PHILIPS
Lifeline
White Paper

Population Health Management – **Analysis in the Home**

A Philips Lifeline White Paper

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Introduction

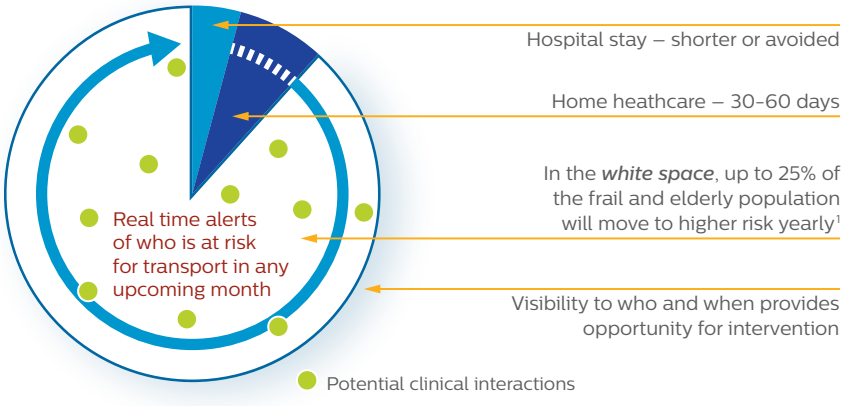
The rapid aging population is one of the most significant realities of our time with pervasive impact on our society and in particular, on healthcare. The graying of America is a trend driven by the baby boomer population that started to cross into the age 65 and over contingency in 2011[1] at a rate of 10,000/day.[2] By 2030, there will be about 72 million older persons, more than twice the number in 2000.[3] Chronic disease is prevalent in the older population[4] and management of chronic conditions has been a primary factor in spiraling healthcare costs.[5] The Affordable Care Act (ACA) of 2010 is the latest in a long legacy of legislation intended to "bend the cost curve."

The ACA has drawn attention to population health management (PHM) as a model of care with great promise in reducing costs, improving health outcomes, with greater patient satisfaction. PHM focuses on improving the health of a defined population, such as the frail and elderly, using pro-active, preventive measures, with post-acute accountability and a view to long-term health management. Philips Lifeline conducted research with healthcare organizations (HCO) leaders across the country to gain insight into gaps in care in PHM in order to inform Philips Lifeline innovation plans.

Staying connected with high-risk patients in the "white space," i.e. the time spent at home alone between health encounters, was identified as a critical need.

From the perspective of a healthcare provider, the "white space" is a black hole – a time and space in which the patient is disconnected from healthcare oversight and support.

The patient journey



As hospital stays are shortened or avoided to reduce costs and Medicare-certified home care services are time-limited, patients, especially the frail and elderly, of whom about one third live alone,[6] spend more time in the white space. Evidence shows that, without oversight, 25% of the frail and elderly population will be at greater risk with every passing year.[7]

This white paper introduces the Philips Frail and Elderly Program, powered by CareSage, the predictive analytics engine. Specific objectives are to:

1. Share insights gained from Philips Lifeline research with HCO executives and clinical leaders
2. Describe the features and functionality of the Philips Frail and Elderly Program, powered by CareSage and how the solution addresses critical gaps in PHM
3. Review Philips Lifeline's innovation roadmap and its alignment with needs of HCO's

Philips Lifeline Research Drives Innovation of PHM Solution

Philips Lifeline conducted market research with over sixty hospital executives and clinical thought leaders to learn the impact of healthcare reform on HCO's and how they were managing transitions from hospital to home. This research identified solution gaps and provided insight into what would be considered viable solutions for PHM in a risk-sharing environment. The end goal was to assure the Philips Lifeline innovation roadmap was aligned with the needs of HCO's. The research identified three areas of need:

1. A means of capturing dynamic changes in high risk patients in the "white space" to allow pro-active, preventive intervention and minimize risk of hospitalization for acute treatment
2. Data driven decision support tools integrated into clinical workflow to enable efficient deployment of staff resources to patients with the greatest need
3. Patient loyalty to prevent leakage to providers outside their network to maintain control of care management, costs, and patient experience

These concerns are captured in the following quote:

"When you're taking risk, the goal is to be able to stratify patients based upon need and to focus energies and resources on those with the greatest need."

