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ORIGINAL ARTICLE

Periodic Review of Benchmarks Contributing to Reduction of Healthcare Associated Infections: An Observational Study in a Tertiary Care Hospital

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ABSTRACT

Purpose: The pattern of HAIs (Healthcare Associated Infections) [device associated infections such as Catheter Associated Urinary Tract Infection (CAUTI), Ventilator Associated Event (VAE), Central Line-Associated Bloodstream Infection (CLABSI) & Surgical Site Infection (SSI)] is analysed and their occurrences are compared to review benchmarks for HAIs in a tertiary care hospital for a period of 4 years.

Methods: Passive surveillance data is collected by infection control nurses from the microbiology lab following reporting of culture specimens Active surveillance data is collected by the infection control nurses during their daily rounds in wards and ICUs. The data is compiled and analysed by the microbiologist and infection control officer. The data collection forms are prepared and updated as per Centers for Disease Control and Prevention (CDC) and National Healthcare Safety Network (NHSN) guidelines.

Results: Over a four year period, the average of CAUTI rate is 0.31, VAE is 1.38, CLABSI is 1.29 & SSI is 1.1%. Following annual analysis of rates of healthcare associated infections, the benchmarks have been revised to 0.5 for CAUTI, 1.5 for VAE, 1 for CLABSI and 0.5% for SSI.

Conclusions: Analysing institutional data periodically to establish in-house benchmarks enables scope for improvement in infection control practices, thereby, contributing to patient safety.

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KEYWORDS:

• Healthcare-associated infections (HAIs) • Infection control • Benchmarking • Tertiary care hospital • Observational study • Infection prevention • Quality improvement

INTRODUCTION

Healthcare-associated infections (HAIs) are a group of infections that patients contract in the process of being treated for other illnesses in a healthcare environment. Of these, device-associated infections (DAIs) and surgical site infections (SSIs) are very common and cause great problems for patient safety and healthcare quality. DAIs, such as catheter-associated urinary tract infections (CAUTI), central line-associated bloodstream infections (CLABSI), and ventilator-associated events (VAE), are found frequently in intensive care units (ICUs) and are linked with increased hospital stays, higher healthcare expenses, and higher mortality.[1] SSIs account to a large extent for postoperative morbidity, longer hospitalization, and higher healthcare expenses. Tracking and monitoring quality indicators of such infections are also important in the evaluation of effective infection control procedures and to influence patient care improvement.

AIMS AND OBJECTIVES

The aim of the study is to assess the periodic review of in-house benchmarks for DAI and SSI and its impact in reduction of healthcare associated infections in a tertiary care hospital. The objectives of this study is to determine the prevalence and common causative of DAI and SSI in a tertiary care hospital.

MATERIALS AND METHODS

This prospective observational study was conducted at a 1000-bedded tertiary care hospital in Telangana, India, for a duration of four years from year 2021 to 2024. The data from 2021 to 2024 were obtained using both active and passive surveillance techniques and compared. Active surveillance involved infection control nurses and microbiologists making routine visits to ICUs and wards, collecting information on device use and infection events. Passive surveillance consisted of the evaluation of culture-positive samples from the hospital microbiology laboratory. Infection surveillance proformas following CDC/NHSN guidelines were utilized to gather data on infection rates and pathogen profiles.

Monthly data of healthcare associated infections are analysed and discussed in the hospital infection control committee meetings. The same, along with other Quality Indicators of hospital infection prevention and control are communicated to all clinical departments at the end of every month. Every year, the infection control data pertaining to DAIs and SSIs are reviewed by the hospital infection prevention and control core team consisting of the Infection Control Officer, Microbiologist and the Infection Control Nurse. Based on the annual rates of DAIs and percentage of SSI of previous year, the institutional specific benchmarks are determined for those infections for the next upcoming year. These benchmarks provide a scope to identify areas of improvement in the infection control practices and to target the problematic areas.

