

# Predictive Modeling

## NEWS

## MA to Use Predictive Modeling to Align MCO Payment to Predicted Risk

Rong Yi, Senior Scientist and Principal at Verisk, and Patrick Holland, Commonwealth Health Insurance Connector Authority CFO, share the details

by Russell A. Jackson

Verisk Health Inc., Boston, has completed a project with the brand-new Commonwealth Health Insurance Connector Authority – the entity formed to manage Massachusetts’ attempt at universal healthcare coverage – that involves using predictive modeling-based risk adjustment to allocate program rates across the managed care organizations that will be underwriting the recently uninsured who are now covered under the program. “Risk adjustment can help offset risk-selection issues and establish a fairer payment mechanism,” notes Rong Yi, PhD, Senior Scientist and Principal, Analytic Services, at the data company. But the Bay State isn’t stopping there in its use of predictive modeling. Connector Authority CFO Patrick Holland reports that the program hopes to expand its PM use into more patient-focused functions, including pinpointing the best candidates for coordinated disease management efforts.

Here’s some background on the project Verisk and the Authority worked on together, in edited excerpts from the abstract the pair submitted to the International Health Economics Association’s 7th World Congress on Health Economics, to be held in Beijing in July.

“In 2006, Massachusetts enacted legislation that would provide nearly universal coverage to state residents,” the abstract says. “The bipartisan legislation combined individual responsibility, through a mandate to purchase insurance, with government subsidies to ensure affordability. Implementation of the plan began at the end of 2006, and by July 2007, more than 170,000 previously uninsured adults had gained coverage.”

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## Pair Plan to Use Predictive Modeling to Predict, Prevent Patient Safety Lapses in Hospitals

Aviation-based safety systems have surprising applications to hospital error reduction

by Russell A. Jackson

Hospitals can do a better job of predicting – and then preventing – patient safety issues with predictive models populated with details of real past incidents. Using programs similar to those employed in air travel and space flight, healthcare executives can tap the collective experiential wisdom of the recently congressionally created “patient safety organizations” – entities empowered to gather confidential information on lapses in patient care -- and use the results to keep patients alive and out of harm’s way.

“Continuing concern over preventable harm to patients due to medical error has inspired a government agency to emulate a leading aviation safety system,” reports Human Performance Technology Group, Memphis, one of the first PSOs created under the Patient Safety and Quality Improvement Act of 2005, which itself was “an immediate outcome of recommendations in the Institute of Medicine ‘Crossing the Quality Chasm’ series of reports.” PSOs, the company says, will “provide a secure environment in which clinicians and healthcare organizations can collect, aggregate and analyze data that enable the identification and reduction of risks and hazards associated with patient care.”

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## MA to Use PM to Align MCO Payment... *continued*

The abstract continues: "The Connector Authority is the independent public entity established to facilitate the availability, choice and adoption of private health insurance for eligible individuals and groups as regulated by the Massachusetts Health Care Reform Act of 2006. To better understand the healthcare needs of the uninsured and to be better informed in contracting with health plans, the Authority is using a risk-adjusted capitation payment methodology for fiscal year 2010 for the Commonwealth Care program."

That's where Verisk comes in. It was chosen to assist with risk-adjustment model selection. To do so, the company "obtained CommCare enrollment data for calendar year 2007 and medical and pharmacy claims incurred in calendar year 2007 and paid through March 31, 2008," the abstract notes. "There are 183,549 unique individuals in the study period, with an average age of 38.4, a female-to-male ratio of 53:47 and average eligible months of 5.84, sitting right between the commercial and Medicaid benchmarks."

The data, the abstract points out, were processed through Verisk's software, which "maps the ICD-9-CM diagnosis codes from all sites of service into 184 condition categories. Individuals with multiple medical claims may have multiple CCs, and those with no medical encounters have none. Clinical hierarchies identify the most costly manifestation of each distinct disease for each individual. The models not only create a comprehensive clinical profile for each individual, they provide each person's predicted healthcare costs, expressed in relative risk scores."

From that effort, Verisk chose two candidate models: one developed for the commercially insured population and one based on a Medicaid managed care population. "Based on a comparison of the CommCare data to the demographic composition, disease prevalence rates and risk and cost distributions of those benchmarks," the firm says in the abstract, it concluded that "the CommCare population most closely resembles the commercial experience."

And "through evaluation of widely accepted predictive performance measures," the data company again "concluded that the commercial model is a better fit to the CommCare population."

*Predictive Modeling News* talked to Yi and Holland about their work together and about Massachusetts' plans for increased use of predictive modeling.

**Predictive Modeling News:** Are the formerly uninsured enrolled in a separate program than Medicaid eligibles and those who've had private insurance all along? Or are they more like government-subsidized members of the same plans?

**Patrick Holland:** Before CommCare, treatment for people who were uninsured, but who did not qualify for Medicaid, would come from an uncompensated care pool. On an episodic basis, people would present for services primarily at emergency rooms, and the state would reimburse the hospital for each episode of care. But as part of the healthcare reform law, CommCare was created for people who do not qualify for Medicaid or have employer-sponsored coverage. The new program shifts resources from the uncompensated care pool to pay managed care organizations to help manage those people and move them into primary care-focused insurance. The benefits provided under the program are determined by our board of directors, an entity created to administer the program on behalf of the state. There are no families per se in the program. If you're a family and you qualify, you and your spouse would go into the program as individuals and your children would be enrolled in Medicaid. The CommCare program is for adults at or below 300% of the federal poverty level.

