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Title

EVALUATION OF IMPACT OF AIR PURIFICATION IN POST OPERATIVE INTENSIVE CARE UNIT ON ENVIRONMENTAL AND CLINICAL OUTCOMES: A PROSPECTIVE, INTERVENTIONAL STUDY

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Diploma in Infection Prevention & Control

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by

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Dissertation Submitted to the

CDVL, University of Hyderabad, Telangana India

In partial fulfillment

of the requirements for the degree of

Diploma in Infection Prevention & Control

Under the guidance of

Dr. Burri Ranga Reddy

Year: 2024

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation entitled **"**Evaluation of impact of air purification in post operative intensive care unit on environmental and clinical outcomes: a prospective, interventional study **"** is a bonafide and genuine research work carried out by me under the guidance of Dr. Burri Ranga Reddy, President – Infection Control Academy of India Honorary Professor - University of Hyderabad**.**

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Date:18.05.2024
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LIST OF ABBREVIATIONS USED
(in alphabetical order)

S.No	Abbreviations	Expansion
1	CO_2	Carbon Dioxide
2	HAI	Healthcare Associated Infection
3	HEPA	High-efficiency particulate air
4	HVAC	Heating, ventilation, and air conditioning
5	HCP	Healthcare Professional
6	ICU	Intensive Care Unit
7	PM	Particulate Matter
8	PPM	Parts Per Million
9	RH	Relative Humidity

ABSTRACT
(Max. 200-300 words)

Background & Objectives

The study will assess the effectiveness of air purification systems in critical care areas of healthcare facilities through a prospective intervention. It aims to determine how these systems reduce airborne pathogens, enhance air quality, and impact environmental and clinical outcomes.

Methods

Evaluation Parameters:

The parameters related to environmental outcomes include real-time measurement of air-born particulate matter (PM) such as PM10 µm, PM2.5 µm, PM1 µm, and PM 0.5 µm. Additionally, air-born viable pathogen loads are measured using settle plate air sampling method. The levels of CO_2, temperature, and humidity are also measured in real-time.

Parameters related to a patient's clinical outcomes include monitoring vitals such as blood pressure, pulse rate, respiratory rate, oxygen saturation, and body temperature. Additionally, factors like hospital-acquired infections detected through culture tests, impact on antibiotic use, length of stay in the ICU and hospital, discharge destination, rates of intubation and non-invasive ventilation, readmissions, and mortality rates are also captured.

Results

The study evaluated the impact of air purification in critical care areas of healthcare facilities using the Sterile 360 system. Results showed a decrease in CO_2 concentration from 717 ppm to 431.43 ppm post-installation, indicating improved air quality. The system also regulated temperature between 23.5 to 25.5 degrees Celsius and reduced humidity from 62.45% to 48.63%. Hospital stay duration decreased to 2.92 days after system implementation, enhancing patient outcomes and operational efficiency. Overall, the Sterile 360 system positively impacted patient recovery and hospital operations.

Interpretation& Conclusion

Implementation of Sterile 360 positively impacted patient recovery and hospital resource utilization, supported by statistically significant shorter hospital stays. The Sterile 360 air filtration system implemented in the post-operative ICU led to a notable reduction in cases of hospital-acquired infections among patients

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1. Introduction

In healthcare facilities, maintaining air quality in critical care areas is crucial for ensuring the well-being of patients, healthcare workers, and visitors. Poor air quality can lead to the spread of infections, exacerbation of respiratory conditions, and overall compromised clinical outcomes. As a result, the implementation of air purification systems has gained significant attention as a potential solution to improve environmental and clinical outcomes in healthcare settings.

This prospective, interventional study aims to evaluate the impact of air purification in critical care areas of healthcare facilities on both environmental and clinical outcomes. By carefully assessing the effectiveness of air purification systems, we seek to understand their potential benefits in reducing airborne pollutants, pathogens, and allergens, thereby creating a safer and healthier environment for patients and healthcare workers.

Healthcare-associated infections (HAIs) pose a significant challenge in critical care areas of healthcare facilities, leading to increased morbidity, mortality, and healthcare costs. One significant factor contributing to HAIs is poor air quality, as airborne pathogens can easily spread and infect vulnerable patients. To address this issue, the implementation of air purification systems in critical care areas has been proposed as a potential solution to reduce the burden of HAIs and improve both environmental and clinical outcomes.

The current study aims to evaluate the impact of air purification in critical care areas of healthcare facilities through a prospective, interventional study design. By systematically assessing the effectiveness of air purification systems in reducing airborne pathogens and improving air quality, this study seeks to provide valuable insights into the potential benefits of this intervention on both environmental and clinical outcomes.

Key objectives of the study include:

1. Assessing the baseline air quality in critical care areas prior to the implementation of air purification systems.
2. Implementing air purification systems in designated critical care areas and monitoring their performance over a specified period.
3. Evaluating the impact of air purification on reducing airborne pathogens, particulate matter, and other pollutants in the air.
4. Assessing the incidence of healthcare-associated infections before and after the implementation of air purification systems

Through this study, we hope to contribute valuable insights to the existing body of research on air quality management in healthcare settings and inform evidence-based practices that can enhance patient care, infection control measures, and overall healthcare outcomes.

2. Objectives

The main objective of this study is to assess the impact of implementing air purification systems in critical care areas of healthcare facilities on both environmental and clinical outcomes. This includes evaluating how the quality of air is improved by the air purification systems, as well as examining any potential changes in patient outcomes and staff well-being as a result of purified air in these settings.

