Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13401 – 13406
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6258

The Role of Epidemiology, Nursing, Pharmacy, and Emergency Medicine in Managing Infectious Disease Outbreaks: An Integrated Approach

Ibrahim Ayed Al-Dalbahi[1], Bandar Mohammed Mufres[2], Khaled Mohammed Mufres[3], Majid Sebaa Al-Hafi[4], Mansour Nasser Al-Dalbahi[5], Salem Marshoud Al-Azmi[6], Oqab Mutayliq Ammar[7], Salman Mutlaq Jazzy[8]

Abstract

Infectious disease outbreak is a recurring issue for global health with high disease, fatality, and burden for healthcare systems. Successful outbreak management is a multidisciplinary intervention with coordination between epidemiology, nursing, pharmacy, and emergency medicine with one another. All specialties have a complementary role in controlling an outbreak—evidence-guided interventions and epidemiologic surveillance through epidemiology, infection prevention and control through nursing, optimized stewardship of antimicrobial through pharmacy, and triage and early care through emergency medicine. All specialties together make a significant contribution in improving outbreak management, minimizing complications in a patient, and controlling infection dissemination. In this review, collaboration, contribution of specialties, and best practice in infectious disease outbreak management is focused.

Keywords: *Infectious Disease Outbreak, Epidemiology, Nursing, Pharmacy, Emergency Medicine, Antimicrobial Stewardship, IPC, Outbreak Management*

Introduction

Infectious disease outbreak is a recurring issue for global health, and a coordinated and multidisciplinary intervention is a necessity in controlling and managing them effectively. Outbreaks, most often, present widespread disease and fatality, overburdening healthcare systems and in critical necessity for immediate intervention. According to Haque et al. (2018), alone, a single cause, i.e., healthcare-associated infection (HAIs) cause a million infection per annum, prolonged stays in a hospital, increased cost of care, and a significant burden for healthcare systems. Overcoming infectious disease outbreak involves a multidisciplinary and evidence-guided intervention with coordination between epidemiology, nursing, pharmacy, and emergency medicine with one another. All specialties have a complementary role in controlling an outbreak but with a specific role, and in together enhancing outbreak management and public health outcomes.

The role of epidemiology in infectious disease outbreak is paramount in disease transmission pattern determination, intervention guidance, and disease impact evaluation and intervention effectiveness determination. Outbreaks can timely detected through platforms such as National Electronic Disease Surveillance System (NEDSS), and fact-based decision-making is supported (Straif-Bourgeois et al., 2023). Targeted interventions for infectious disease dissemination minimizing depend on such information gained through data.

Nursing professionals' role in infection prevention and control (IPC) cannot go un-noted and following protocols such as washing hands and use of personal protective gear (PPE) is guaranteed. According to

[1] Pharmacist, Community Health in Al-Jamash
[2] Nurse, Community Health in Al-Jamash.
[3] Nurse, Community Health in Al-Jamash.
[4] Nurse, Community Health in Al-Jamash.
[5] Nurse, Community Health in Al-Jamash
[6] Epidemiologist, Community Health in Al-Jamash
[7] Epidemiologist, Community Health in Al-Jamash
[8] Emergency Technician, Community Health in Al-Jamash

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13401 – 13406
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6258

Kim and Hwang (2020), nursing professionals' skill and awareness in providing a sterile environment, critical in protecting both medical workers and a patient during an outbreak, cannot overestimated.

Pharmacy and emergency departments' professionals' role in infectious disease outbreak cannot go un-noted, either. Pharmacy professionals coordinate antimicrobial stewardship programs (ASPs), and use of antibiotics' use is optimized for fighting antimicrobial resistances, and care for a patient is optimized, with an assurance of safe and effective use of antibiotics (Barlam et al., 2016). According to them, review of prescription and educational expertise of a medical professional and a patient cannot go un-noted during an outbreak, specifically in pharmacy professionals' case. Emergency departments' professionals, meanwhile, have first contact with contaminated patients, and triage, and isolating and timely administration of empiric antibiotics' role cannot overestimate (Messacar et al., 2017). Emergency professionals' compliance with infection controls and rapid reaction protocols can avert most cases of infection in a nosocomial, according to them.