RESULTS

Over the four-year period, the calculations of device associated and surgical site infections and their yearly rates are shown in the table below:

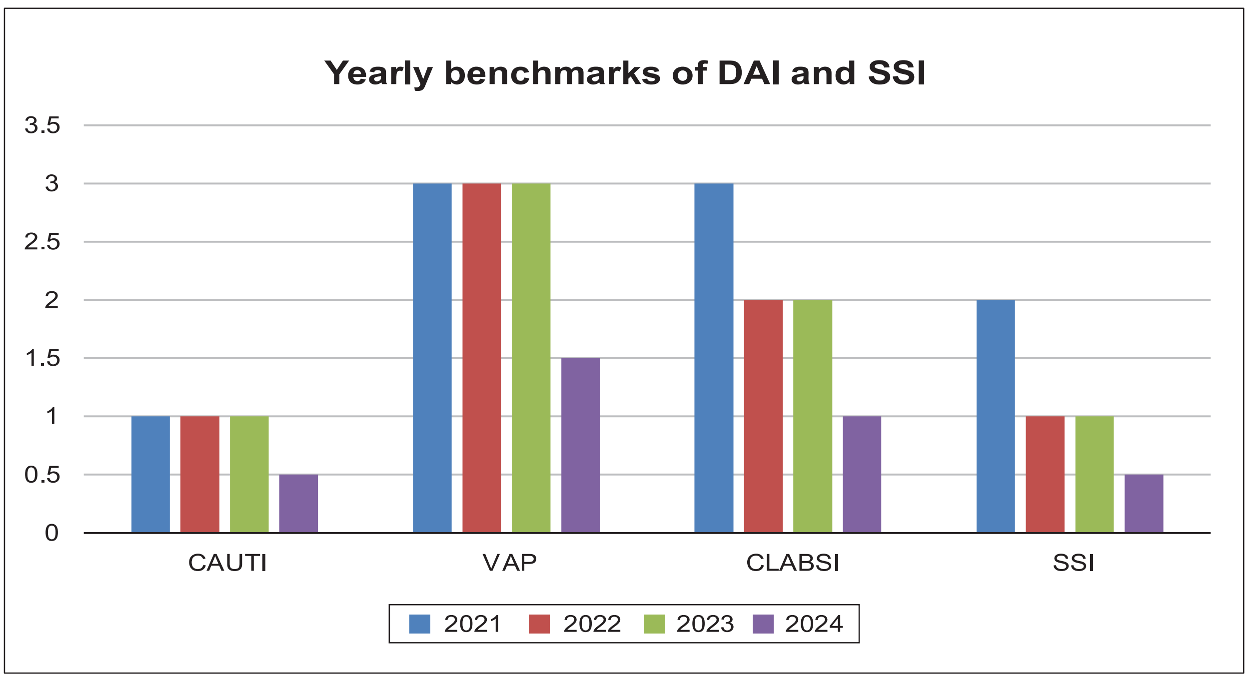
Table 1: Calculations of Device associated and surgical site infections and their yearly rates

CAUTI	Formula	Unit of measurement	2021	2022	2023	2024
	Number of catheter associated urinary tract infections/ Number of central line days X 1000	Rate per 1000 device days				
Number of CAUTI cases			17	16	14	6
Number of catheter days			38741	40899	45746	46292
CAUTI rate			0.44	0.39	0.30	0.12
Benchmark			1	1	1	0.5

table cont...

CAUTI	Formula	Unit of measurement	2021	2022	2023	2024
VAP	Number of ventilator associated pneumonia/ Number of ventilator days X 1000	Rate per 1000 device days				
Number of VAP cases			10	16	15	12
Number of ventilator days			10919	8643	10622	8726
VAE rate			0.91	1.85	1.41	1.37
Benchmark			3	3	3	1.5
CLABSI	Number of central line associated blood stream infections/Number of central line days X 1000	Rate per 1000 device days				
Number of CLABSI cases			22	14	19	27
Number of central line days			14138	14494	14895	19192
CLABSI rate			1.55	0.96	1.27	1.40
Benchmark			3	2	2	1
SSI	Number of surgical site infections/Number of surgeries performed X 100	Percentage (%) of SSI				
Number of SSI cases			40	36	58	54
Number of surgeries			13772	16065	17500	17514
SSI percentage			0.29	0.22	0.33	0.30
Benchmark			2	1	1	0.5

These rates represent a reduction from baseline benchmarks of 1 to 0.5 for CAUTI, 3 to 1.5 for VAP, 3 to 2 to 1 for CLABSI, and 1% to 0.5% for SSI, as shown in the figure below. This indicates improved infection control outcomes. The most common pathogens identified included *Klebsiella pneumoniae, Acinetobacter baumannii*, and *Pseudomonas aeruginosa*, with a notable prevalence of multidrug-resistant strains.