The objectives are:

- To evaluate the impact of air purification (using Sterile 360) in post operative intensive care unit of healthcare facilities on following environmental outcomes (Air-born particulate matter, Air-born viable pathogen load, CO_2 levels, Temperature and, Humidity levels)
- To evaluate the impact of air purification (using Sterile 360) in critical care areas of healthcare facilities on clinical outcomes (Patient outcomes, hospital-acquired infections, healthcare-economics).
- Evaluate the effectiveness of air purification systems in reducing airborne contaminants, such as bacteria, viruses, and particulate matter, in critical care areas.
- Assess the impact of improved air quality on the overall environmental conditions within the healthcare facility, including indoor air quality levels and potential reduction in healthcare-associated infections.
- Investigate any changes in clinical outcomes among patients in critical care areas, such as reduced instances of respiratory infections, improved wound healing, and overall patient recovery rates.
- Measure the impact of air purification systems on staff health and well-being, including potential reduction in occupational exposure to airborne pathogens and improved work environment.
- Analyze the cost-effectiveness of implementing air purification systems in critical care areas, considering factors such as energy consumption, maintenance costs, and potential savings from reduced healthcare-associated infections.

3. Review of Literature

The well-being of patients and healthcare professionals (HCPs) within healthcare facilities is significantly influenced by the quality of air circulating within the facility. The air serves as a medium for transmitting infectious microbes and particulate matter (Rao et al. 2020). The study aimed to determine if using portable photo-electrochemical oxidation (PECO) air purification in pediatric hospital rooms improves health outcomes for patients with respiratory distress. A prospective study was conducted, comparing patients using PECO technology to a historical control group. Twenty-seven PECO-equipped air purifiers were placed in rooms, with outcomes measured including length of hospital and ICU stay, intubation rates, non-invasive ventilation, and nebulizer use. Results showed a decrease in ICU stay from 0.7 to 0.4 days post-intervention, a 0.3-day reduction in overall hospital stay, and a decrease in non-invasive ventilation use from 77% to 23%.

Consequently, the presence of these contaminants necessitates regular elimination procedures. Nearly half of all hospital-acquired infections and most surgical site infections are likely attributed to airborne transmission (Ereth, 2020). A study on a novel particle control technology showed significant reductions in airborne particulate matter and pathogen levels in operating rooms. The technology achieved a 94.4% to 95% reduction in particle and pathogen loads in different healthcare settings. The addition of particle control technology to a collector loaded with a biologic warfare surrogate resulted in a 95% kill rate of an anthrax surrogate (Bacillus subtilis) within 3 hours. Deployment of this technology could reduce indoor air contamination, infections, and inflammatory responses in healthcare settings, potentially protecting patients (Ereth, 2020).

Poor air quality, characterized by elevated levels of pollutants and contaminants, poses a significant threat to the health of individuals seeking medical care. Therefore, the impact of air quality on patients' clinical outcomes is a crucial consideration in healthcare settings. Clean air enhances overall well-being, contributing to improved recovery rates and treatment outcomes. Prioritizing optimal air quality ensures a safe environment for patients and healthcare professionals. Past experiences with air purification technologies showed reduced infectious fomites on surfaces (Engelhart et al. 2003). A one-year study was conducted to investigate the impact of a portable air filtration unit on the exposure of haematology-oncology patients to airborne Aspergillus fumigatus spores. The study included weekly measurements of airborne A. fumigatus indoors and outdoors, and surveillance for invasive aspergillosis among patients. Results showed that indoor A. fumigatus counts were similar to outdoor counts, and the portable filtration units only reduced indoor counts by about one third. Five cases of invasive aspergillosis were reported during the study period by Engelhart et al. 2003.

However, contemporary methods like HEPA filtration, pressurization, and ultraviolet light may reduce the presence of larger airborne particles (>2.5 µm), but their impact on fine particles (<2.5 µm) and ultrafine particles (<0.25 µm) is limited (Ereth et al. 2020).

In 2020, Park conducted a study on the Evaluation of Air Purifier Performance in Reducing Fine Particulate Matter Concentration for Occupants based on Operation Methods. The study assessed the efficacy of using an air purifier to decrease fine particulate matter levels in the breathing zone. The findings revealed that merely installing an air purifier without adjusting the discharge direction did not lead to a significant reduction in particulate matter levels. However, directing purified air from the air purifier enhanced the reduction within the breathing zone compared to the surrounding area. Factors such as distance from the air purifier and airflow velocity were identified to influence the effectiveness of reducing fine particulate matter.

The study conducted by Listy aimed to investigate the potential of a locally installed air purifier unit (Novaerus Protect 800) in reducing bacterial concentrations in the air of an operating room during orthopaedic surgery to minimize the risk of surgical site infections. The study, carried out in a Swedish hospital in 2018, involved the installation of three air purifying units in the OR. During 11 operations, air samples were taken with the units turned on and off using a slit-to-slit agar impactor. Despite visualizing air movements with the aid of smoke in mock-up studies, the study did not find a significant difference in bacterial concentrations in the air between the two conditions.

In 2021 Smoke flow studies were conducted by N. McInerney by using an air purifier system at the edge of the operative air space. The system was tested both on and off to observe its impact on smoke leakage. A particle counter linked with the air purifier was placed on the operating table. Video data was captured at different angles for particle image velocimetry analysis, showing that the air purification equipment effectively diverted and captured smoke.

The LifeAire System (LAS) is installed within a hospital's HVAC system, replacing a section of ductwork. It effectively reduces infectious airborne and surface pathogens, leading to a decrease in hospital-acquired infections, shorter length of stays, and improved healthcare economics. The LAS uses UVGI to kill and inactivate infectious biologicals like tuberculosis, influenza, and coronaviruses (Stawicki 2023). The study evaluated the installation of LifeAire Systems (LAS) in a long-term care facility's memory support floor over 15 months. They compared a control floor with HEPA filtration to a study floor with complete LifeAire remediation. The results showed an 88.43% reduction in airborne pathogens on the study floor after LAS installation, along with significant reductions in surface pathogens. Comparisons of Healthcare-Associated Infection (HAI) rates indicated a 39.6% reduction in HAIs during the study and a 54.5% reduction on the study floor before and after installation.