**PMN:** Does the existing Medicaid program use a similar risk-adjustment methodology for plan payment?

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## Additional Information Needed to Weigh Adding Biomarkers to Risk Models

A recent article in the *Archives of Internal Medicine* addresses the limited clinical information provided by summary measures

**C**omparing new predictive models or biomarkers to existing data tools by four of the most common means – global fit, discrimination, calibration and reclassification – may not give clinicians an adequate picture of the value of the new models and markers in the treatment of cardiovascular disease. Instead, researchers should also add graphics to their comparisons. That's what authors Kevin McGeechan MBIostat, Petra Macaskill PhD, Les Irwig MBCh PhD, Gerald Liew MBBS Mmed, and Tien Y. Wong MD PhD recommend in "Assessing New Biomarkers and Predictive Models for Use in Clinical Practice," from the November 24, 2008, issue of *Archives of Internal Medicine*.

Here's the abstract of the article:

New biomarkers and predictive models that aim to improve the identification of people at risk of cardiovascular disease are constantly proposed. Clinicians need to be aware of the various methods used to assess the biomarkers and models and how they should be interpreted. New biomarkers and models are assessed in terms of their contribution to global fit, discrimination, calibration and reclassification. Those measures, when used in isolation, do not address the clinically important questions of whether the new model predicts risk more accurately than existing models and whether the risks predicted for individuals are sufficiently different to warrant a change in treatment decisions.

We recommend that the measures be supplemented with graphical displays, such as a calibration plot for the Hosmer-Lemeshow test and a scatterplot of the risks predicted by the models being compared. We encourage researchers to report such analyses from studies on the clinical utility of new biomarkers because that information is pertinent for the clinician who must decide whether to test for a new biomarker in his or her clinical practice.

And here are excerpts from the paper:

Guidelines for the prevention of cardiovascular disease among asymptomatic people recommend that a person's CVD risk should be used to guide the type and intensity of preventive measures (eg, dietary advice, physical activity, smoking cessation and medication use). The risk of CVD is typically estimated using traditional CVD risk factors including blood pressure, cholesterol levels and smoking status, which are combined using a risk model such as the Framingham risk score. However, new models and biomarkers that claim to provide improved and more accurate estimates of CVD risk (eg, high-sensitivity C-reactive protein level or coronary calcium score) are constantly proposed, with an aim to allow more appropriate targeting of interventions.

When a new model or biomarker is reported, it is commonly compared with an existing model (e.g., the Framingham risk score) according to four summary statistical measures:

- [1] Global measures of model fit: How likely is it that the new model chosen would give rise to the data observed?
- [2] Discrimination: How well does the new model separate individuals who develop the outcome from those who do not?
- [3] Calibration: How close are the predicted risks to the actual observed risks?
- [4] Reclassification: Does the new model sufficiently change a person's risk to move him or her into a different risk category and thus alter treatment decisions?

Is it possible to use those four measures to answer two questions regarding risk prediction?

- [1] Does the new model predict risk more accurately than existing models?
- [2] Are the risks predicted for individuals sufficiently different to warrant a change in treatment decisions?

We can use the statistical measures and graphical displays developed for each of the four measures to help answer the two questions. However, the measures and displays must be interpreted with caution.

Two commonly used measures of global fit are the Akaike Information Criterion and the Bayes Information Criterion, which provide information on how likely the model chosen would give rise to the data observed. [But] when [they're] used to compare models with different variables, they are, on their own, of limited use because they do not provide information that can be used to answer the clinically important questions of whether the new model is more accurate or whether the predicted risks are sufficiently different to warrant a change in treatment decisions. When they are used to determine whether adding a new marker to an existing model is worthwhile, they do not provide any more information than the test of whether a new marker is significantly associated with the outcome.

Discrimination is usually reported as the C statistic, the probability that a randomly selected person with the event will have a higher predicted risk than a randomly selected person without the event. Although the C statistic is considered to have clinical meaning and provide a more appropriate test of a biomarker's predictive ability, it also has important limitations. It may be insensitive to clinically important risk differences because it assesses risk rankings and does not take into account relative differences in risk magnitude.

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**MA to Use PM to Align MCO Payment...** *continued*

**PH:** Medicaid does have a managed care program that pays insurers on a capitated basis. As I understand it, the program is contemplating employing predictive modeling software, but as of now, the Connector is the only program employing the PM tool to allocate dollars across insurers.

**Rong Yi:** The Medicaid program does plan to use our predictive modeling tool for the coming fiscal year. In our proposal, we talked conceptually about how the PM tool can also help measure quality and efficiency in outcomes. Such a tool certainly would help in a lot of decision-making.

**PMN:** How does the bidding process work for the CommCare program eligibles?

**PH:** Because it's a fairly new program, and we're charged with procuring services for people who were previously uninsured, we received bids from Medicaid MCOs to provide health services to those members. Initially, by law, only four managed care companies were allowed to bid. We had a competitive bidding process related to specific benefits, in which we created an incentive for plans to come to the table with efficiencies, hoping to elicit aggressive bidding. Our end game was to procure cost-effective care. But by doing so, we created some selection issues among the four plans.

**PMN:** How did that happen?

**PH:** The plans bid different price points for various income categories and a few of the MCOs highly valued the incentive we employed that rewarded the lowest bidder with differentially more membership. Additionally, if an enrollee earns between 0% and 150% of poverty, benefits are fully subsidized, for the most part. However, if you earn between 150% and 200% of poverty, you pay \$39 a month for individual coverage for full benefits. If you earn between 200% and 250% of poverty, you pay \$77 a month for those benefits, and if you earn between 250% and 300%, you pay \$116. Again, as an incentive for the MCOs to bid low and provide greater value to the state, enrollees who select a plan that is not the lowest-price option are required to pay the full differential. That had the effect of creating choice for members, which resulted in classic selection issues emerging in the program. As we started strategizing for fiscal year 2010 procurement, we decided we'd go to the market and look for a PM tool to smooth out the selection issues and reallocate payments based on actual risk.