—Senior Vice President, Chief Medical Officer, IDN/ACO

A recent report on PHM data analytics reinforces that risk stratification is foundational to effective PHM as is evidenced-based interventions.

Population Insight and Analytics

"The essential element to get right in population health management analytics is risk stratification. In the future, closing the loop and using patient and care management data to track whether PHM interventions are actually working will join the list of PHM must-haves. Going forward analyzing patient data and predicting risk will need to get a whole lot more sophisticated than what we are seeing today."

The Frail and Elderly Program, powered by CareSage is a PHM solution designed to address several of the critical gaps in PHM.

Introducing the Frail and Elderly Program, powered by CareSage predictive analytics engine

The Frail and Elderly Program, powered by CareSage predictive analytics engine, is a population health management (PHM) program developed through co-innovation initiatives with partner HCO's across the country and Philips research resources. The program leverages Lifeline's continuous medical alert service monitoring in the white space during a patient's length of time on the Lifeline service – an average of 32 months. The monitoring data is analyzed using a proprietary predictive algorithm to stratify patient risk and predict risk of emergency department transport in any upcoming 30-day period. The program generates actionable risk reporting to partner HCO's to enable proactive, preventive intervention. In short, the Frail and Elderly Program, powered by CareSage identifies dynamic changes in patient risk and enables intervention by the HCO at the right time with the right resources.

The Frail and Elderly Program uses a programmatic approach that transforms care delivery with several components that are implemented over time. The key components of the program are:

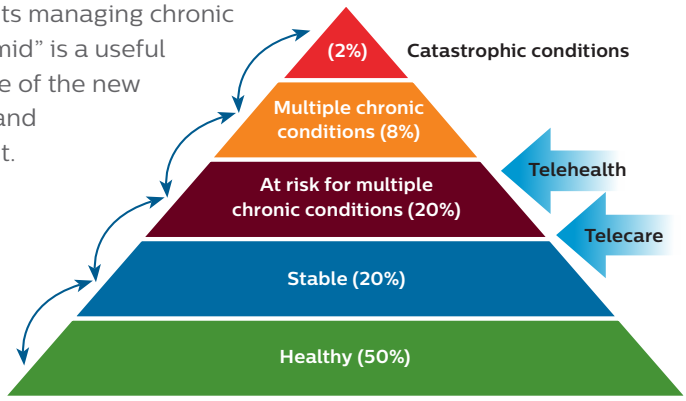
- Patient monitoring with the Lifeline HomeSafe with AutoAlert medical alert service
- Systems integration
- Risk stratification
- Data analytics and risk prediction
- Workflow integration
- Actionable reporting
- Clinical education and patient and family caregiver resources on falls prevention

AutoAlert effectiveness within comparable populations:**

- AutoAlert has reported twice as many falls as standard medical alert systems.
- AutoAlert has summoned help for 30% more severe falls that required transport to the hospital than standard medical alert systems.
- People with one or more medical conditions have 20% more falls than healthy individuals.

The Frail and Elderly Program, powered by CareSage provides value long term for HCO's and patients managing chronic conditions.[9] The "Kaiser Acuity Pyramid" is a useful construct for demonstrating the value of the new solution in the context of pre-acute and post-acute chronic care management.

Managing 30 day readmissions
Patient Segmentation with programs for those at risk



The goal of managing people with long-term conditions is to help them maintain health, keeping them at the lowest level of acuity and avoiding unnecessary emergency department (ED) and hospital admissions. The reality is that people move up and down the acuity pyramid with changes in their condition, their ability to cope, their sense of wellbeing and external factors that impinge on their life. The Lifeline medical alert service delivers value to people at any level in the pyramid, giving them a way to access a Lifeline response associate for help at any time, for any reason.