Going beyond the standard use of high-efficiency particulate air (HEPA) filtration, advanced air purification technologies have the potential to significantly improve environmental and clinical outcomes, including healthcare economics (Urrutia et al. 2023). On the other hand, Sterile 360 is a newly developed and highly efficient medical grade air purifier that can filter the air up to 0.5 µm.

4. Methodology

This study is a prospective, interventional research consisting of two distinct phases: Pre-installation Phase and Post-installation Phase. The study involves placing a sterile 360 air filtration system in each department for a duration of 2 months. The study involving 400 patients, with 200 in the pre-installation phase and 200 in the post-installation phase. The detailed examination led to a significant finding that there were no notable differences between the demographic profiles of the two groups. This in-depth investigation of demographics provided a robust groundwork for a well-balanced and insightful comparison between the pre-installation and post-installation phases.

1. Air-born Particulate Matter (PM) Measurement:

- Real-time measurement of various particulate matter sizes: PM10 µm, PM2.5 µm, PM1 µm, PM 0.5 µm .
- Monitoring the concentration of these particulate matter sizes in the air is crucial for assessing air quality and potential health risks associated with inhalation.

2. Air-born Viable Pathogen Loads:

- Utilizing automatic or settle plate air sampling method to measure viable pathogen loads in the air.
- Sampling frequency: Day 1 - at 0, 1, 2, 3, 4, and 24 hours; Day 2 (48 hours); Day 7; then weekly once for the remaining study period.
- Monitoring pathogens in the air is essential for understanding potential risks of airborne diseases and infections.

3. CO_2 **Levels, Temperature, and Humidity Measurement:**

- Real-time measurement of CO_2 levels, temperature, and humidity in the air.
- Monitoring CO_2 levels helps in assessing indoor air quality and ventilation effectiveness.
- Temperature and humidity levels impact air quality, comfort, and health outcomes.
- Continuous monitoring of these parameters provides insights into environmental conditions and their potential health implications.

Parameters related to Patient's Clinical outcomes

These parameters encompass a wide range of factors that can provide valuable insights into a patient's overall health and recovery process.

- Monitoring of Vitals such as Blood Pressure, Pulse Rate, Respiratory Rate, Oxygen Saturation, and Body Temperature are essential indicators of a patient's physiological status and can help in early detection of any abnormalities or complications.

- Hospital-acquired infections (HAIs) can significantly impact a patient's recovery process. Culture tests, along with high-sensitivity biomarkers like C-reactive protein, procalcitonin, can help in diagnosing and managing infections promptly to prevent further complications.
- Length of stay in the ICU and Hospital stay are important metrics that reflect the severity of a patient's condition and the effectiveness of treatment provided.

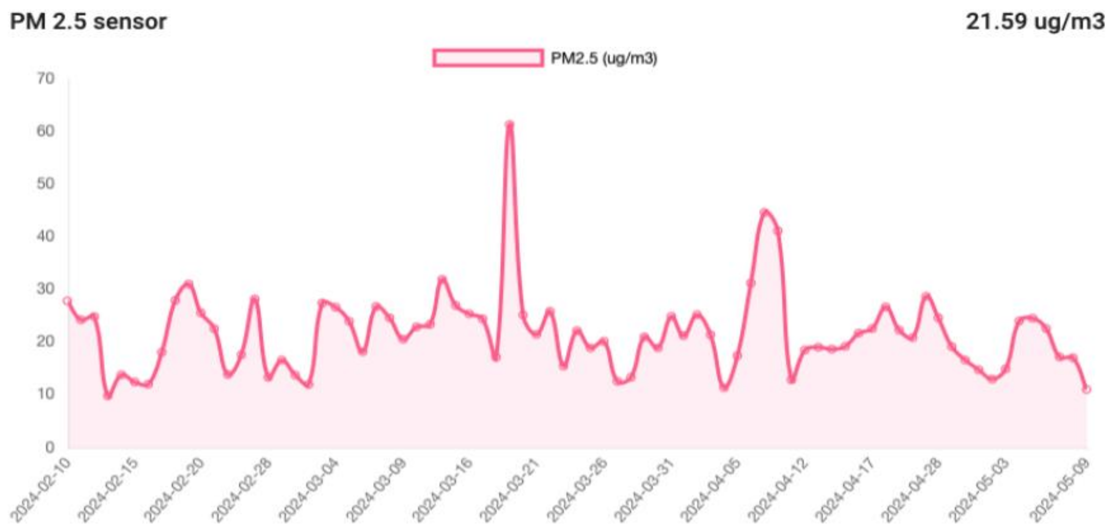
5. Results

Environmental Outcomes

1) Air-born particulate matter (real-time measurement) – PM2.5 µm:

The mean PM2.5 level in the postoperative intensive care unit before the installation of Sterile 360 (pre-installation study period) was measured at 35.89 µg/m3. However, during the post-installation study period, the average PM2.5 level significantly decreased to 21.59 µg/m3 (as shown in Figure 1). This reduction was found to be statistically significant. Notably, Sterile 360 was able to reduce the PM2.5 particulate matter to below the maximum limit level recommended by the World Health Organization, which is 25 µg/m3 .