**PMN:** How will that play out?

**PH:** We'll employ the PM tool to start aligning the monthly capitation payment with the risk of the enrollees in each MCO. From the same pool of money, we're going to start aligning the payments to individual plans, taking dollars away from plans with better-than-average risk and providing dollars to other plans with worse-than-average risk. In other words, we're using the PM tool not to help set the rates, but to allocate dollars across the plans. We've set up the predictive modeling program so that payment will be better aligned with risk in the short term. In the long term, we see creative ways of using the software, such as better understanding the acuity of the population and some insight into ways we can structure specific disease management programs.

**PMN:** Are there plans to roll the CommCare folks into the traditional Medicaid population?

**PH:** CommCare is a separate program that covers individuals who are not eligible for Medicaid. Therefore, there are no such plans.

**PMN:** How much money will move around among the four plans as a result of using the PM tool?

**PH:** The question is: What's the impact of using the predictive software on payments? Rather than answer directly, I'll say that because we're still learning about the population and how to apply predictive risk assessment in a fair and uniform way, we've softened the impact of the reallocation by ramping up use of it slowly in the first year. We'll analyze the results and then roll it out fully downstream. As part of FY2010 procurement, we're telling plans how the PM tool will be used. We see that as a positive. Plans will know that if they are experiencing selection issues, they'll be paid accordingly.

**PMN:** Any specific plans for how you'll use predictive modeling moving forward?

**PH:** Right now, because it's such a new program, we're trying to continue to be innovative and understand how this new methodology will play out. I'm sure we will continue to learn from the process and will continue to refine and tweak it. We're not sure how we'll use PM tools going forward, but we do see ourselves trying to expand more and more on their use to align the goals of the state and the plans. We're not all the way there yet. We want to see how it maps out to enrollment downstream. What we like about the model we're employing is it may allow us to work collaboratively on disease management programs with the MCOs. My guess is that we will always use it allocate resources, but we want to go further with it, exploring how we can identify opportunities for savings and improved quality. That's an even more powerful aspect of how we want to manage the program. The real issue to tackle collectively is controlling costs. Using sophisticated software will allow us to identify what disease state is most prevalent and then work collaboratively with our MCO partners to determine the best programs for lowering their disease burden.

**PMN:** Are there opportunities in that effort for companies like Verisk?

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**MA to Use PM to Align MCO Payment... *continued***

**RY:** That's exactly what we do. We're following the movement of the program, of course, and if there's a place where we can be of further help, we want to be part of that. The Connector, in my opinion, is really the avant garde of adopting risk adjustment, of really thinking through the information and having a well-thought-out game plan. The program uses the phrase "punishing the data" to mean really scrutinizing the information going into and coming out of the model to identify the practical challenges we might encounter when we implement the PM tool. They've really thought through the whole process.

**PMN:** Is there anything technologically new, from Verisk's perspective, in your work with CommCare?

**RY:** There were some technological challenges to the way we selected which model to use for the uninsured population. Ideally, we'd want 24 to 36 months' data to customize a predictive model for the program. But the limited availability of data and the time line didn't allow that, so we were limited to choosing a model that fits the current population best. And in that selection process, we did come up with some fairly innovative selection approaches. Because nothing was going to be a perfect fit, we had to look at which model was closer to the expected experience of the newly insured. In the analysis, we examined CommCare's disease prevalence rates, demographic composition, benefit plan type and healthcare cost and utilization patterns. The key metrics were compared to those of age/sex-comparable samples for the commercially insured population and the Medicaid managed care population. Having answered the question of which population CommCare resembles more, we moved on to the next question, which was how well a risk-adjustment model fit on the CommCare population, especially with regard to short eligibility, membership churn and pent-up demand. We're hoping that people will look at the Massachusetts experience and learn something from the visionaries there. We have something quite unique in terms of methodology and application.

Verisk Health is the new name for the old DxCG, now that it has just merged with D2Hawkeye. The CommCare program is in active procurement toward a July 1 implementation date, as of PMN's deadline, using the PM-based premium distribution methodology for the first time as part of the request for proposals. Visit [www.veriskhealthcare.com](http://www.veriskhealthcare.com) and [www.healtheconomics.org](http://www.healtheconomics.org). Contact Yi at [rong.yi@veriskhealthcare.com](mailto:rong.yi@veriskhealthcare.com) and Holland at [patrick.holland@state.ma.us](mailto:patrick.holland@state.ma.us)

**Additional Information Needed... *continued***

An alternative measure of discrimination, the Integrated Discrimination Improvement, does take into account differences in predicted risk. It measures the separation between people who develop the outcome and those who do not in terms of the average predicted risks for the two groups. However, as with global measures of fit, neither the C statistic nor the IDI directly answers the two clinically important questions previously raised, so the following measures are needed to address them.

**Additional Information Needed... *continued***

Measures of calibration provide information on how close the predicted risks are to the observed risks. [They] directly address the first question: Does the new predictive model predict risk more accurately than the old model? The calibration of a model can be summarized using the Hosmer-Lemeshow test or variations of it. The test compares the observed number of people with events within pre-specified risk groupings (eg, deciles of risk) with the number predicted by the model. An important drawback is its performance is affected by how the groups are formed. For example, in an evaluation of adding high-sensitivity C-reactive protein level to the Framingham variables in a CVD prediction score, it leads to contradictory results depending on whether the groups were formed using equal increments of risk or deciles of risk. Another limitation is the test tends to poorly rate models that are adequate when the predicted risks are similar across the sample and when sample sizes are large because of the resulting high power to detect small, clinically insignificant differences in risk.