At the program configuration, the population will be stratified, and algorithm sensitivities and thresholds will be determined based on the HCO's preferences. Based on these settings, as changes in risk are detected alerts will be sent to the identified care providers for action. This allows for the care-giver to contact the patient in order to triage and determine the care plan. Advanced care coordination allows time for interventions that may prevent avoidable hospitalizations for a percentage of the population.

The Philips Lifeline PHM solution enables the HCO to take a proactive approach to care management: the program helps to stratify the population, it detects changes in risk and sends alerts to care providers using alert thresholds defined by the HCO. Timely care coordination allows for pre-acute care and may prevent an unnecessary hospitalization. There is a growing body of evidence that, especially for older adults, avoiding a hospitalization with intervention in the comfort of home by either home care services[10] or emerging home-based hospital care programs, yields optimal health outcomes at reduced cost — by 30% or more for hospital at home. Care at home also results in higher rates of patient satisfaction.[11]

Implementation Tiers

A three-tier implementation approach enables an HCO to gain early benefits from the program with implementation of the first tier using processes that can be easily integrated. We support the organization on the journey to interoperability of the program. Configuration and interoperability requires HCO IT resources and those of its Electronic Medical Records vendor which can be scheduled according to the HCO roadmap. Philips Lifeline provides support through every step in implementation.

Each of the implementation tiers is reviewed below with an overview, the key features and benefits and a discussion of key points. The overview contains an estimate of IT resource requirements and time needed for implementation.

The Frail and Elderly Program—**Tier I**

Establishes foundation for population monitoring with visibility into the white space

Overview

The first tier of the Frail and Elderly Program allows the referral process to begin and provides patients with the benefit of Lifeline's medical alert service, HomeSafe with AutoAlert, which includes fall detection capabilities while the integration of the program is taking place. AutoAlert provides patients with an added layer of protection by automatically

placing a call for help if a fall is detected, whether or not the subscriber pushes their personal help button.

The program can be implemented with no involvement of IT resources. Implementation of Tier I is based on a commitment by the HCO to assign and schedule IT resources to allow Tier 2 implementation within four months.

Features and Benefits

Tier I Key Features	Tier I Benefits
Patients provided with senior-accepted HomeSafe with AutoAlert medical alert service	• Expands the number of at-risk patients who have the benefit of early intervention • Potential for improved outcomes and reduced cost of care due to reduced lie times • Market differentiation
HCO receives patient incident reports revealing when a fall has occurred or when a patient has been transported for medical attention.	• HCO stays connected to patients in the "white space" to facilitate ongoing health management • Reduced patient leakage • Early indication of possible decline with fall detection
Subscriber calls answered in the name of the HCO according to Lifeline response protocols Preferred hospital identified at the time of emergency transport.	• Reinforced brand recognition and patient retention • Patient returns to HCO when services are needed up to twice as often with HCO's that provide the Lifeline services vs. those that don't (attribution)

Philips Frail and Elderly Program, powered by CareSage—**Tier II**

Provides view of HCO population distribution by risk/key stakeholder tools

Overview

Tier II of the Frail and Elderly Program enables a HCO to define patient risk segmentation criteria. At-a-glance operational and clinical dashboards and reports are delivered in this second tier and clinical, family and patient educational tools and resources are available.