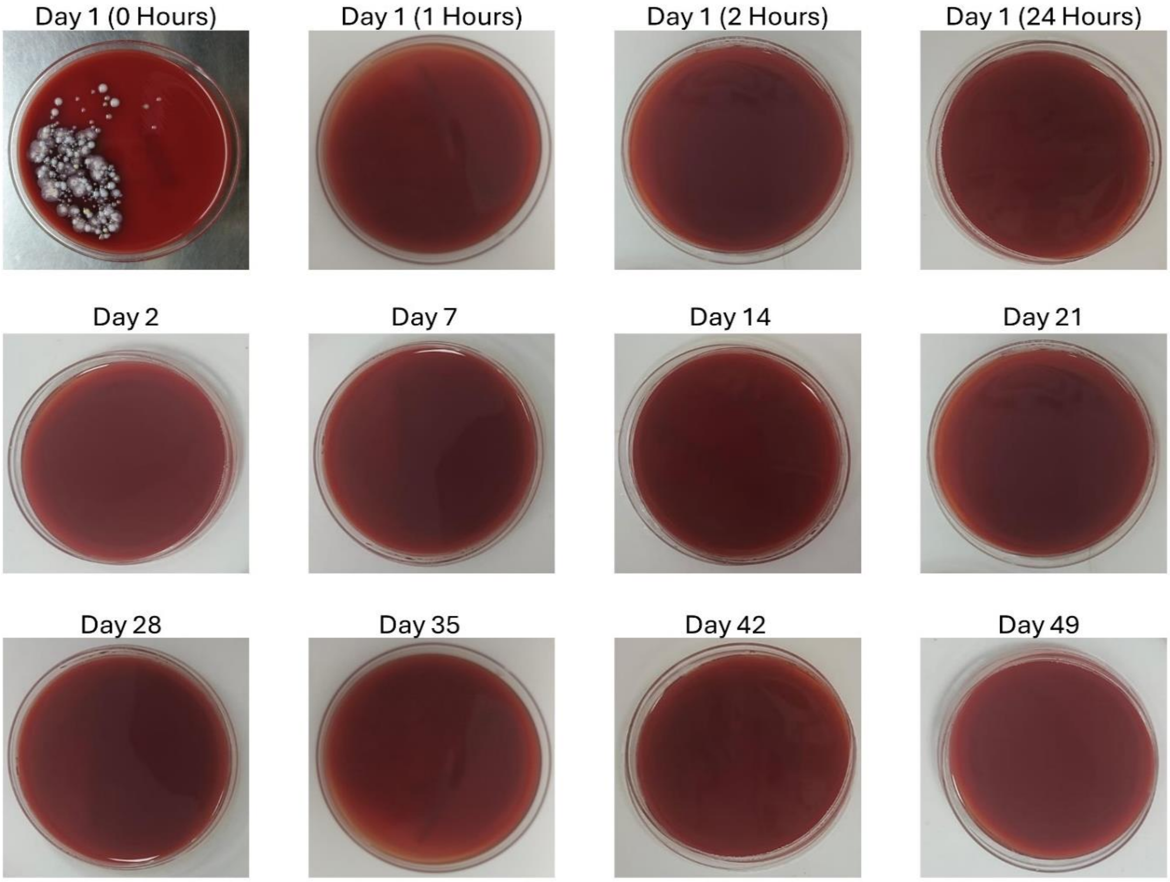
Figure 1. Line graph of PM2.5 concentration (µg/m^3) trend during pre-installation phase from 10 Feb 2024 to 09May2024.



2) Air-born viable pathogen load

There was evident microbial growth observed in the air sampling cultures taken during the pre-installation phase. Interestingly, the post-installation air samples showed no microbial growth, just one hour after the installation of the sterile 360 in the intensive care unit (ICU) (refer to Figure 2). This indicates that the sterile 360 effectively eliminated all microbial contaminants from the ICU room within a short period of time, and this trend persisted throughout the entire duration of the study. Further analysis of air samples on various days (Day 1 - 2 Hours, Day 1 - 24 Hours, Day 2, Day 7, Day 14, Day 21, Day 28, Day 35, Day 42, and Day 49) consistently confirmed the absence of microbial growth, highlighting the continued efficacy of the sterile 360 in maintaining a clean and sterile environment in the ICU.

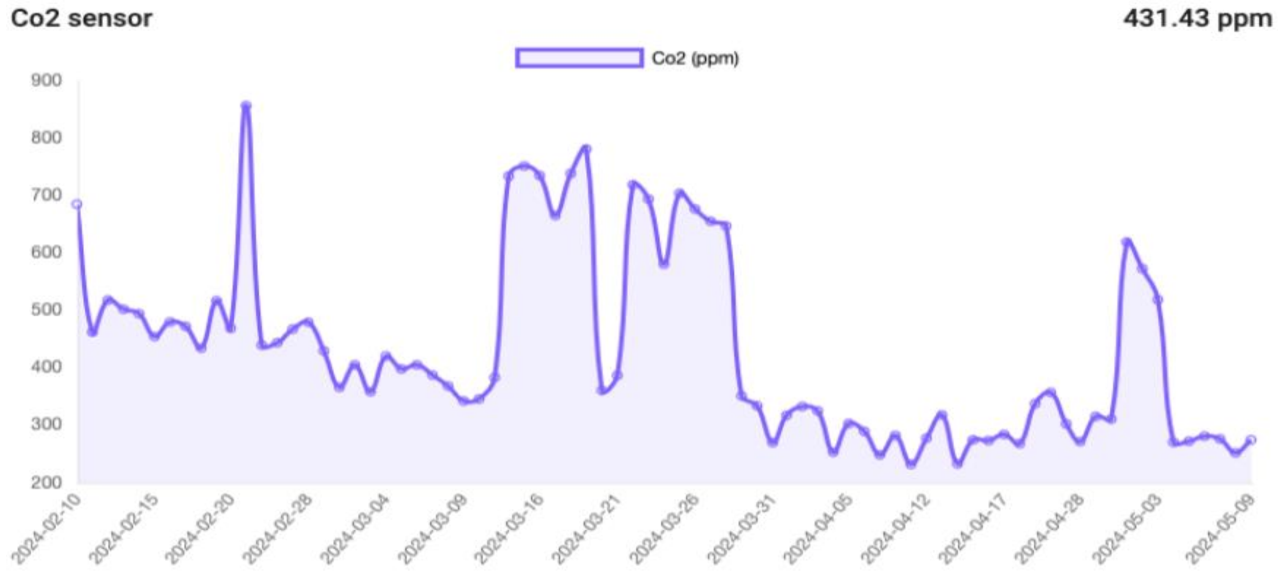
Figure 2. Representative photomicrographs of microbial culture plates of air sampling.



