

Predictive Modeling NEWS

Journal Scan

Hopkins, HealthPartners Research Sees Predictive Value in EHR-Only Data

The news about EHR data is especially big. Other recent research looks at predicting admissions and incidence of disease. Here's a look.

MEDICAL CARE

Official Journal of the Medical Care Section, American Public Health Association

Researchers Caution: 'More Research is Needed'

Researchers from the Johns Hopkins Bloomberg School of Public Health's Center for Population Health Information Technology, Baltimore – including Jonathan P. Weiner DrPH, the Center's Director, a Professor of Health Policy & Management and of Health Informatics, ACG Co-Developer and Director of the ACG R&D Team at Hopkins and a *Predictive Modeling News* Editorial Advisory Board member -- and HealthPartners' Bloomington MN-based Health Informatics Division compared and contrasted using electronic medical records and claims data sources for predictive modeling. Here are excerpts of the abstract of their published findings:

- “The results of this study support the premise that predictive models to stratify risk in a given population using EHR data alone are feasible; however, the EHR-based models may underperform compared with administrative claims.”

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Health Leader College's Infographic Details Hospital Use of Predictive Analytics

The celebrate Healthcare Risk Management Week, Regis College's Online Masters of Health Administration program created an infographic that helps hospitals understand predictive analytics. Noting that “96% of hospitals have converted to electronic health records” and that “healthcare systems manage an extraordinarily growing amount of data every year,” a statement announcing the infographic adds that “while hospitals are beginning to apply Big Data techniques to predict individual outcomes like post-operative complications and diabetes risk, Big Data remains largely a buzzword.”

THE MOST VALUABLE DATA TO PREDICT IN HEALTH CARE ACCORDING TO HEALTH CARE EXECUTIVES

CLINICAL OUTCOMES	55%
COSTS	52%
REIMBURSEMENT	35%
HOSPITAL READMISSIONS	32%
PATIENT DEMAND/POPULATIONS SHIFTS	28%

The graphic and the accompanying text aim to help clear things up.

For example, the article says, “more than half of US healthcare centers and organizations are using predictive analytics” and “most hospitals and health-care organizations have large plans to use tools and solutions related to this field.”

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 part of this publication may be
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Journal Scan...continued from page 1

- “An EHR often does not include all clinical events a patient has experienced, unless it is fully interoperable among all providers, so its suitability for risk stratification should be assessed -- or at least certain minimum data quality and credibility metrics should be met -- before using the EHR-based models in operational settings.”
- “Combining EHR data with claims slightly improved the performance of some predictions -- but decreased others’.”
- “Overall, using EHR data alone results in an acceptable performance of predictive models to identify populations at higher risk for hospitalization or being in the top 1% of annual cost.”

But:

- “The results of this study should be treated as preliminary. The generalizability of these results is limited to delivery networks with similar specifications, such as patient populations and EHR infrastructure.”
- “More research is needed to replicate the findings in other settings, with other measurement methods, to evaluate the value-add of novel EHR data types, such as lab information and vital signs, for risk stratification.”

Predictive Modeling News talked to Weiner, the paper’s senior author, and to Hadi H. K. Kharrazi MD PHD, the paper’s first author and Assistant Professor of Health Policy and Management at Bloomberg, Assistant Professor at the Hopkins School of Medicine and Assistant Director at CPHIT, which the pair call “the R&D home of the widely used Johns Hopkins ACG predictive modeling system” -- the methodology applied to develop the EHR and claims-based benchmark statistics featured in the study.