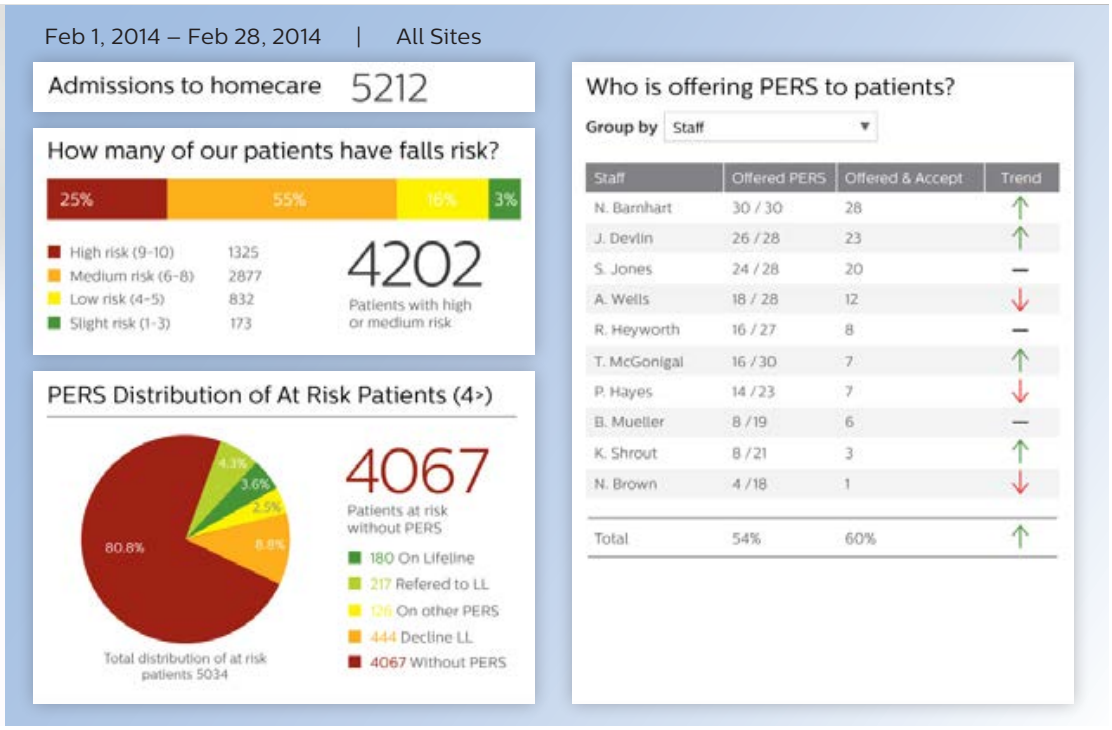
Tier II can be implemented with minimal involvement of IT resources. IT resources are required to automate the referral process and to transmit a daily report to Lifeline via a secure site.

This report contains data that is used in several ways:

1. Select patient identifying information allows Lifeline to contact and enroll the patients who have accepted the service.
2. Patient information includes additional data points that enrich the algorithm to support current analytics and will add value to future analytic advancements.
3. The data enables Lifeline to generate an operational population report based on the HCO's uniquely defined segmentation. On the next page is an example of a population report based upon falls segmentation.

Tier 2: Population Operational Reports

Example uses fall risk based on data



The above report also provides insights on clinician competency/improvement in discussing risk with patients and guiding patient acceptance of needed support services. Discussing risk may be a difficult conversation for some clinicians to initiate. The report allows the HCO organization to identify individual clinicians who might benefit from additional training to help assure that high-risk patients have the benefit of the service. We provide a continuing education credit for clinicians written by a leading physician on the subject of empowering patients who are at risk to utilize interventions like HomeSafe with AutoAlert.

Features and Benefits

Tier II Key Features	Tier II Benefits
Operational Report: Patient risk stratification and various patient activity reports	Provides view of HCO's population distribution by risk level
Operational Report: trend report on internal clinician engagement	Actionable insight to staff and patient engagement with the program
Program on-boarding toolkit and support	Maximize benefits of the program with best practices for implementation
Medical Record Number (MRN) linked to Lifeline subscriber	• Identify patients transported to HCO outside of network • Ability to cross market HCO services to Lifeline subscribers
Turnkey falls prevention training package including clinician, family caregiver and patient modules	• Increased patient and family engagement in falls prevention • Supportive continuing education units (CEU's) for select professions at no charge to the clinician • Staff education in priority issues

The Frail and Elderly Program, powered by CareSage—**Tier III**

Clinical workflow integration and predictive analytics

Overview

Implementation of Tier III enables an HCO to manage large populations over the long term, i.e. during the length of stay with Lifeline. This tier requires systems integration with a HCO's EMR and workflow software to enable patient risk stratification and to generate actionable status alerts. Implementation requires IT resources to a moderate degree (approximately 20 hours effort).