3) CO_2 levels (real-time measurement)

Before the installation of the Sterile 360 system, the average CO_2 concentration in the postoperative intensive care unit was measured at 717 parts per million (ppm) during the pre-installation study period. However, during the post-installation study period, there was a notable decrease in the average CO_2 level, with a measurement of 431.43 ppm as shown in Figure 3. This reduction in CO_2 concentration was found to be statistically significant. It is worth highlighting that the Sterile 360 system demonstrated its effectiveness in significantly reducing the mean CO_2 levels in the postoperative intensive care unit.

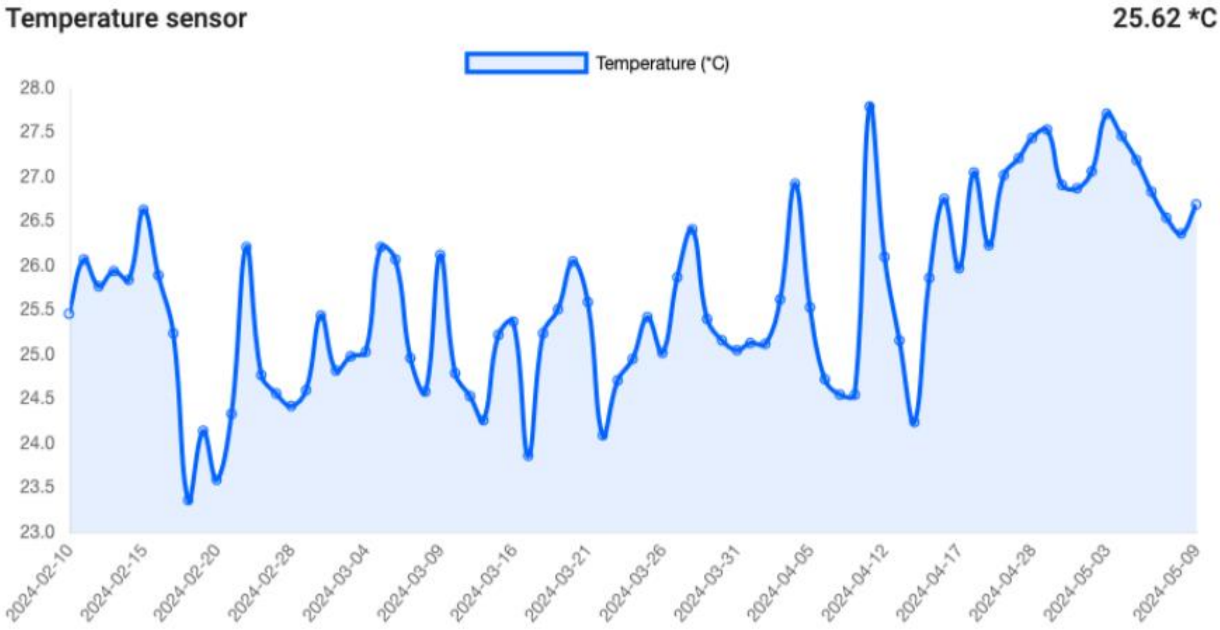
Figure 3 Line graph of CO_2 concentration in the air during pre-installation phase from 10 Feb 2024 to 09 May2024.



4) Temperature (real-time measurement)

Before the installation of Sterile 360 in the post-operative intensive care unit, the mean temperature was recorded at 25.5 degrees Celsius during the pre-installation study period. Following the implementation of Sterile 360, the device played a crucial role in consistently maintaining the temperature within the range of 23.5 to 25.5 degrees Celsius, as depicted in Figure 4. This decrease in temperature was not only significant from a statistical perspective but also highlighted the effectiveness of Sterile 360 in regulating the temperature levels. Additionally, the findings suggest that Sterile 360 was instrumental in creating a more stable and controlled environment within the intensive care unit, ultimately contributing to better patient outcomes and recovery rates. Furthermore, the successful temperature management provided by Sterile 360 showcases its potential impact in enhancing the overall quality of care in post-operative settings.

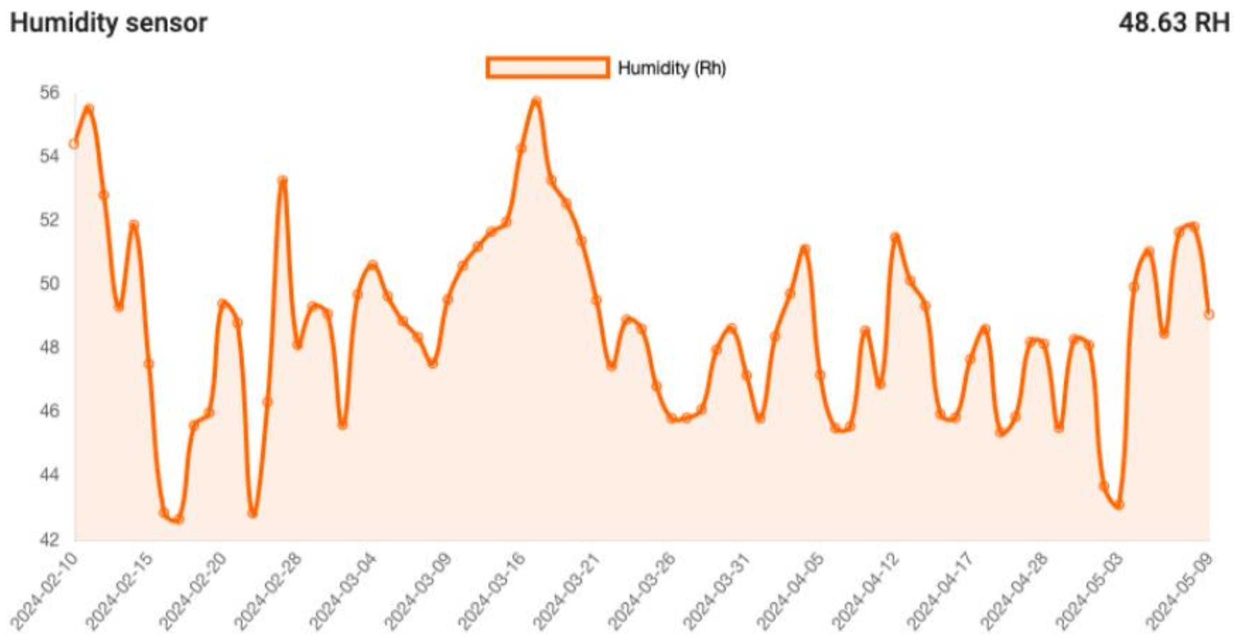
Figure 4. Line graph of temperature of the air during pre-installation phase from 10 Feb 2024 to 09May2024.