Predictive Modeling News: *The finding that “EHR data alone can be used to derive predictive models to stratify risk in a given population” is pretty huge, isn’t it? How would you characterize the impact of your key finding?*

Hadi Kharrazi MD PHD & Jonathan P. Weiner DrPH: Historically in the US, almost all risk adjustment and predictive modeling analyses are based on health plan claims or provider administrative data. That is shifting and newer data sources like electronic health records will, over time, become the main source of risk factor information. All widely used population-based risk measurement or stratifier methods -- e.g., HCCs or ACGs -- have been developed and are calibrated using claims or administrative data, so it is important to understand how well these predictive modeling tools will work as we shift to EHRs. Our research paper, one of the first of its type, was done in collaboration with a large integrated delivery system that had comprehensive, overlapping claims and EHR data systems. This allowed us to compare and contrast risk stratification for the same population using various streams of data. We encourage your readers to review the actual paper since there are many nuances, but the punch line is that with mature and complete EHR data, predictive accuracy is almost as good when derived from EHR systems alone.

PMN: *You also report that combining diagnostic and medication data from EHRs and claims can boost prediction accuracy. Can data from those two systems usually be easily integrated? Do legacy data silos still pose a problem?*

HK & JPW: Yes, there was a modest boost for some models when EHR and claims were integrated. But at most IDSs, lots of energy is being expended to collect and integrate EHR data across settings -- and then linking these complete EHR files with administrative data is not always easy. To date, due to the limited exchange of EHRs across physicians and hospitals and the newness of population-based EHR analytics, probably less than 15% of organizations have near-complete EHR data on their patient/enrollee cohort. Thus it’s pretty tough to link with claims data, even if the payers and providers are fully integrated -- which most are not. So outside of mature IDSs, it may be some time before EHR data will fully come out of their silos for use in population-based analyses like those we did in our paper.

PMN: *What are some of the instances when combining selected EHR and claims data doesn’t improve prediction accuracy? Why does it work in some cases but not others?*

(continued on page 5)

Movers and Shakers

EXCEL MEDICAL

Excel Medical Appoints Finnegan Executive Vice President, Sales and Marketing

Excel Medical, which calls itself “the leader in Next-Generation Medical Device Integration, reports the appointment of Mike Finnegan as Executive Vice President, Sales and Marketing. Finnegan is “a widely known industry leader,” a statement from Excel says, adding that, “as the company continues on its mission to apply predictive analytics in acute care settings to achieve proactive patient monitoring, [he’s] the perfect leader and proven change agent to add to the mix.” At GE Healthcare, he was Commercial GM for the Dose Management business, “where he and his team were responsible for creating a new market in North America for radiation informatics,” the statement notes. Excel says it’s “an innovator in medical device data acquisition and storage and clinical integration across the hospital enterprise” and adds that “its products transform clinical workflow by liberating data and making it more accessible to clinicians through untethered access and NGMDI with electronic medical records.” Partnering with IBM’s TJ Watson Laboratory since 2011, the statement adds, “Excel has developed a first-of-its-kind clinical streaming analytics platform that is shaping the future of critical care medicine.” Visit excel-medical.com.



Brennan Joins Clarify Health Solutions as Strategic Advisor

Clarify Health Solutions Inc., which calls itself “a pioneer in AI-enabled care guidance and patient journey optimization,” reports it will “benefit from the expert guidance of Niall Brennan, President of the Health Care Cost Institute and former Chief Data Officer for the Centers for Medicaid & Medicare Services.” Brennan, who is joining Clarify Health’s strategic advisors, “has vast experience using data to improve healthcare,” according to a statement, and “has spent much of his career advocating for healthcare organizations to become more data-driven.” At CMS, it adds, he “spearheaded the efforts to make large data sets more accessible to healthcare professionals, researchers and the public.”

Clarify Health’s platform features a detailed patient profile that includes clinical, demographic and behavioral data. “Real-time care orchestration is powered by both retrospective and predictive analytics,” the statement says, “helping providers engage more effectively and efficiently with their patients.” Visit clarifyhealth.com.



Crane Joins InteliSys Health as CTO

InteliSys Health, which says it’s “pioneer of the first real-time prescription transparency platform,” reports that former Allscripts Chief Technology Officer and Chief Innovation Officer Stanley Crane has joined the executive team as CTO. Crane will “guide development of InteliSys Health’s breakthrough point-of-care drug pricing and medication adherence tools,” a statement says, “as well as spearhead new products in additional markets.” He’s credited with creating Allscripts Open API, growing it “from a technology into its own business unit.” Crane, the statement adds, “will help drive the company’s strategic expansion beyond prescribing-focused solutions to a cloud-based platform uniting actionable data and predictive analytics to deliver the lowest prescription costs across the healthcare landscape, along with information on medication fill behavior.”