Measures of reclassification tell us whether using the new model or marker changes a person's risk sufficiently for treatment decisions to change. Their use requires the existence of predefined risk levels at which treatments would change, as well as the existence of effective treatments at different risk levels. In many intensively researched areas, there may be a lack of effective interventions, limiting the use of risk prediction models. [Also,] measures of reclassification do not distinguish between individuals correctly reclassified and those incorrectly reclassified. The Net Reclassification Improvement takes directional movement into account and thereby focuses on the risks that may be of high interest to the clinician. [Its] four components are the proportion of individuals with events who move up or down a category and [that] of individuals with nonevents who [do so]. [Those] separate components are needed to address the second clinical question: Are the risks predicted for individuals sufficiently different to warrant a change in treatment decisions? However, a major issue with NRI is it may be affected by the cut points chosen and how many groups are used in the categorization, a problem it has in common with the Hosmer-Lemeshow test. It should also be noted that reclassifying a person between adjacent categories carries the same weight as reclassifying a person between risk categories far apart.

There are no agreed values for what represents clinically meaningful changes in the four summary statistical measures described [above]. One reason is in [their] calculation, statistical weightings are given to the misclassification of people who develop the outcome and those who do not. Those weightings may not reflect the clinical importance. One solution would be to apply different weights to the changes in risk that more appropriately reflect their clinical importance. Such an analysis would weigh up the costs (financial, inconvenience, adverse effects for patients) of measuring the new marker as well as the benefits (events prevented and reassurance provided).

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## Pair Plan to Use PM to Predict... *continued*

Supporters of the PSO program note that the combination of physicians' fear of disclosure and isolated, non-standardized data hampers learning from the information collected on patient safety events. Similar to NASA's Aviation Safety Reporting System, the new government-sanctioned PSOs, therefore, allow for confidential reporting and analysis of data on adverse medical events without fear of legal discovery.

ASRS is the world's largest repository of aviation human factors information, HPTG points out in a statement. Pilots anonymously report as many as 40,000 mistakes a year to the database system, which is maintained by NASA.

"Tracking reported errors for more than 30 years has allowed researchers to effectively pinpoint problems within the aviation system, identify safety risks and proactively address the problems before flying customers are jeopardized," the statement says. "In an effort to achieve similar success, the government has designed a healthcare safety reporting system utilizing multiple data collection agencies designated as PSOs."

The Agency for Healthcare Research and Quality recently listed HPTG as one of the first such organizations. Lindsey Donges, president there and a commercial airline pilot who's familiar with ASRS' benefits, created the firm after experiencing errors in his own healthcare, he says.

HPTG "offers a proven communication and data analysis and measurement application called KBCore that's similar to NASA's system," he explains. "Powered by KBCore, HPTG's customized, Web-based data collection modules capture, analyze, share and manage hospital-wide patient safety data from multiple hospitals in a standardized format and with a primary focus on learning, aggregating and building knowledge."

Supporters of the PSO program note that the combination of physicians' fear of disclosure and isolated, non-standardized data hampers learning from the information collected on patient safety events. Similar to NASA's Aviation Safety Reporting System, the new government-sanctioned PSOs, therefore, allow for confidential reporting and analysis of data on adverse medical events without fear of legal discovery.

He adds: "I lived through a culture change in aviation over the past 35 years and I can tell you firsthand that the culture of team-building, communicating and knowledge-building is desperately needed in the dynamic environment of practicing medicine in hospitals of the future."

To ensure that hospitals "get the maximum benefit from embedding a proactive, preventive and predictive patient safety knowledge communication and analysis system," HPTG is collaborating with LifeWings Partners, the nation's largest provider of aviation-based safety systems for hospitals. The company's Crew Resource Management program, built by a former Top Gun instructor and a group of commercial airline pilots, former astronauts, physicians, nurses and risk managers, "has been proven to significantly and measurably reduce errors, increase patient and employee satisfaction, reduce turnover and cut healthcare costs," the statement continues.

Taught to more than 13,000 medical team members a year, the LifeWings system "has been a resounding success at scores of institutions," the company says. Healthcare facilities using the program report seeing error rates reduced ten-fold, observing mortality rates cut by 43% and decreasing surgical count errors by 50%, says Stephen Harden, president and co-founder of LifeWings. "The teams we work with are, in many respects, just like flight crews. They are extremely skilled, highly dedicated and disciplined professionals who take their work seriously. We find that the practices developed for the LifeWings CRM program resonate with them."

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*Predictive Modeling News* discussed using predictive modeling to improve patient safety with Donges and Harden.

**Predictive Modeling News:** Please clarify what each of your companies does, and how you work together. Is HPTG the technology side of it and LifeWings the training side of it?

**Stephen Harden:** LifeWings implements for healthcare organizations the same team training and safety tools that have made aviation so safe and reliable. LifeWings has helped more than 90 organizations in 27 states create better teams, implement safer systems of care and lower costs. Hospitals that have used our system have documented hundreds of lives saved, fewer infections, elimination of surgical mistakes, fewer errors and better treatment outcomes. As they become safer, they also become more efficient -- decreasing delays, reducing waste, improving turnover and taking less time to do routine tasks.