5) Humidity levels (real-time measurement)

During the pre-installation study period in the post-operative intensive care unit, the average relative humidity (RH) level was measured at 62.45% ppm. However, after the installation of the sterile 360 system, the average RH level significantly decreased to 48.63%, as depicted in Figure 5. The reduction in RH was found to be statistically significant, highlighting the effectiveness of the sterile 360 system in maintaining optimal humidity levels in the healthcare environment. This improvement in RH levels can contribute to creating a more conducive and sterile environment for post-operative care, potentially enhancing patient outcomes and reducing the risk of infections. The findings suggest that implementing the sterile 360 system can positively impact the overall quality of care provided in the intensive care unit setting.

Figure 5. Line graph of humidity in the air during pre-installation phase from 10 Feb 2024 to 09May2024.



<u>Clinical Outcomes</u>.

1) <u>Patient related parameters:</u>

A comprehensive study involving a total of 400 patients, with 200 patients in the pre-installation phase and 200 patients in the post-installation phase, was conducted and the results are presented in Table 1. The detailed demographics of the patients can be found in the table below. Upon analysis, it was revealed that there were no notable differences in the demographic characteristics between the patients in the pre-installation and post-installation phases. This indicates a balanced representation of patient profiles across both phases, ensuring a robust comparison for the study's outcomes. Additionally, the consistency in demographic characteristics enhances the reliability and validity of the study findings, allowing for a more accurate assessment of the impact of the installation on patient outcomes.

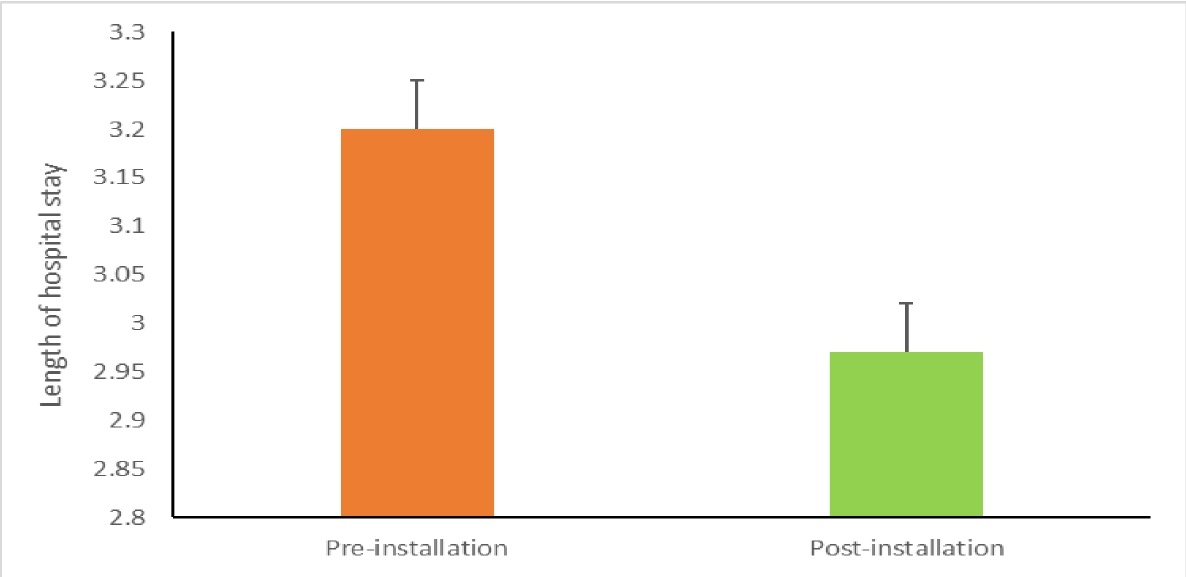
Table 1. Patient demographics

S. No		Pre-installation	Post-installation
1	Gender		
2	Male	109/200 (54.5%)	117/200(54.5%)
	Female	91/200(54.5%)	83/200(54.5%)
3	Age	45.25	46.1 (10-90)
4	Marital status		
	Married	185/200 (92.5%)	187/200 (93.5%)
	Unmarried	15/200 (7.5%)	13/200 (6.5%)

2) Length of hospital stay

During the pre-installation study period, the average length of hospital stays in the post-operative intensive care unit was determined to be 3.2 days. However, following the implementation of Sterile 360, a notable decrease was observed as the mean length of stay dropped to 2.92 days during the post-installation study period, as depicted in Figure 6. This reduction in hospital stay duration was not only significant but also highlights the effectiveness of Sterile 360 in improving patient outcomes and operational efficiency within the healthcare facility. The findings suggest that the implementation of Sterile 360 had a beneficial impact on patient recovery and hospital resource utilization. Additionally, the statistical significance of the reduction in hospital stays underscores the potential of Sterile 360 to optimize the post-operative care process and enhance overall patient care quality.