Features and Benefits

Tier III Key Features	Tier III Benefits
• Customized risk stratification definition • Integrated data analytics and proprietary predictive algorithm • Proactive identification of patients at risk for transport in any upcoming 30-day period • Customized algorithm sensitivity configuration	• Enables predictive, proactive outreach • Optimizes resources for patients identified as at risk for emergency transport for any upcoming 30 day period
Incorporates data from Philips devices	Provides a more complete picture of patient status based upon dynamic monitoring
• Integrates with clinician workflow: • Flags at-risk patients for enrollment • Triages caseload based upon risk prediction • Consultative service for best practice intervention	• Standardizes selection of patients for the program • Enhances staff efficiency • Reduces care variability and increases care reliability
Secure notifications and alerts of incidents	• Enhances care coordination across the continuum/HCO • Breaks down silos of care • Contributes to patient retention and long term value of patients

Discussion Tier III

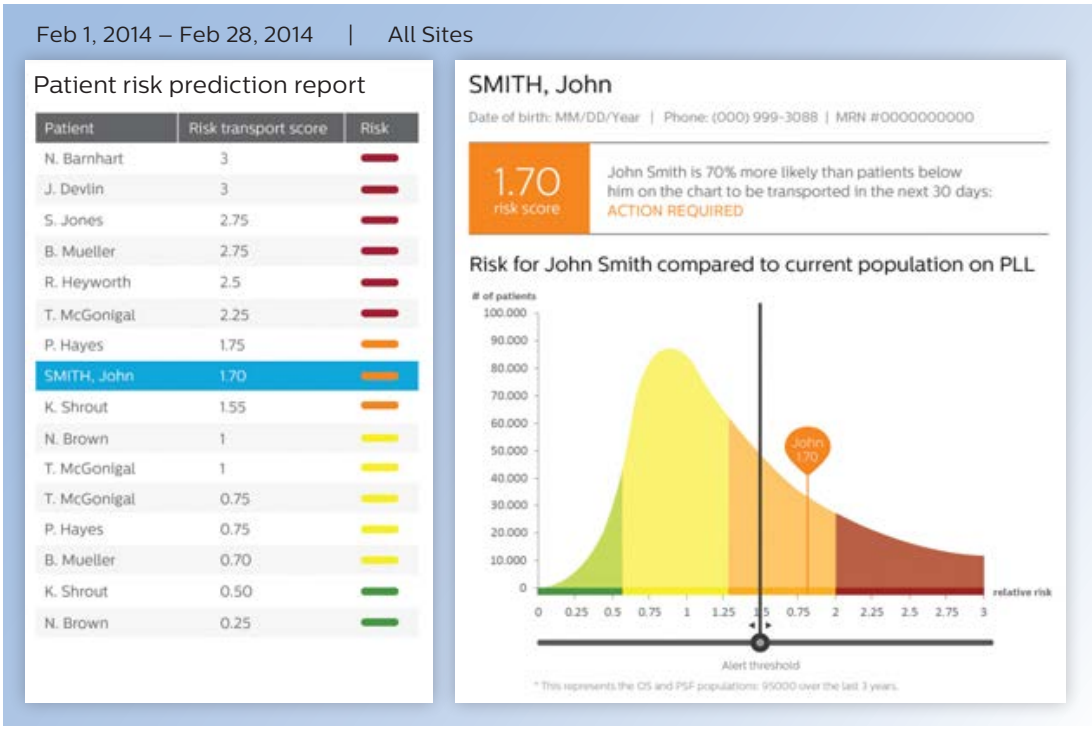
In this tier, data from the HCO's EMR is electronically transmitted to process the Lifeline service enrollment. The Lifeline medical alert service captures a wealth of information that is valuable in predicting risk of decline and need for intervention. Lifeline information is dynamic and includes data on frequency, timing and types of incidents and disposition of incidents, i.e. whether the situation was resolved with responder or emergency intervention and whether transport to the ED was required.