**Lindsey Donges:** HPTG provides hospitals with a platform to receive and manage patient safety information to meet Patient Safety Evaluation System requirements for participation in PSOs. KBCore is a knowledge-building application designed and built by CRG Medical Inc. to meet a recommendation in the 1999 Institute of Medicine report "To Err is Human" to have a system to collect and analyze data about errors, near misses, mistakes and incident reports and to identify root causes and trends. HPTG also provides the InfoTool diagnostic research tool used to identify, with laser precision, where a particular problem lies within a facility. Once the real and underlying causes have been identified, LifeWings is better equipped to customize training and process improvements to address the real issues a hospital is confronting.

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**Pair Plan to Use PM to Predict...** *continued*

**PMN:** What patient safety programs does LifeWings offer in hospitals now?

**SH:** LifeWings provides five main safety programs. One is leadership development, to ensure the executive team has the change management skills needed to guide the effort to create a culture of safety. Another program is team training based on the AHRQ-sponsored TeamSTEPPS program to equip healthcare teams with effective communication, collaboration and coordination skills. Training is based on needs assessment, which is conducted using the results of HPTG's PSO data, on-site observation and in situ simulation using structured scenarios. The combination of methods is very predictive and will tell us exactly what needs to be addressed to prevent future errors and mishaps. A third program is creating and implementing hardwired safety tools to hardwire effective teamwork behaviors into daily work life. Tools include checklists, standard operating procedures, code words, communication scripts, patient handoff checklists, protocols and algorithms. The fourth program is data collection and assessment to document "before" and "after" changes that prove results and allow an organization to manage its effort. And the fifth is "master-train-the-trainer" to provide the facility with the internal capability to implement the program in any department and sustain the culture change over time.

**PMN:** Is that with HPTG or on your own?

**SH:** We are not currently using the results of the HPTG effort in any of our work. But will do so as hospitals begin to transfer their data to the HPTG PSO.

**PMN:** What is HPTG doing in hospitals now?

**LD:** HPTG is interviewing hospitals and hospital associations that want to contract with a PSO. The PSOs only began working with hospital clients since the final rule went into effect on January 19. Now, hospitals and other PSOs can sign contracts with HPTG to provide legal gap analyses and needs assessments for institutions that want to become "component PSOs" or to contract with the HPTG PSO. HPTG will receive and analyze information provided as "patient safety work product" from the hospitals for quality improvement and safer patient outcomes purposes.

**PMN:** What are you both doing now, under the government's PSO program, that you weren't doing before?

**SH:** In a hospital, as of now, nothing. What we are doing internally is revising our needs assessment process to take into account the patient safety work product of the PSO so we can use it in the future to refine our training customization process.

**PMN:** Is the PSO program up and running?

**LD:** The PSO program is made up of several parts that all need to be associated with a PSES at the hospital level. Once a hospital decides that it will seek the privilege and the confidentiality umbrella of the Act, it is obliged to establish a PSES and the protocols, policies and procedures that will define what is and what is not PSWP. The HPTG PSO will have in place the KBCore application, which will include the AHRQ-designed "Common Formats" for recording and transmitting patient safety information between secure entities. Like all the other PSOs, HPTG will send common-format data to the PSO Privacy Protection Center in Iowa for de-identification and forwarding to the National Patient Safety Databases for public distribution. That will probably not happen for many months while the PSOs grow and collect data.

**PMN:** Are you actively seeking hospital clients?

**SH:** Yes. We will offer the combined HPTG/LifeWings partnership to them. We are also revisiting current clients to offer the HPTG PSO for their data collection needs and as a means of ensuring the sustainment of their targeted patient safety efforts.

**PMN:** How many safety incidents are in your database now?

**LD:** The hospitals own their own data, even if it has been put into KBCore, so we do not know exactly how many total events are recorded. The interesting issue is hospitals beginning to use KBCore as the proactive, preventive and predictive tool it was designed to be, rather than using it in a reactive, responsive and punitive mode. As the patient safety culture climate changes in the various hospitals, and as clinicians feel safe with the PSES system and working on performance improvement, the number of recorded near-miss occurrences will increase and the actual number of patient safety incidents and preventable medical errors will decrease.

**PMN:** Tell us about the predictive aspects of the patient safety program. How will the two of you use the information in KBCore to predict patient safety issues and keep them from arising?

**SH:** For many years, healthcare has waited until an adverse event has occurred and then has conducted a root cause analysis, then has retroactively tried to change the conditions that allowed the event to occur. The new process analyzes critical incidents, potential errors, small errors and near misses to spot trends and identify potential "holes" before a serious event occurs. It proactively assesses the system under which care is delivered and shores up the weak parts of that system before the system produces a patient-harming failure. It is very similar to the NASA ASRS. That database collects reports of incidents and near misses from pilots and crews operating in the aviation system and is periodically mined by the agency operating the system to detect trends that need intervention. Two trends recently identified were altitude busts (pilots climbing to the wrong altitude due to inattention or communications issues) and runway incursions (crossing an active runway without a clearance from ground control and putting aircraft at risk of collision). Based on the trend data, the FAA was able to put effective training and tools in place to counteract the potential for disaster.

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**Additional Information Needed...continued**

We suggest several additional measures that could be used to address the limited clinical information provided by the summary measures.

