

Christine Lang, MBA – Senior Director of Product Strategy, OCS, Inc.

Tina Schwien, MN, MPH - Senior Data Consultant, OCS, Inc.

Sue Blockberger-Miller, RN, MSN, - Director of Education, OCS, Inc.

Anne Erickson – Data Consultant, OCS, Inc.

Predictive Modeling—To Improve Outcomes in Patients and Home Care



Copyright ©2008 OCS, Inc. All Rights Reserved.

OCS logos, and trademarks or registered trademarks of OCS or its subsidiaries in the United States and other countries. Copyright ©2006 OCS, Inc. All Rights Reserved.

Other names and brands may be claimed as the property of others. Information regarding third party products is provided solely for educational purposes. OCS, Inc. is not responsible for the performance or support of third party products and does not make any representations or warranties whatsoever regarding quality, reliability, functionality, or compatibility of these devices or products.

TABLE OF CONTENTS

■ INTRODUCTION.....	1
■ WHAT IS PREDICTIVE MODELING?	1
■ PREDICTIVE MODELING IN HEALTHCARE	2
■ PREDICTIVE MODELING IN HOME HEALTH	3
■ A CASE STUDY.....	4
■ DISCUSSION	5
■ CONCLUSION	6
■ AUTHORS.....	6
■ CONTACT US.....	6

INTRODUCTION

Healthcare is under tremendous pressure – pressure to cut costs, increase outcomes, improve patient satisfaction, reduce risk, improve patient safety, communicate and coordinate better with other providers, and – oh yeah – cut costs. Home health certainly isn't immune from this reality. Changes in the payment system, a looming pay-for-performance program, publicly reported outcomes, and increasing competition, just to name a few, place these pressures squarely on the shoulders of home care leaders and clinicians.

As we look to managing home care today and into the future, leaders must constantly be aware of emerging tools, technology, and approaches to providing care and managing an organization that will help alleviate all of these pressures and meet the demands of the vast myriad of stakeholders involved in the work that they do.

Predictive modeling is a powerful tool that has been used for decades in the insurance industry but is just starting to come into its own in clinical applications in healthcare. Predictive modeling has the potential to help managers and clinicians improve efficiencies and quality of care, thereby reducing costs, increasing outcomes, and improving the lives of patients.

WHAT IS PREDICTIVE MODELING?

Predictive modeling is a statistical process by which historical data is analyzed in order to create an algorithm that can be used to determine the likelihood of a future event. Predictive modeling helps identify the risk of an outcome, based on an in-depth understanding and analysis of what has happened in the past.

Predictive modeling has applications all around us, many that we don't even notice on a day-to-day basis. How much spam ends up in your email folder? If your company is like most, your IT department has implemented a spam filter that uses an analysis of the words and characteristics of an email in order to determine how likely it is that each message might be spam. Messages that exceed a specific threshold of probability get filtered out while the rest get delivered to you. That analysis and process is predictive modeling in action – identified spam email of the past has been studied in order to create an algorithm that can quickly and automatically scan and assess new messages to determine the probability that you don't care about whatever it is that the author has to offer you.

Predictive Modeling – To Improve Outcomes in Patients and Home Care

Beyond preventing unwanted pharmaceuticals ads, predictive modeling is used in business settings to determine the likelihood of everything from a consumer buying a product based on a combination of advertising and marketing messages to a care insurance customer having an accident. The probability determined by the predictive modeling process helps companies make decisions – decisions about where to spend their advertising budget or how much to charge for car insurance in order to be confident that future costs will be covered by ongoing revenues. Sometimes the decisions are a bit more straight-forward, other times more complex.

The approach to developing predictive models itself can be simple or complex. We use simple predictive models without even thinking about it in decisions that we make in our personal lives every day. For example, we know from past experience that a toddler who has missed his nap is much more likely to have a temper-tantrum before dinner. The equation in this example is simple – a single independent variable (presence and maybe length of a nap) and a single, binary (yes it happened, or no it didn't) dependent variable or outcome (temper-tantrum). With this knowledge, a parent can make decisions about how much work they will put into making sure that the toddler gets a nap or about how to arrange afternoon and evening activities to try to prevent or best manage the tantrum.

Most predictive models in use in business and healthcare fall into the complex category. People are complex, and there are often a lot of variables or characteristics that contribute to an outcome. The more complex a model, generally the more accurately it can predict outcomes. Complex predictive models can be developed using any number of statistical approaches, arguably the most common of which are uplift modeling, decision trees, and logistical regression. The beauty of these statistical approaches is that they can deal with the complexity of something like people, by taking into consideration multiple factors or characteristics in calculating anticipated risk or likelihood of an event.