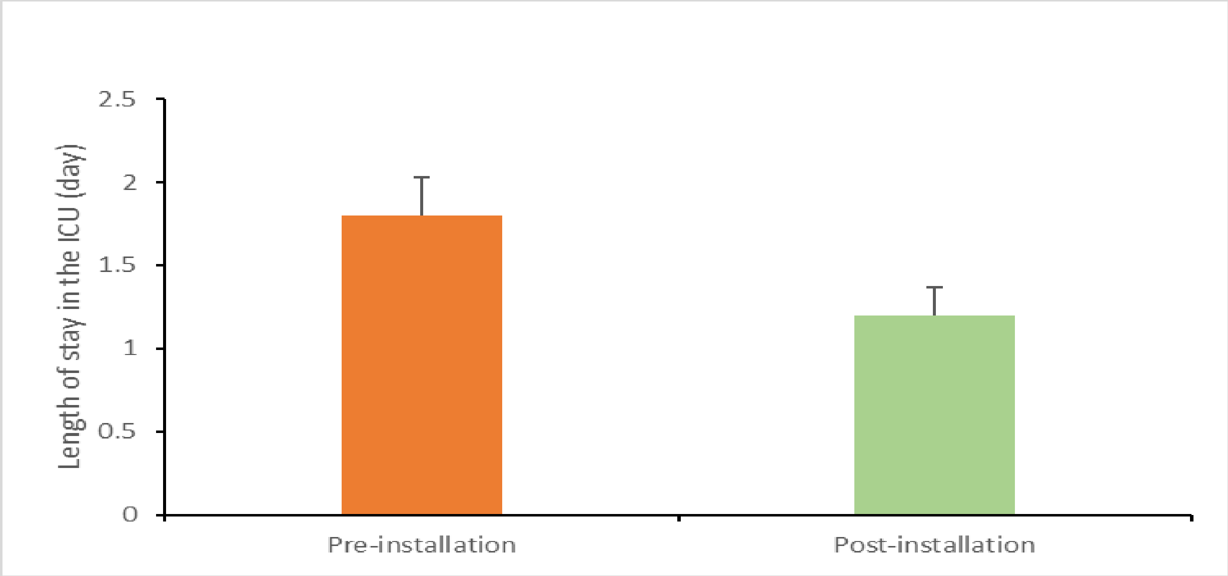
Figure 6. Effect of air purification by Sterile 360 on mean length of stay in hospital.



3) Length of stay in the ICU

The mean length of stay in ICU during the post operative intensive care unit before installation of the sterile 360 (pre-installation study period) was found to be 3.2 days. However, following the implementation of Sterile 360, the average length of stay in the ICU decreased to 2.92 days during the post-installation study period, as shown in Figure 7. This reduction in the length of stay was not only statistically significant but also demonstrated the effectiveness of Sterile 360 in optimizing patient care and resource utilization in the hospital setting. The implementation of Sterile 360 not only shortened ICU stays but also contributed to improved patient outcomes and enhanced overall efficiency in the healthcare facility. By streamlining processes and enhancing infection control measures, Sterile 360 proved to be a valuable asset in providing high-quality care while reducing the burden on healthcare resources.

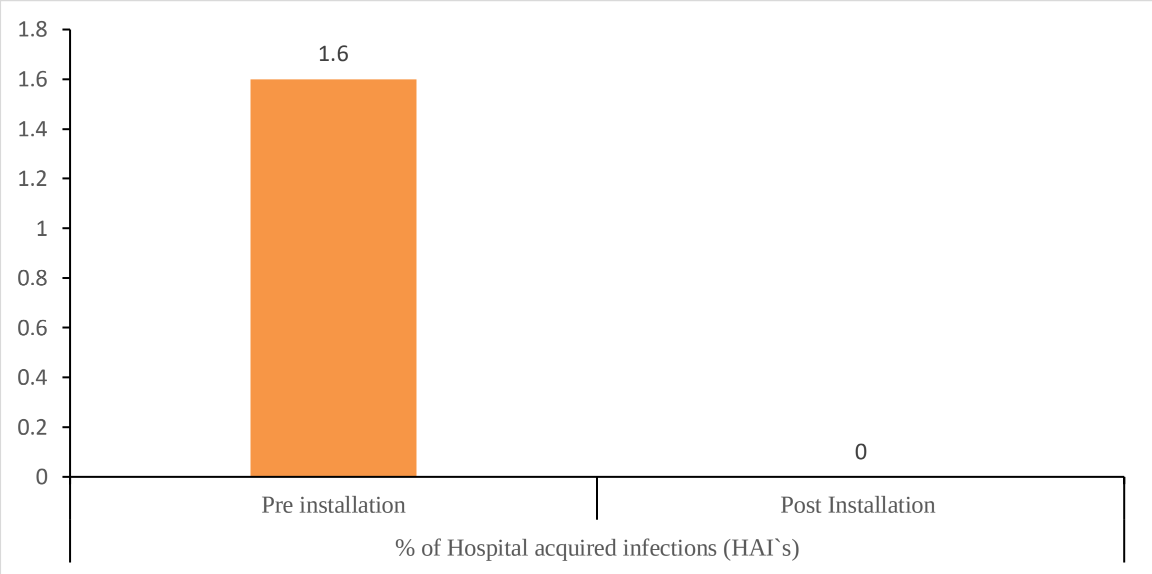
Figure 7. Effect of air purification by Sterile 360 on mean length of stay in ICU.



4) <u>Health care-associated infection or hospital-acquired infections (HAIs)</u>

The sterile 360 was able to reduce the percentage of hospital-acquired infections in patients admitted to post operational ICU (Figure 8). The implementation of the Sterile 360 air filtration system in the post-operational ICU led to a significant decrease in hospital-acquired infections among patients. Prior to the installation of Sterile 360, the percentage of hospital-acquired infections in patients admitted to the post-operational ICU was 1.6%. However, post-installation, this percentage dropped to an impressive 0%. The reduction in hospital-acquired infections observed after the installation of Sterile 360 was not only substantial but also statistically significant. This indicates the effectiveness of the air filtration system in preventing infections and promoting a safer environment for patients recovering in the ICU.The results of this study underscore the importance of implementing advanced air filtration technologies like Sterile 360 in healthcare settings to improve patient outcomes and reduce the risk of nosocomial infections. Further research and continuous monitoring of infection rates can help validate the long-term benefits of such interventions and guide future healthcare practices for infection control.