Graphical displays may provide more clinically useful information than the four aforementioned summary measures. The reporting of the Hosmer-Lemeshow test should be accompanied by a bar graph displaying the average observed and predicted risks for either deciles of risk or equal increments of risk categories, allowing the clinician to decide at a glance the first clinically important question of whether the difference between observed and predicted risk is large enough to be clinically important. A scatterplot of risks predicted by the two models – the original and the new – addresses the second clinically important question, displaying the information used in the calculation of the NRI. One important advantage of the scatterplot over the NRI is it [can] highlight that, [for example], although people may change risk categories, there is only a small absolute change in risk that occurs with the addition of [a given data element]. The clinician now has the information to decide whether [a] small change in risk is important enough to warrant use of the new predictive model. [Finally,] the number needed to screen is useful to assess whether testing for an additional risk factor is worthwhile when the additional risk factor has been shown to provide accurate risk predictions. The NNS provides the number of people the clinician would have to test for the additional marker to prevent one outcome.

*Arch Intern Med.* 2008;168(21):2304-2310

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**Pair Plan to Use PM to Predict... continued**

**PMN:** Any additional comments about predicting patient safety problems?

**LD:** On a national basis, it is pretty clear what causes patient safety problems -- human behavior. Communication breakdowns between caregivers cause about 70% of the patient-harming errors. Other culprits include medication errors, hospital-acquired infections, falls, drug interactions and surgical errors. Even though we know those issues on a national level, there is no guarantee we will know on a local and departmental level which of them needs preventive intervention. The national trend data are too coarse to be able to create a specific local intervention. Even within a single hospital, the root causes of current problems and potential causes of future problems might be different in one area of the hospital compared to another. Labor/Delivery might need a completely different intervention than does the ICU, for example. Even different teams within the ICU may have different issues and thus need different interventions.

**SH:** The most effective predictive intervention is local, specific and granular. Healthcare has struggled with that level of granularity. Even now, when a hospital conducts a safety climate survey to see where it is and what needs to be addressed, it often neglects to make a provision in its surveys for respondents to mark which department in the hospital they work in or to which shift they are assigned. Thus, it is impossible to know where the specific problems exist. HPTG will provide hospitals and other PSOs with access to the Web-based InfoTool diagnostic research application to conduct the AHRQ surveys of patient safety and perform leadership performance assessments. PSOs such as HPTG, coupled with LifeWings' specific site assessments of departments and teams and its in situ simulations, will be able to provide that level of granularity.

KBCore, InfoTool and other PSES services are available to PSOs and hospitals through the PSO Services Group. Visit [www.psoervices.net](http://www.psoervices.net), [www.saferpatients.com](http://www.saferpatients.com) and [www.humantechgroup.com](http://www.humantechgroup.com).

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## Subscribers' Corner

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## Thought Leader's Corner

Each month, *Predictive Modeling News* asks a panel of industry experts to discuss a topic suggested by a subscriber. To suggest a topic, send it to us at [info@predictivemodeling.com](mailto:info@predictivemodeling.com). Here's this month's question:

### Q: "What new, significant developments or issues do you see emerging for predictive modeling in 2009?"

"One issue that we are very sensitive to, because it affects a number of clients, is DxCG's" – now Verisk Health's – "proposed changes to its clinical models. As described at the DxCG user conference last year, they are quite extensive -- probably the most extensive since the models were constructed. From the information provided at the meeting, the changes sound as though they will increase the accuracy of the models. And the change to using different mappings for prospective and concurrent models should also increase the accuracy. That's the good news. The less good news is the implications for users: for example, some clients use models that go back historically to track trends over time. If the trend information is to be kept consistent and useable over time, prior years will have to re-scored using the new models. Secondly, clients will have to use the two models side-by-side for a while to see what the implications are on different applications. For example, where models are used for provider reimbursement, they could change the allocation between providers. Similarly, model changes could affect the relative risks of different groups for underwriting purposes. So for users of Verisk's models, 2009 will provide a lot of hard work adapting to those changes. It's all about transition. (And then we have to transition to ICD-10!!)"



**Ian Duncan FSA FIA FCIA MAAA**

President, Solucia Inc.  
Farmington CT

"I believe there will be more opportunities for integrating grouped clinical information into mortality prediction. That may evolve out of companies that typically have only worked in the healthcare space, or through traditional life insurers by means of clinical data aggregation. As data storage becomes cheaper, longitudinal data sets become longer and statistical techniques for prediction of low probability events become sounder, more credible predictive models will emerge in the realm of life insurance, disability and long-term care. That will be fertile ground for 'cross-disciplinary' work between life insurance and health actuaries. One challenge will be to identify the development dataset that integrates all dependent and independent variables."



**Vincent Kane FSA MAAA**

Research Scientist, DxCG – A Division of Urix Inc.  
Boston

"The *New York Times* just noted in its annual rundown of what venture capitalists are looking for that predictive health is 'the new Web 2.0.' Not in the sense that we have thought about predictive models in the past, but rather in new 'genetic terms.' There are a number of start-ups, including one here in Indiana called Personalized Physiology and Medicine, an outfit that is rolling out a 'personal health assessment' product called Viveda. Adding genetic data to a list of potential input variables for modeling isn't the hard part. Rather, the tough hill to climb includes all the ethical concerns about using genetic information for identification of those at risk. Some have proposed that the current way out of the dilemma is to use genes as a guide to target the best classes of drugs for current diseases to see which might work best. Those of us who have tried to stem the tide of rising healthcare costs by identifying and helping the 12% who become this year's 80% cost burden are watching Obama's proposed changes with interest ... you change the payer, you change who's interested in finding and helping people ahead of acute crisis. The initial boon to the predictive modeling industry will likely change as new models of healthcare take hold."