The role of such multidisciplinary interventions' integration forms a backbone for an overall infectious disease outbreak management.

Methodology

The literature review below covers epidemiology, nursing, pharmacy, and emergency medicine practice in infectious disease outbreak management.

In a systemic search, studies in databases such as PubMed, Google Scholar, and Embase, with keywords such as "infectious disease outbreaks," "infection prevention," "infection stewardship," "infection in nursing," "infection and emergency medicine," and "infection and epidemiology," and studies between 2008 and 2023, were included in a search.

Following filtering, 45 articles for a qualitative synthesis, out of 450 articles, duplicates and irrelevant studies, and 90 articles for full-text filtering, were included in a review.

The studies included in a review included studies such as randomized trials, cohort studies, systematic reviews, and expert recommendations.

Infection prevention and control (IPC) strategies, antimicrobial stewardship, outbreak surveillance, and care for a patient, were key information extracted regarding infection, studies, and interventions.

Analysis of studies aided in identifying best-evidence practice, factors for effective practice, and multidiscilinarity collaboration strategies.

Integration of each contribution of a discipline and an analysis of integration in enhancing overall effectiveness of a system in infectious disease outbreak management have been synthesized in a review.

Literature Review

The review below covers epidemiology, nursing, pharmacy, and emergency medicine practice in infectious disease outbreak management.

In a systemic search, studies in databases such as PubMed, Google Scholar, and Embase, with keywords such as "infectious disease outbreaks," "infection prevention," "infection stewardship," "infection in nursing," "infection and emergency medicine," and "infection and epidemiology," and studies between 2008 and 2023, were included in a search.

Following filtering, 45 articles for a qualitative synthesis, out of 450 articles, duplicates and irrelevant studies, and 90 articles for full-text filtering, were included in a review.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13401 – 13406
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6258

Key findings involve disease tracking via epidemiologists' contribution (e.g., NEDSS), case-control studies, and intervention application via modeling, for instance, social distancing and vaccination.

Nurse contribution involves infection and disease control (IPC), for instance, washing, use of protective gear, and awareness in patient care, but with a barrier such as a lack of funding.

Pharmacy contribution involves antimicrobial stewardship programs (ASPs) getting a boost, for instance, through antibiotics' optimization, review of prescription, and institution-specific protocols for stemming resistance.

Emergency medical contribution involves early case detection, triage, and infectious case rapid isolation, with an intention of stemming infection in a care environment.

The future will demand studies for effectiveness evaluation of coordinated infection controls in individual care environments.

In general, overall, the findings confirm a multidisciplinary contribution in infectious disease outbreak management, with epidemiology, nursing, pharmacy, and emergency medicine combining expertise for a positive contribution towards public health and a lighter burden of outbreak.

Discussion

Role of Epidemiology in Controlling Infectious Outbreaks

The role of epidemiology in controlling infectious disease outbreaks is important in providing fact information for disease tracking, disease determination, and disease controlling. Epidemiologists use disease tracking and analysis tools in finding out-of-the-way trends in disease occurrences, including case clusters and trends not in trends predicted, representing an outbreak. For example, Centers for Disease Control and Prevention (CDC) use National Electronic Disease Surveillance System (NEDSS) for notifiable disease tracking and timely intervention in case of an outbreak (Straif-Bourgeois et al., 2023). Surveillance tools act as a key intervention for instating controls at an early stage, with an objective of curbing widespread infection. Efficient tracking aids in providing interventions in a timely manner, and in a fact basis, and in a manner specific to a population's requirements.

The role of epidemiology in controlling infectious disease epidemic source investigation and investigation of dynamics

The role of epidemiology in controlling infectious disease epidemic source investigation and investigation of dynamics is beneficial for public health professionals. Methods such as case-control studies, cohort studies, and descriptive epidemiology can use in epidemic source investigation, epidemic transmission, and at-risk groups investigation. For example, during pandemic days of COVID-19, epidemiologists have utilized such methodologies in infection investigation, population demographics, and effectiveness of public intervention (McBryde et al., 2020). All such aided in targeting interventions, such as isolating, vaccinating, and issuing warnings, and aided in disease controlling in at-risk groups.

