

Case Study: Air Purification System Reduces Infections and Staff Call-Outs

 **Phoebe**
Ministries

 **LifeAire**
Systems

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Categories:

- ◆ Reduce Number of Infections
- ◆ Increased Quality of Life
- ◆ Increased Resident Satisfaction

About the Organization

Organization Name:

Phoebe Ministries,
Allentown Campus

Main Contributor:

Michell Staska-Pier, VP,
Health Care Services

Organization Type:

Continuing Care
Retirement Community

Organization Description:

Phoebe Allentown is located in Allentown, PA. It is a senior living community serving over 300 individuals. The community provides a continuum of care ranging from independent living to skilled nursing and rehabilitative services.

Project Description

The LifeAire system was designed to destroy the DNA and RNA of all airborne pathogens, rendering them noninfectious. The technology was installed into Phoebe's ductwork and supplied ultra-pure air to a memory support floor. A study was conducted comparing the floor receiving LifeAire purified air plus high efficiency particulate air (HEPA) filtration to another floor with only HEPA filtration. A statistically significant reduction in facility acquired infections and staff call outs was associated with the installation of the LifeAire technology.

Infection Control Modality

Air Filtration & Disinfection

System Embodiment

In-Duct Air Purification System

Business Model

Private pay, Medicare insurance plans, Medical Assistance

Implementation Approach

Long-term care facilities (LTCFs) work to provide the best care for their residents, but illnesses and infections are a major source of added costs. Each illness or infection requires doctor visits, increased monitoring, additional medications, and potentially hospital admission. Most illness-causing pathogens originate from the air. The LifeAire System was designed to destroy the DNA and RNA in airborne pathogens, rendering them noninfectious. The technology also comprehensively remediates volatile organic compounds (VOCs). A study was conducted comparing the clinical outcomes of the LifeAire zone to a control zone with standard high efficiency particulate air (HEPA) filtration. It was hypothesized that the LifeAire technology would be associated with improved clinical and economic metrics.

The LifeAire technology was retrofitted onto the roof of Phoebe Ministries Allentown and used the existing HVAC layout. The technology is in line with the ductwork, after the air handler, and supplies ultra-pure air to a memory support resident floor. A study was conducted comparing the floor receiving LifeAire purified air plus HEPA filtration to another memory support resident floor with only HEPA remediation. The control floor was located directly below the study floor and both had the same physical layout.

Throughout the study, all unit ventilators and packaged terminal air conditioners remained operational.

Environmental data was collected and studied prospectively. Multiple locations were selected for environmental testing on both the study floor and the control floor. These locations included the corridor, two resident rooms, the community area and the dining area. Surface swabs were taken for commonly touched resident and clinical surfaces. Comprehensive air testing was performed which included VOC testing and airborne bacterial and fungal sampling. All samples were evaluated by third party independent laboratories.

Clinical data was studied prospectively between the study floor and the control floor and retrospectively pre and post installation. There were 38 residents and 14 staff members on each floor and none were excluded from the analysis. The study was powered to 90% and the control floor was used as the reference point. All of the data was provided by Phoebe and analyzed by an independent third party epidemiologist.

Outcomes

There was a statistically significant 88.43% reduction in airborne biological and fungal pathogens and an 89.88% reduction in total VOCs on the study floor pre vs. post installation. There was also a significant reduction in surface bacteria on the study floor compared to the control floor. It is critical to reduce airborne and surface pathogens, two common vectors of illness, when trying to create a safe environment for residents, visitors and staff.

Facility acquired infection (FAI) rates were calculated by dividing total infections by total patient days. A prospective evaluation comparing the FAI rates between the two floors revealed a statistically significant 39.6% reduction in FAIs. A retrospective evaluation comparing FAI rates on the study floor pre and post installation yielded a statistically significant 54.5% reduction in FAIs. The study team also noted a statistically significant 47% reduction in staff call-outs pre vs. post installation.

There is a direct link between FAI rates and the Centers for Medicare and Medicaid Services (CMS) reimbursements. CMS pays up to \$500/day/resident and withholds 2% of the total payout. Facilities earn back the withheld payment based on their healthcare performance which is ranked by CMS based on their

hospital readmission rates. Year over year improvement is considered along with overall ranking. A 39.6% reduction in FAIs will be reflected in a facility's improvement and will help the facility improve their overall rank to maximize reimbursement. If a resident becomes ill with a FAI, they may go to the hospital, causing the LTCF to lose their CMS reimbursement for that resident until they have returned to the LTCF for a predetermined amount of time. Reductions in FAIs from the AAPT have a direct and positive economic impact.

A 47% reduction in staff call-outs has a significant positive financial impact. When a staff member calls out, the facility is required to replace this individual either with a staff member or an agency nurse. Utilizing staff can result in overtime costs. Calling in agency nurses has negative ramifications both economically and clinically. Agency nurses cost significantly more than staff nurses and they disrupt the continuity of care causing increased care failures. The use of agency nurses is associated with increased falls, meal and medication errors, and negatively impacts resident mental wellbeing.

The findings supported the hypothesis that environmental factors impact clinical and economic metrics. The significant reductions in airborne and surface pathogens along with the dramatic reduction in FAIs and staff call-outs have a direct positive impact on facility economics along with the health and wellness of the residents and staff.

Lessons Learned/Advice to Share with Others

The installation of the LifeAire System resulted in dramatic environmental and clinical improvements. Air quality management systems are critical in long term care facilities in order to protect residents, visitors, and staff.