**Julie A. Meek DNS**

Executive Vice President and COO, CareGuide  
Indianapolis, IN

## Thought Leader's Corner *...continued*

"I anticipate the following developments:

- [1] Preparations for ICD-10 implementation/underlying grouper updates and its implications on predictive modeling.
- [2] Emphasis on using predictive modeling for identifying members for wellness/prevention programs.
- [3] Member behavior prediction to support engagement and convergence of financial impactability, clinical impactability and behavior impactability to develop a member-level comprehensive index.
- [4] Movement towards provider predictive modeling."



### Soyal Momin MS MBA

Manager, R&D and Consulting, BlueCross BlueShield of Tennessee  
Chattanooga, TN

"I believe there will be a continued interest in introducing social marketing and demographic information into predictive modeling such that the output provides a more tailored approach to outreach and engagement of at-risk individuals; for example, different messaging and risks for those who live alone versus those with kids versus single parents, as well as variations on socio-economic status."



### Seth Serxner PhD MPH

Principal, Mercer  
Los Angeles, CA

"The potential new developments for 2009 will be linked both to external healthcare policy events and to the general maturing of the PM and health IT fields. Some issues may include: 1) how PM applications can best capitalize on President Obama's push for HIT/EHR expansion; 2) pressures on risk-adjustment methods for payment and other financial exchanges in these tough economic times; 3) increased global interest in PM; 4) continued blurring of the line between EHR-based clinical decision-support systems and PM; and 4) calibration issues associated with the ICD-10 switch-over."



### Jonathan Weiner DrPH

Professor, Health Policy and Management; Director, PhD Program in Health Services Research and Policy;  
Deputy Director, Health Services Research & Development Center, Johns Hopkins University  
Baltimore, MD

## INDUSTRY NEWS



### CNIC to Use BI's Connect Service for Data Management

Denver's CNIC Health Solutions Inc., Colorado's largest third-party administrator, says it has entered into an agreement with Jenks, OK's Benefit Informatics Inc. for data analysis and reporting services, which will allow CNIC to enhance its current reporting package and provide clients and broker partners comprehensive access to health plan data. CNIC is utilizing BI's Connect service to allow clients and brokers to electronically access analysis functions and report output.

Using BI's services, CNIC staff "can proactively monitor health plan utilization, trends and plan performance to help clients make informed decisions and control costs," a statement from the Sooner State says. "The Web-based service provides an array of standard and ad-hoc analysis capabilities for each plan administered by CNIC."

*continued...*

### CNIC to use BI...continued

Through its clients, BI serves more than 5,000 businesses, managing health benefits for more than 2 million members. Visit [www.benefitinformatics.com](http://www.benefitinformatics.com) and [www.cnichs.com](http://www.cnichs.com).



### MEDai Presents at WRG's Underwriting Meeting

Orlando-based MEDai Inc. reports it was invited by World Research Group to present at the 5th Annual Conference on Predictive Modeling for Underwriting conference, held in Orlando. The meeting "focuses heavily on the importance of effectively integrating predictive modeling into overall underwriting and actuarial processes," the data firm says in a statement. "Predictive modeling is no longer unique to care management," comments Swati Abbott, president there. Visit [www.medai.com](http://www.medai.com).

*continued on page 11...*

## INDUSTRY NEWS



### DecisionView: Investors Validate Firm's Strategy

San Francisco's DecisionView Inc., a leading provider of business performance optimization applications for the life sciences industry, reports the close of its Series D investment with Granite Ventures, Adobe Ventures and Aeris Capital. "The continued confidence demonstrated by our venture capital partners validates our business strategy and growth opportunity," notes Steve Andrade, CEO there.

The additional funding will be applied to DecisionView's strategic growth opportunities for expanding its platform for improving the performance of clinical trials, including the company's flagship application, StudyOptimizer, the first Web-based clinical trial enrollment software that enables companies to optimize the clinical trial recruitment and enrollment process for greater predictability, faster cycle times and reduced costs.

Says Chris Hollenbeck, managing director, Granite Ventures: "With the increased economic and operational pressures on pharmaceutical companies today, DecisionView is poised for significant growth with product offerings that provide tangible value." DecisionView announced several new features and enhancements to StudyOptimizer 4.0, including an innovative user interface framework, a new analytic engine, an enterprise-class J2EE server and enhanced administration capabilities. Visit [www.decisionview.com](http://www.decisionview.com).



### PHX Signs On to Use APEX Management's PM Platforms

Bedminster, NJ-based PHX, a leader in health plan cost management, has formed a partnership with Princeton, NJ's APEX Management Group that will "provide PHX with the insight to identify the true source of a health plan's cost problems," a statement says.

APEX, a division of Gallagher Benefit Services Inc., is an actuarial and data management firm specializing in predictive modeling, benchmarking and benefit plan modeling. Under the new partnership, PHX will license APEX's claims analysis and pricing platforms, which will become part of the newly developed PHX Analytic Desktop, which will "provide a road map to appropriately manage healthcare utilization and measure outcomes," the statement adds.

"Initially," it says, "PHX's Web-based report offering will include analysis of budget versus actual expenses, trend reporting, financial projections, demographics reporting, utilization reporting and network savings reporting."

*(continued)*

### PHX Signs On...continued

Also, PHX says, it intends to provide its customer base with direct access to the data warehousing and analytic services as part of a bundling solution. "As we continue to take a greater consultative role with our customers, we believe detailed information will pinpoint the exact areas where costs are increasing and allow our customers to make focused plan management responses rather than cut benefits," comments Robert Malone, PHX's CEO and president.

