel technologies on the other hand administrative and management strategies includes staffing, training, surveillance, and compliance monitoring and for policy frameworks we have WHO guidelines, national action plans, and accreditation standards.

CONCLUSION

Disease control in clinics and its administration are a major portion of understanding security and a healthcare service's quality as a entirety. Whereas there have been important advancements of rules and IPC programs, there is still work to be done, particularly in resource-limited settings. Proceeded venture, instruction, and standardized adherence to hones will be foremost in tending to the dangers of HAIs and AMR. It will take a concerted worldwide exertion to fortify our IPC conventions to offer a more secure environment for wellbeing care administrations.

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