Figure 8. Effect of air purification by Sterile 360 on hospital-acquired infections (HAIs)



6. Discussion

Before the installation of the Sterile 360 system, the average CO_2 concentration in the postoperative intensive care unit was measured at 717 parts per million (ppm) during the pre-installation study period. However, during the post-installation study period, there was a notable decrease in the average CO_2 level, with a measurement of 431.43 ppm as shown in Figure 3. This reduction in CO_2 concentration was found to be statistically significant. It is worth highlighting that the Sterile 360 system demonstrated its effectiveness in significantly reducing the mean CO_2 levels in the postoperative intensive care unit.

The installation of the Sterile 360 system in the post-operative intensive care unit improved temperature control, maintaining it between 23.5 to 25.5 degrees Celsius and reducing average relative humidity from 62.45% to 48.63%. This enhancement in environmental conditions can potentially lead to better patient outcomes, reduced infection risks, and an overall improvement in the quality of care in the ICU. The study conducted with 400 patients (200 pre-installation phase, 200 post-installation phase) found no significant differences in demographic characteristics between the two groups, ensuring a balanced representation for a robust comparison. Consistent demographics enhance the study's reliability and validity for a more accurate assessment of the impact of installation on patient outcomes.

A notable decrease in hospital stay duration was observed as the mean length of stay dropped to 2.92 days during the post-installation study period, as shown in Figure 6. This reduction highlights the effectiveness of Sterile 360 in improving patient outcomes and operational efficiency within the healthcare facility. The findings suggest that the implementation of Sterile 360 had a positive impact on patient recovery and hospital resource utilization. Additionally, the statistical significance of the reduction in hospital stays demonstrates the potential of Sterile 360 to optimize post-operative care processes and enhance overall patient care quality. The implementation of the Sterile 360 air filtration system in the post-operational ICU resulted in a significant decrease in hospital-acquired infections among patients.

7. Conclusion

The study assessed the impact of air purification in critical care areas of healthcare facilities on environmental and clinical outcomes. Prior to the installation of the Sterile 360 system, the average CO_2 concentration in the postoperative intensive care unit was 717 ppm. Following the installation, there was a notable decrease in CO_2 levels to 431.43 ppm, indicating the system's efficacy in enhancing air quality. The system also enhanced temperature regulation, maintaining it within the range of 23.5 to 25.5 degrees Celsius and reducing average relative humidity from 62.45% to 48.63%, potentially resulting in improved patient outcomes.

Moreover, the average hospital stay duration significantly decreased to 2.92 days after the implementation of the system, suggesting that the Sterile 360 system effectively improved patient outcomes and operational efficiency. The adoption of Sterile 360 had a positive impact on patient recovery and hospital resource utilization.

8. Summary

Before the installation of the Sterile 360 system, the average CO_2 concentration in the postoperative intensive care unit was 717 ppm. After installation, there was a significant reduction in CO_2 levels to 431.43 ppm, indicating the system's effectiveness. The system also improved temperature control, maintaining it between 23.5 to 25.5 degrees Celsius and reducing average relative humidity from 62.45% to 48.63%, potentially leading to better patient outcomes. The mean hospital stay duration decreased significantly to 2.92 days post-installation, indicating Sterile 360's effectiveness in improving patient outcomes and operational efficiency. Implementation of Sterile 360 positively impacted patient recovery and hospital resource utilization, supported by statistically significant shorter hospital stays. The Sterile 360 air filtration system implemented in the post-operative ICU led to a notable reduction in cases of hospital-acquired infections among patients.

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10.ANNEXURES

UNIVERSITY OF HYDERABAD
INSTITUTIONAL ETHICS COMMITTEE DECISION LETTER

DHR: EC/NEW/INST/2023/3825

IEC No. Application No:	UH/IEC/2024/72	**Date of review**	11-01-2024
Project Title:	Evaluation of impact of air purification in critical care areas of healthcare facilities on environmental and clinical outcomes: Aprospective, interventional study		
Principal Investigator/ Co-PI:	Name of the Applicant: Nimisha V Appukuttan PI: Dr. Burri Ranga Reddy CI 1: Nimisha V Appukuttan CI 2: Ramanachary Namoju		
Participating Institutes if any	----	Approval from Participating Institute	---
Documents received and reviewed	Protocol & ICF		
In case of renewal submission of update	----		
Decision of the IEC:	Expedited/Exempted from full review Duration: One year from date of approval		
Any other Comments Requirements for conditional Approval	Expedited/Exempted from full review		
Members Present	Dr. A.S. Sreedhar, Dr. P. Uday Kumar, Shri. A. Madhava Rao, Prof. B.R. Shamanna, Prof. Bramanandam Manavathi, Dr. M. Srinivas, Dr. Samrat L. Sabat, Prof. Ajaya Kumar Sahoo, Dr. Ramesh Maturi, Mr. A. Jeevan, Dr. Deepa Srinivas, and Dr. M.K. Aruanasree		

Please note:
a.Any amendments in the protocol must be informed to the Ethics committee and fresh approval taken.
b.Any serious adverse event must be reported to the Ethics Committee within 48 hours in writing (mentioning the protocol No. or the study ID)
c.Any advertisement placed in the newspapers, magazines must be submitted for approval.
d.If the conduct of the study is to be continued beyond the approved period, an application for the same must be forwarded to the Ethics Committee.
e.It is hereby confirmed that neither you nor any of the members of the study team participated in the decision making/voting procedures and declared conflict of interest.

11/01/2024 — 11/1/24 — 11/1/24

Chairman	Member Secretary	Convenor
(Dr. A S Sreedhar)	(Prof. Bramanandam M.)	(Prof. B. R. Shamanna)

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