DISCUSSION

The results of this research highlight the importance of systematic surveillance and rigorous adherence to infection control practices in lowering the incidence of Device-Associated Infections (DAIs) and Surgical Site Infections (SSIs). For example, the adoption of care bundles that include practices such as scrupulous hand hygiene, aseptic techniques, and timely removal of medical devices have been consistently proven to enhance infection outcomes in the long term. Additionally, frequent audits and putting in place feedback mechanisms have been key to encouraging healthcare worker adherence to infection control practices.

Benchmarking overall HAI surveillance data without considering potential confounders can draw incorrect conclusions. Recognized benchmarks for HAI include the NHSN (3), INICC(4), European Centre for Disease Prevention and Control (ECDC), and World Health Organization (WHO) estimates(5), HAI benchmarking can be classified into internal and external systems. Internal benchmarking involves comparing current and past institutional data in the same healthcare facility.[6] External benchmarking involves compiling and comparing data from various institutes to establish a baseline target. The purpose of benchmarking is to monitor the current practices and their contribution to improve healthcare by assessing the value of interventions intended to reduce HAIs.[6] Benchmarking is often compromised as only outcome indicators are analysed.[7] As statistically relevant numbers of outcomes are required for comparison, data must be collected using standardized case definitions using similar data collection methods in populations of adequate sizes over a certain period of time.[8]

The selection of the right benchmark is a difficult task, especially when there are variations in the incidence of HAIs. Yearly changes in NHSN case definitions and methodologies also contribute to difficulty in interpretation of the data. INICC benchmarks seem user friendly because of similar methodologies.

The process of benchmarking is intended to improve infection control practices. WHO estimates for high-resource countries are derived from NHSN and ECDC data, while for low-resources countries, the data is diverse and not derived from a validated reference.

In this study, data from 2021 to 2024 reported an average prevalence of CLABSI to be about 1.29 per 1000 central line days, of CAUTI to be 0.31 per 1000 catheter day, of VAP to be 1.38 per 1000 ventilator days and the percentage of SSI to be 1.1%. In a previous study conducted by Bilolikar AK et al. from the same tertiary care centre, the average (5 years) CAUTI rate is 0.45, VAE is 2.42, CLABSI is 1.35 & SSI is 0.21. HAI rates were highest for VAE (2.42/1000 ventilator days), the next was CLABSI (1.35/1000 central line days), followed by CAUTI (0.45/1000 urinary catheter days). SSI rate was 0.21/ 100 surgeries.[9] Before the study was started, the benchmark were 2 for CAUTI, 5.5 for VAE, 3 for CLABSI and 2 for SSI. It is evident that improved infection control practices enabled reduction of benchmark to 1 for CAUTI, 3 for VAE, 2 for CLABSI and 1 for SSI that can be used in developing HAI prevention policies by the institution.[9] As a follow up of that study, it is shown that review of benchmarks annually and encouraging infection control practices have further reduced the rates of healthcare associated infections, thereby, further reducing the benchmark to 0.5 for CAUTI, 1.5 for VAE, 2 for CLABSI and 0.5% for SSI.

The frequency of different HAIs varies across the country. The risk of acquiring HAI is up to 20 times higher in developing countries.[10] In a study by Rosenthal VD et al, ssurveillance from INICC comprising of 45 under developed and developing countries, reported three to six times higher rates of device associated infections when compared with intensive care units (ICUs) in the USA.[11] From 40 hospitals in India, Surveillance data from 2004 to 2013 reported a pooled prevalence of CLABSI to be 5·1 per 1000 central line days and of CAUTI to be 2·1 per 1000 catheter days.[12] A single-centre study in India reported a pooled CLABSI rate of 4·3 per 1000 central line days.[13]

CONCLUSION

This four-year study demonstrates the effectiveness of comprehensive surveillance and quality indicator monitoring in managing DAIs and SSIs in a tertiary care hospital. Establishing and achieving infection rate benchmarks is crucial for enhancing patient safety and guiding institutional infection control policies. As there is no national reporting system of HAIs, there is a deficiency of national data of HAIs, thereby, imposing the difficulty of establishing benchmarks. Collaboration of institutional data to set in-house benchmarks, oongoing education, adherence to evidence-based practices, and a multidisciplinary approach are essential for sustaining improvements in infection control outcomes.

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