The company “launched in June after two years in stealth mode, and is currently rolling out its first solution, RxStream,” it says, which works by “connecting all stakeholders in the e-prescribing transaction, providing actionable data back to the doctor and insurer about drug fills and refills, to enable intervention to prevent adverse events due to medication non-adherence.” It can be embedded in the e-prescribing workflow of any EHR, the statement adds. Visit intelisyshealth.com.



ZeOmega Appoints Raman Chief Analytics Officer

ZeOmega, which calls itself “the market leader in population health management,” reports naming clinical informatics expert Sivakumaran “Siv” Raman Chief Analytics Officer. He’ll lead the analytics capabilities strategy for the company’s Jiva platform. Raman previously served as Staff Vice President of Data Integration and Clinical Informatics for HealthCore, a division of Anthem, and as Vice President of Clinical Informatics for OptumLabs. And he was part of the core faculty at the Institute for Health Informatics at the University of Minnesota. Company executives are counting on his “knowledge and expertise to make Jiva an even more powerful solution for organizations transitioning to value-based care.”

The solution “enables healthcare organizations to aggregate, reconcile and analyze health and financial data from disparate sources,” a statement adds. “Its predictive analytics engine automates the analysis of 10,000 social determinants of health, making it twice as accurate as other commonly used patient risk assessment solutions.” Raman’s team, the statement says, “will continue to hone Jiva’s analytics capabilities, ensuring that ZeOmega clients remain successful and competitive in the era of payer-provider collaboration.” Visit zeomega.com.

(continued on page 4)

Movers and Shakers



EagleForce Health Appoints Fallon Director of RM for Pharma, PBM & Pharmacy Services

EagleForce Health LLC, a provider of Big Data interoperability and advanced analytics, reports that Aisling Fallon will lead its Risk Management Practice, aimed at educating boards and C-Suite executives on Anti-Kickback Act violations. She'll "employ EagleForce's advanced AI tools to model financial risk, then explain it to individuals on a brand medication-by-brand medication basis," a statement says. Her "expertise in risk modeling and forecasting," it adds, "will extend EagleForce's success at providing advanced analytics and business services to many of the top medical and pharmaceutical companies in the United States."

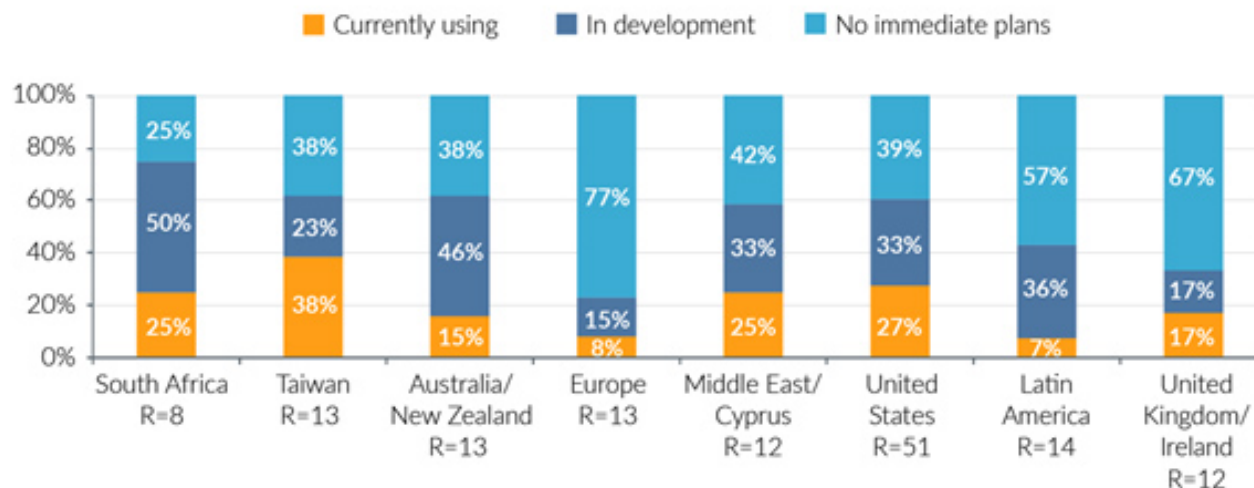
EagleForce "has many patents in the area of eligibility and predictive analytics," the statement continues, "which it employs in solving some of healthcare's most difficult problems utilizing artificial intelligence, neural computing and enhanced data modeling." Visit theeagleforce.net.