The Lifeline and EMR integrated data combined with proprietary predictive analytics and modeling delivers a decision support solution that enables predictive, proactive outreach. Results modeled on data from 600,000 patients and validated by a second data set of over 100,000, show that this program can be used to predict risk for transport for patients in any upcoming 30 days period. Based on the risk alerts, the clinicians at the HCO can intervene, beginning with a triage call or a survey to the patient. This may assist an organization to reduce unnecessary hospitalizations or emergency room visits. Hospitalizations and

emergency room visits contribute to costly care. Research has shown that up to 27% of hospitalizations may be avoided with proactive care.[13]

A second powerful finding based on data from over 25,000 admissions indicates a high correlation that patients of home health agencies who are provided Lifeline at the time of admission, return to that agency up to twice as often when future care is needed than similar patients who are not provided with Lifeline.***

Patient tethering and retention may be reflective of the proactive and collaborative care enabled by the Lifeline service.



The Tier III program integrates with provider workflow systems which allows for several additional benefits:

1. Referral to the program is automated within the clinicians' workflow providing a flag between a patient's assessment and program risk stratification.
2. A clinician's caseload may be automatically updated for patient risk stratification using a patient's most recent discharge data.
3. Customized configurations for the algorithm sensitivity and the thresholds for alerts can be made.
4. Alerts allowing for the patient triage, enhancing staff efficiency.

Clinical Implementations Opportunities

Risk stratification, risk alerts, and clinical workflow integration are essential to PHM but they are only valuable when the loop is closed with cost-effective interventions that yield improved outcomes. We are holding discussions with multiple organizations to implement a clinical studies that will evaluate and measure the results of their interventions and the cost savings with the use of CareSage.[12] The Frail and Elderly Program, powered by CareSage will be used to predict risk for transport and generate actionable notification to care managers for intervention to help prevent an adverse event. Care managers will triage patients and determine the intervention. Intervention options include Home-based care, tele-health monitoring and physician or EMS visits among others. Study outcomes will include cost of care based on several data points, quality of life and patient satisfaction.

CareSage is the latest innovation being built on the **Philips HealthSuite Digital Platform**, an open cloud-based platform that supports the secure collection and analysis of health and lifestyle data from multiple sources and devices.

Conclusion

Philips Lifeline is engaged in innovation that deepens its value proposition for the HCO ecosystem and the patients they serve. Ultimately Philips will provide the HCO access to an end-to-end population management transformational program that connects the patient, family caregiver, and HCO clinical team. Providing population health solutions with actionable information is at the core of Philips Lifeline research and development initiatives; allowing organizations to monitor many patients over a long period of time with senior accepted wearable technology. As financial risk is passed down from government agencies to healthcare providers and ultimately the patient (consumer), we will provide cost effective solutions enabling them to age in the place they call home.

We are committed to using an approach to enable HCOs to partner at whatever stage of readiness for systems integration and technological innovation. Innovative HCOs are invited to join us on the journey to support the preference of seniors to age in the comfort of their own home. We aim to meet the goals of the HCO to serve more patients, more efficiently, and more effectively.

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AutoAlert does not detect 100% of falls. If able to user should always push their button when they need help.

* Data cited comes from a 2014 Philips Research Study of over 400,000 customer records, which analyzed statistically similar populations of AutoAlert and standard medical alert system users.

*** Based on a study demonstrating that a high correlation between use of PLL and returning to the same homecare provider.

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