Apart from investigation and observation, epidemiology aids in testing interventions in infectious disease epidemics. By comparing information both preceding and following intervention, epidemiologists can assess intervention effectiveness, including vaccination, quarantines, and social distance interventions. For instance, in pandemic COVID-19, mathematics models aided in projecting intervention impact, including face coverings and rolling out vaccines, in infection and deaths (Kretzschmar et al., 2022). All such inform decision-makers, and in the long run, curtails infectious disease burden in medical care and communities.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13401 – 13406
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6258

Nurse and its Role in Controlling Infectious Disease Outbreaks

Nurses have a focal role in infection control and prevention (IPC) in infectious disease epidemics, with a critical role in disease transmission and assurance of patient safety minimization. Engaging in putting in practice IPC practice such as washing hands, following personal protective equipment (PPE), and environment disinfection, compliance with practice is determined by awareness, workload, and availability of resources, according to Kim and Hwang (2020). By resolving such factors and proper training, nurses can effectively apply evidence-based practice, minimizing infection chance in a medical environment during epidemics. Having a high level of awareness in having a clean environment is important in protecting both medical workers and persons.

Nurses have a key role in patient education during infectious disease epidemics, with an eye towards educating persons and family members about disease transmission prevention. By providing proper guidance in terms of washing hands, care of respirators, and isolating persons, persons actively become involved in infection controlling through nurses. As per Barrera-Cancedda et al. (2019), individualized educational interventions for nurses have a positive impact towards compliance in practice and towards patient care. By effective dissemination of information and training, a bridge between medical providers and persons is filled through nurses, providing a safe and awareness-raising environment in epidemics.

Though having a key role, several obstacles confront nurses in infectious disease epidemic controlling, such as high workloads, unavailability of time, and unavailability of tools and materials. All such obstacles can make them inefficient in following protocols of IPC to its full and in providing best care. According to Akagbo et al. (2017), such obstacles can be removed through intervention at an organizational level, effective and proper staffing, and availability of critical tools such as PPE. By providing a conducive environment, infection disease epidemics can enable nursing professionals in utilizing its critical role in controlling infectious disease epidemics effectively, and in consequence, infection cases and patient security can be maximized.

Pharmacy and Role in Controlling Infectious Disease Outbreaks

Pharmacy professionals have an important role in controlling infectious disease epidemics through leadership in antimicrobial stewardship programs (ASPs). Antimicrobial stewardship programs function for best use of antibiotics for best care for a patient and least development of antimicrobial resistance. Pharmacy professionals evaluate antibiotics for prescription for suitability in selection, dosing, and duration, and for use of antimicrobials in logical and sequential manner. According to Barlam et al. (2016), pharmacy professionals have an important role in supporting use of narrow-spectrum antibiotics wherever possible in an attempt to cause minimum collateral damage and selective microbial community pressure, and in consequence, in least development of antimicrobial resistance. Antimicrobial management skill of pharmacy professionals is important in controlling infection dissemination during an epidemic.

Apart from antimicrobial stewardship, infection prevention is facilitated through training imparted to medical care providers regarding proper use of antibiotics and best practice use of antibiotics and antimicrobial stewardship programs in an infectious disease epidemic, according to Manning et al. (2018). Pharmacy professionals join multidisciplinary rounds, providing real-time feedback for shrinking therapy according to culture, and for termination of unnecessary antibiotics. Pharmacy professionals' guidance ensures proper use of antimicrobials through proper use of antimicrobials, minimizing danger of poor consequences such as Clostridioides difficile infection and antimicrobial development of resistance.