PREDICTIVE MODELING IN HEALTHCARE

Health plans are the most well-known users of predictive modeling in healthcare. Insurance companies use predictive modeling to set premium rates, determine coverage and formularies, and calculate capitation payments. Prospective pay is another example of predictive modeling in healthcare. Prospective payment systems, including Home Health PPS, are developed by analyzing historical patterns of patient and cost information. The result is a calculation that takes into consideration patient characteristics in order to determine the payment based on the anticipated cost of that patient's care.

Clinical applications of predictive modeling in healthcare are not especially common, but offer a great deal of potential value to providers and patients. The problem is a lack of standardized comprehensive patient information tracked over an extended period of time. Most predictive models in

Predictive Modeling – To Improve Outcomes in Patients and Home Care

healthcare are based on claims data, which generally offer only information about diagnoses and limited patient demographic and treatment information. That information has been used to help insurance carriers identify patients who are appropriate for and would benefit from participation in disease management programs – a pseudo-clinical application that is still driven by expected cost impact.

PREDICTIVE MODELING IN HOME HEALTH

In home health we are offered a unique opportunity to evaluate patient outcomes over time and the relationship of those outcomes to patient characteristics – beyond age, gender, and primary diagnosis. The robustness of the OASIS allows these types of studies, and has given us the opportunity to develop predictive models that calculate the likelihood of patient outcomes.

Risk assessments calculated by predictive models can be useful tools in managing home health care. Understanding a patient's statistical risk of an outcome or event can help a clinical team make decisions in two important areas: 1) directing or creating a patient's plan of care, identifying the best clinical protocols and establishing appropriate visit timing; 2) allocating costly resources, such as telehealth, advanced wound treatments, or specialty care, to those patients who need them and will benefit from them the most.

Predictive modeling and risk assessments are complements to a clinician's experience, expertise, and intuition and can fit seamlessly into the clinical process. The standardization of the predictive model can greatly increase efficiencies in several ways. First, by offering a systematized way to make clinical decisions and utilize resources, the care planning process can be streamlined. Second, more standardized care and implementation of best practices can make it faster and easier to evaluate the work of your clinical teams. Third, the standardization and objective input to decision-making can help focus resource on the patients who need them most. Finally, using a common tool and a common language to determine a patient's level of risk and subsequent clinical care can increase understanding, communication, and cooperation in clinical or interdisciplinary teams. An automated predictive modeling tool can further increase efficiencies by not requiring duplicative data entry or manual calculations.

For the purposes of this report, we will focus on predicting risk of hospitalizations, although predictive models are not limited in functionality or usefulness to this outcome. Hospitalizations are a difficult and critical problem to address. We have been bombarded with information to reinforce these opinions: hospitalization rates are the one outcome that has not improved since the start of Home Health Compare; QIOs were focused on helping the industry reduce hospitalization rates; the single biggest factor in determining pay-for-performance bonuses under the current CMS demonstration

Predictive Modeling – To Improve Outcomes in Patients and Home Care

project is hospitalization rates. We know that hospital admissions are costly, sometimes unnecessary, and usually a burden on our patients and their families.

Hospitalizations are a difficult and critical problem to address, and predictive modeling may help the industry do just that.