GenRe Sees PA Understanding Gaps in Insurer Survey

G uizhou Hu, head of Decision Analytics in insurer Gen Re's North American Life/Health Division, who "works on prediction model development for underwriting in life and Medicare supplement insurance," according to a statement, "set out to find answers to these questions: How big is Big Data for life and health insurers? What are insurers world-wide focused on when it comes to predictive analytics? How are they adopting it and what are their expectations for the future?" His team gathered feedback from 136 companies in 23 countries; he detailed his findings in a recent blog post on the company's website.

- "Adopting predictive analytics requires a paradigm shift, management commitment, resources and talent. While it has been widely used by companies outside the insurance industry, its usage in life and health insurance is still regarded as an innovation."
- 22% of companies use predictive analytics and 32% plan to develop the capability over the next two years.
- But 46% have no immediate plans to use it.
- More companies use predictive analytics for sales and marketing support than for any other function.
- "The majority of participants with models [used] internal resources; more than a third have engaged external resources to assist, particularly around underwriting."

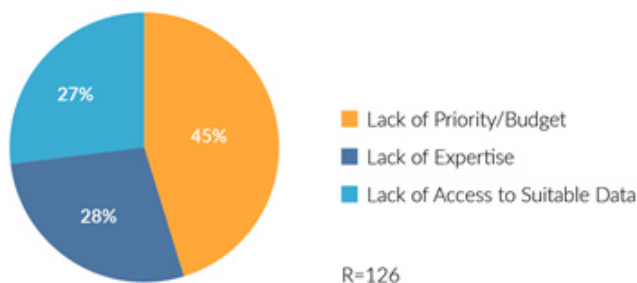
Hu's team "found variance among insurers using predictive analytics in different regions of the world," the blog post noted. But "insurers that use predictive analytics are in the minority across all regions."



(continued on page 5)

GenRe Sees PA Understanding Gaps...continued from page 4

Insurers cite a number of “significant barriers” for not implementing predictive analytics.



Hu concluded that “the power of predictive analytics is still to be determined” and that while “many companies reported that their models meet their expectations,” the issue of obtaining data “remains a challenge.” Still, he wrote, “insurance companies are seriously looking at the usefulness of predictive analytics. If plans stay on track, the industry is set to experience considerable growth and undergo significant changes.” Access the blog at genre.com/knowledge/blog/. Contact Hu at 203-352-3013 or at guizhou.hu@genre.com.

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HK & JPW: In some cases, EHR-based models -- at least using structured ICD and Rx data -- are a bit less accurate than claims-based models. One reason for this is that even at large IDSs, some patients may get care outside the organization, so the EHR information is less complete when assessing total costs, as found in the claims. Also, the Johns Hopkins ACGs -- used in this study -- like all other established methods, were originally calibrated to predict cost and utilization derived from health plan claims. So, in our study, even when EHR data are fairly complete, it might be expected that claims-derived risk measures would be more closely linked to cost. Another interesting issue is that drug information extracted from the EHR is usually based on the doctor's orders, not the pharmacy claim. So this is another difference that we will need to learn to understand further. For example, at our CPHIT R&D center, we have found that when we assess differences between the doctor's orders and the patient's prescription fill, at times it adds risk prediction information -- for example, differences between the two data sources might be due to non-compliance.