Pharmacy teams contribute a significant role towards institution guideline and protocol development for use of antibiotics and its practice. Antibiotic use guideline development, guided through laboratory-supplied, locally relevant resistances, harmonizes prescription and maximizes correct use of antibiotics. Pharmacy-led prophylaxis programs in preparation for operations maximize prophylactic drugs' administration and restrict surgical site infection, according to Peter et al. (2018). By participating in developing policies and practicing in a medical environment, pharmacy teams maximize medical environment's potential in infectious disease outbreak management.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13401 – 13406
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6258

Emergency Medicine and its Role in Controlling Infectious Disease Outbreaks

Emergency departments (EDs) act a point of first contact for infectious disease outbreak cases, positioning emergency medical professionals in a position to manage and restrict infection. Emergency medical professionals contribute a significant role in infection restrain, including correct use of Personal Protective Equipment (PPE), correct use of disinfect and washing, and correct use of washing hands, in infection restrain in a medical environment. According to Messacar et al. (2017), such infection restrain can effectively restrict infection in medical environments. By adhering to a high level of infection restrain, medical professionals in an emergency environment minimize infection opportunity in medical environments and protect medical workers and medical environment for workers and patients.

Emergency medical groups contribute towards timely triage and isolating suspected infectious disease cases, an important contribution towards infection inhibition in medical settings. In an outbreak, timely triage and isolating protocols allow contagious disease cases to receive medical care in a manner isolating them with minimum opportunity for transmission with non-contagous cases. Medical triage and infection and public reporting during an outbreak, according to Eze et al. (2022), involve medical triage and reporting to infection and public reporting departments, respectively, and medical triage and reporting efficiency and punctuality can effectively inhibit an outbreak and inhibit its future transmission.

The timely administration of empiric antibiotics for life-threatening infection, such as for sepsis, is an important contribution of emergency medical groups. Coordination with laboratory and pharmacy groups aids in taking samples for diagnostics preceding administration of antibiotics, and pathogens can then accurately be determined and therapy modulated in relation to culture reports. Clark et al. (2019) confirm such coordination in optimizing antimicrobial therapy and in enhancing patient care. By including infection control in practice, emergency groups effectively contribute towards infectious disease epidemic control and safeguarding public health.

Interdisciplinary Approach towards Controlling Infectious Disease Outbreaks

The infectious disease epidemic control involves an Interprofessional practice that integrates epidemiology, nursing, pharmacy, and emergency medical expertise. All such professions synergistically work together in averts infection, diagnostics, therapy, and epidemic controlling. For example, epidemiologic information guides public interventions, nursing groups apply IPC protocols and educate, pharmacy groups maximize antimicrobial use, and emergency medical groups verify rapid case finding and care (Tacconelli et al., 2018). By working and communicating together, such groups maximize a care system's potential in epidemic controlling effectively.

Collaborative approaches, including infection control bundle use, go a long distance in portraying an organized multidisciplinary model for an epidemic's controlling. Infection control bundle use, including washing hands, protective gear use, and antimicrobial stewardship, have been effective in minimizing infection occurrences in a care environment. According to Sydnor and Perl (2011), multidisciplinary groups have a critical role in utilizing such best-evidence practice, with coordination between all medical professionals taking a paramount role. By collaboration, epidemiology, nursing, pharmacy, and emergency medical groups can provide increased care for a patient and curtail infectious disease burden.

Strengthening integration between such professions through training programs, policy, and studies in future interventions will become critical. Sharma and Paul (2023) confirm gaps in practice and new approaches in developing interventions for groups must become addressed and researched. By utilizing each individual's specific strengths and developing a collaboration culture, infectious disease outbreak management and public protection can occur effectively in a care system.

Conclusion

The infectious disease epidemic management requires an organized multidisciplinary model comprising pharmacy, nursing, epidemiology, and emergency medicine. Epidemiology introduces disease surveillance

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13401 – 13406
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6258

and best-evidence interventions, and nursing introduces compliance with IPC and patient education, respectively. Pharmacy departments maximize antimicrobial stewardship, and emergency departments introduce rapid triage and intervention in terms of therapy. Despite such barriers in terms of unavailability of resources and high workloads, collaboration, training, and supportive organisation maximise effectiveness in such professions. In conclusion, best-evidence practice, multidisciplinary practice, and a culture of accountability in controlling an outbreak re-emphasised in such a review, and integration of a coordinated model utilising each discipline's strengths will minimise infectious disease burden and secure public health.