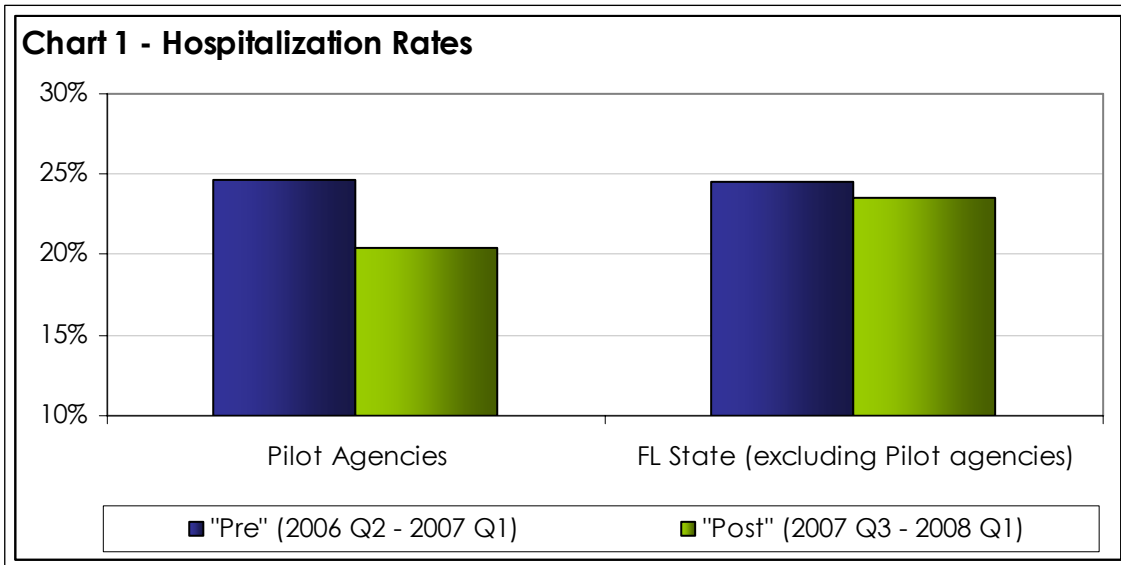
A CASE STUDY

In the fall of 2006, the Associated Home Health Industries of Florida (AHHIF) approached OCS. AHHIF was interested in assisting its member agencies with addressing the challenge of reducing hospitalizations and wanted to know how we could help.

Together, we implemented a pilot project, offering 15 Florida agencies the use of the OCS predictive modeling tool, PatientView. As part of this pilot project, agencies received a report listing each patient's statistically calculated predicted risk of requiring a hospitalization, a second report for each patient with detailed information about the characteristics contributing to the predicted risk, and training on transmitting data and interpreting the information in the reports. There were no broad-scale recommendations or trainings on how the agencies should implement clinical or process changes incorporating this information.

The pilot project participants implemented PatientView in the second quarter of 2006. In evaluating the success of this project, we looked at pre-project (2006Q2 – 2007Q1) and during-project (2007Q3 – 2008Q1) hospitalization rates in participating agencies and compared them to the rates of agencies in Florida not participating in the project (71 agencies).

The results were notable, to say the least, and actually pretty exciting (see **Chart 1**). The groups started with pre-project hospitalization rates that were almost identical: 24.6% in the pilot agencies and 24.5% in the other Florida agencies. After one quarter of implementation and three quarters of measuring post-implementation impact, the hospitalization rates in the entire state of Florida had dropped, but by only 4.2% (or 1 percentage point) in the non-pilot agencies (from 24.5% to 23.5%) and by 17.2% (or 4.2 percentage points) in the pilot agencies (from 24.6% to 20.4%). The difference in the reduction and the difference in the final hospitalization rates are statistically significant ($p < 0.01$).



The difference is also significant outside of statistical calculations. If those 15 pilot agencies had experienced the same reduction in hospitalization rates as the rest of the agencies in Florida, an additional 346 patients would have been hospitalized. As it is, 346 people and families were saved the disruption, discomfort and pain of a hospitalization.

DISCUSSION

We know very little about how the predictive modeling tool was used by individual agencies in this pilot project. We heard from some of the participants about plans to use the information to considerably revamp and refine clinical operations; we know that others did no more than provide their clinical management staff with the information about the predicted risk levels of their patients. Yet we saw a consistent decrease in hospitalization rates in each of the three quarters evaluated, resulting in a 17% reduction in the rate of hospitalization in less than a year.

Imagine if this result could be translated on a broader scale. Let's use some round numbers to get a glimpse of the potential impact – figure 4 million cases of home health care per year, 28% hospitalization rate, and that we could reduce that rate by only 10% instead of the 17% witnessed in the AHHIF pilot project. We could go from 1.12 million hospitalizations to 1.008 million hospitalizations, saving 112,000 patients from experiencing a hospitalization in one year. Saving the costs, risks, inconvenience, health impact, and fear associated with 112,000 people being admitted to the hospital in just one year.

Predictive Modeling – To Improve Outcomes in Patients and Home Care

CONCLUSION

Health care is challenging, rewarding, and ever changing. Many of us ended up with a career in the health field because of these characteristics, among others. It is exciting to see new opportunities to improve the quality of patient care. It is especially exciting when advancements offer the chance to improve patient care by both increasing outcomes and improving efficiencies.

Predictive modeling tools present such an opportunity. Predictive modeling can help us efficiently, systematically, and statistically better understand our patients and their risks. That understanding can help clinicians and providers do their jobs better – improving the allocation of resources, the implementation of best practices, and the focus on the patients who need them the most.

AUTHORS

Christine Lang, MBA
Senior Director of Product Strategy
OCS, Inc.

Sue Blockberger-Miller, RN, MSN
Director of Education
OCS, Inc.

Anne Erickson
Data Consultant
OCS, Inc.

Tina Schwien, MN, MPH
Senior Data Consultant
OCS, Inc.

CONTACT US

Address: 1818 E Mercer Street
Seattle, WA 98112

Email: info@ocsys.com

Website: www.ocsys.com

Tel: 888.325.3396

Fax: 206.720.6018