"The new partnership goes a long way in advancing our product offering," he says. "Delivering health plans accurate and detailed reports, combined with PHX's existing cost management solutions, equals a winning formula." The bundled combination, adds John Powers, PHX's chief marketing officer, "will eliminate any competition our sales team faces in the marketplace. It creates a 'game-changing' opportunity in the healthcare data management arena." Visit [www.phx-online.com](http://www.phx-online.com) and [www.apexmgmt.com](http://www.apexmgmt.com).



### PreMD Developing New Biomarker Staining Technique

Predictive medicine company PreMD Inc., Toronto, has filed a provisional patent application that "describes a new, simplified method of quantifying immunohistochemical staining of biomarkers," the company says. The provisional patent application was filed with the U.S. Patent and Trademark Office and, based on PreMD's existing color measurement patents and patent applications, "may facilitate more accurate and cost-effective detection of biomarkers in clinical specimens," a statement says.

"With the news earlier this year of breast cancer patients being incorrectly diagnosed and treated based on erroneous interpretation of immunohistochemistry tests, it immediately came to our minds that our existing intellectual property and expertise in color measurement may be useful in improving that critical situation," comments Brent Norton, the company's CEO. "We have made significant headway in developing the concept." Biomarkers, detected in human tissue samples by immunohistochemistry, are playing an increasingly important role in prognosis and treatment decisions, he says, and the new methodology "has the potential to be applicable to a broad range of such biomarkers."

He adds: "In the lab, with our limited budget, resources and test samples, we are getting accurate positive results in 90% of cases and full agreement in over 80% of all tests. To take the program to the next step, we need to find a way, in the markets, to fund the development and testing." Visit [www.premdinc.com](http://www.premdinc.com).

## Survey: Predictive Modeling Obstacles and ROI

Periodically, *Predictive Modeling News* provides exclusive results from a survey of health plan and healthcare professionals conducted by MCOL on various issues that relate to predictive modeling. Survey participants typically have a more active interest in predictive modeling issues.

This month, we addressed the obstacles to and return on investment for predictive modeling. We asked participants to respond to three items:

1. Please categorize your organization.
2. Which of the following, if any, do you view as significant obstacles for any PM initiatives within your organization, or your clients: (you may check more than one)?
3. What is the return on investment for predictive modeling within your organization or clients?

The same survey questions were also asked in January 2008, so comparisons with last year's responses are also provided. Here's what we found:

- ROI is more known this year (46.7% unknown vs. 56.1% in 2008) but, the increasing portion that know their ROI feel it is inadequate (20.0% in 2009 compared to 9.8% 2008)
- Vendors were more likely to have unknown ROI (60%) and PM involvement (only 7% not involved), while Providers were the opposite (22% unknown ROI; 33% no PM involvement). Payers were less likely to indicate adequate ROI (14% vs. 22% for Providers and 20% for Vendors.)
- Most obstacles indicated for 2009 compared to 2008 were generally similar (+/- 7.5 % points) except for: adequate IT (+15.0 points); buy-in (-12.3 points); and funding (8.4 points)
- More respondents this year indicated three or more of the items listed were obstacles (3+ items: 63% 2009 vs. 55% 2008), indicated an increasing complexity to overall obstacles faced.

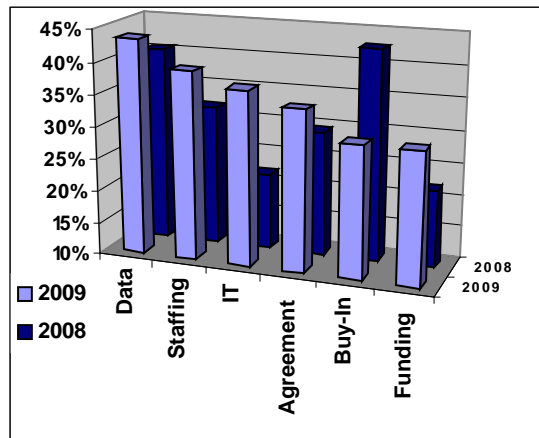
#Obstacles	2009	2008
Zero	0%	2%
One	9%	16%
Two	28%	27%
Three	33%	33%
Four	17%	11%
Five+	13%	11%

- General category of respondents: (N = 46 [2009]; 82 [2008]:

	2009	2008
Payer	47.8%	34.1%
Provider	19.6%	29.3%
Vendor	32.6%	36.6%

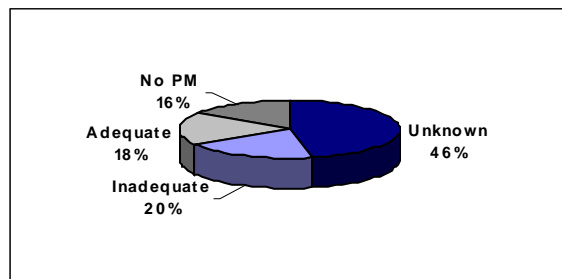
### Significant Obstacles for PM Initiatives:

Issue	2009	2008
Problems with existing data	43.5%	40.2%
Adequate internal staffing	39.1%	31.7%
Adequate IT and related tools	37.0%	22.0%
Lack of agreement on approach	34.8%	29.3%
Management buy-in or priorities	30.4%	42.7%
Funding currently not available	30.4%	22.0%
Lack of action on reporting provided	28.3%	25.6%
Need additional data sources	28.3%	26.8%
Length of timeframe required	17.4%	15.9%
Problems with outsourced vendors	10.9%	12.2%
Legal / compliance issues	4.3%	7.3%



### ROI for Organization or Clients:

Return on Investment:	2009	2008
ROI largely unknown	46.7%	56.1%
ROI inadequate	20.0%	9.8%
ROI adequate	17.8%	22.0%
No PM involvement	15.6%	12.2%



See subscriber Website for additional details.