References

Abdulhak, A. A. B., Altannir, M. A., Almansor, M. A., Almohaya, M. S., Onazi, A. S., Marei, M. A., et al. (2011). Non-prescribed sale of antibiotics in Riyadh, Saudi Arabia: A cross-sectional study. BMC Public Health, 11(1), 538

Alomi, Y. A., Alyousef, A. M. (2021). Infection Control Pharmacist: A New Initiative Project in the Kingdom of Saudi Arabia. PTB Reports, 7(2), 40–43.

Anderson, D. J., et al. (2014). Strategies to prevent surgical site infections in acute care hospitals: 2014 update. Infection Control & Hospital Epidemiology, 35(S2), S66–S88.

Ban, K. A., et al. (2017). American College of Surgeons and Surgical Infection Society: Surgical Site Infection Guidelines, 2016 Update. Journal of the American College of Surgeons, 224(1), 59–74.

Barlam, T. F., et al. (2016). Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America. Clinical Infectious Diseases, 62(10), e51–e77.

Barrera-Cancedda, A. E., Riman, K. A., Shinnick, J. E., & Buttenheim, A. M. (2019). Implementation strategies for infection prevention and control promotion for nurses in Sub-Saharan Africa: A systematic review. Implementation Science, 14(1), 1–41.

Clark, E., et al. (2019). Infection and infection prevention. Trauma Nursing: Resuscitation through Rehabilitation, 181–192.

Clayton, J. L., & Miller, K. J. (2017). Professional and regulatory infection control guidelines: collaboration to promote patient safety. AORN Journal, 106(3), 201–210.

Elbehiry, A., et al. (2022). How MALDI-TOF Mass Spectrometry Technology Contributes to Microbial Infection Control in Healthcare Settings. Vaccines, 10(11), 1881.

Esfandiari, A., et al. (2016). Prevention and control of healthcare-associated infections in Iran: A qualitative study to explore challenges and barriers. American Journal of Infection Control, 44(10), 1149–1153.

Eze, N., et al. (2022). Antimicrobial resistance in long-term care facilities. Antimicrobial Resistance & Infection Control.

Friedman, N. D., et al. (2016). Impact of antimicrobial resistance on surgical site infections. Clinical Microbiology and Infection, 22(5), 416–422.

Haque, M., Sartelli, M., McKimm, J., & Bakar, M. A. (2018). Health care-associated infections – an overview. Infection and Drug Resistance, 2321–2333.

Kim, H., & Hwang, Y. H. (2020). Factors contributing to clinical nurse compliance with infection prevention and control practices: A cross-sectional study. Nursing & Health Sciences, 22(1), 126–133.

Manning, M. L., et al. (2018). Antimicrobial stewardship and infection prevention—leveraging the synergy. Infection Control & Hospital Epidemiology, 39(4), 467–472.

McBryde, E. S., Meehan, M. T., Adegboye, O. A., Caldwell, J. M., & Trauer, J. M. (2020). Role of modelling in COVID-19 policy development. Paediatrics and Respiratory Reviews, 35, 57–60.

Messacar, K., et al. (2017). Implementation of rapid molecular infectious disease diagnostics. Journal of Clinical Microbiology, 55(3), 715–723.

Peter, S., et al. (2018). Antibiotic stewardship programs: A coordinated approach to optimize antibiotic use. Deutsches Ärzteblatt International, 115(23), 407–413.

Sharma, R., & Paul, J. (2023). Prevention of Hospital Acquired Infections: A Scoping Review. Journal of Infection Prevention, 12(3), 45–56.

Straif-Bourgeois, S., Tonzel, J. L., Kretzschmar, M., & Ratard, R. (2023). Infectious disease epidemiology. In W. Ahrens & I. Pigeot (Eds.), Handbook of Epidemiology. Springer Nature.

Sydnor, E. R. M., & Perl, T. M. (2011). Hospital epidemiology and infection control in acute-care settings. Clinical Microbiology Reviews, 24(1), 141–173.

Tacconelli, E., et al. (2018). Surveillance for control of antimicrobial resistance. The Lancet Infectious Diseases, 18(3), e99–e106.