PMN: Do most health plans or providers know how to determine if their EHR data are suitable for use in risk stratification? What kind of guidelines should they use?

HK & JPW: It will be increasingly common for organizations or their EHR/IT vendors to figure out ways to use EHR data only for risk stratification and predictive modeling. But there are not yet any standards or benchmarks for doing this that we are aware of. One purpose of our article in the *Medical Care* journal was to help establish a scientific basis to help the field develop these. We are working with our Johns Hopkins ACG user base and several collaborating EHR/HIT vendors to come up with ways to assess the “credibility” of risk scores derived from EHR-only databases. We will publish more on this in the future, but it is likely these guidelines will be based on reaching certain thresholds of average EHR-derived metrics for the target population, such as mean number of encounters documented, range of specialists and settings included or number of diagnoses or medications captured. For example, we would not recommend considering ACG or HCC scores as “credible” within a Medicare ACO or HMO if the number of primary care visits captured in the EHR is well below the known total number of contacts.

PMN: What's the main takeaway from your research? What should health plans do first to take advantage of what you've learned?

HK & JPW: Well, ready or not, these new data sources are coming online and they have great potential as a source of information for the risk measurement and predictive modeling community. Our study represents only a first step in understanding the risk measurement properties of these new streams of data. We focused on comparing the key risk factors found in both claims and EHRs -- i.e., ICD and Rx codes. As administrative data systems are replaced with clinical ones, all organizations need to gain an understanding of the types of results we found in our paper. But that is hardly the end point. Our work needs to be replicated -- the results at other settings may be better or worse. More importantly, there are many other types of clinical information found in the EHR that will expand our ability to measure population risk. Moving in this direction will be a critical research agenda for the next decade or more.

At Johns Hopkins, we are hard at work on this, documenting what can be added to population-based analytic tools when you have, say, biometric data, lab results, free text clinician observations and more. We also have an active agenda to incorporate these new risk measures -- once they have been thoroughly tested -- into the future versions of our ACG analytic platform. We will be sure to share our future publications with *Predictive Modeling News* over the coming months -- or people should feel free to contact us if they would like to learn more. Thank you for your interest in our work and for helping us to share our findings with the field!

Access the document at <https://www.ncbi.nlm.nih.gov/pubmed/28598890/>. Contact Weiner at 410-955-5661 or at jweiner1@jhu.edu. Visit jhsph.edu/cphit and hopkinsacg.org.

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PEDIATRICS

'Early Prediction Model of Patient Hospitalization from the Pediatric Emergency Department'

A new model can predict pediatric patient hospitalization early in the emergency room encounter using data "commonly available in electronic medical records," says a statement from the American Academy of Pediatrics, citing a study published online in *Pediatrics*. Researchers from Boston Children's Hospital "retrospectively analyzed all visits to the ER" for a one-year period. They used half the data to derive a prediction model and half for model validation.

The researchers found that "using data available within the first 30 minutes after presentation, the model identified 73.4% of the hospitalizations with 90% specificity and 35.4% with 99.5% specificity." That means the ER "could potentially save 5,917 hours a year, or 30 minutes a hospitalization, by applying the model in a real-time setting," the statement adds. Because ERs are "overcrowded and nearing a breaking point," it says, researchers "sought to develop a model for early prediction of hospitalizations, thus enabling an earlier start for the placement process and shorter boarding times."

== Published online April 25, 2017. doi: 10.1542/peds.2016-2785. PubMed 28557729



'Ensemble Risk Model of Emergency Admissions'

Researchers started from the perspective that "about half of hospital readmissions can be avoided with preventive interventions," so "developing decision support tools for identification of patients' emergency readmission risk is an important area of research." Because it's "unclear how to design features and develop predictive models that can adjust continuously to a fast-changing healthcare system and population characteristics," they set out to "develop a generic ensemble Bayesian risk model of emergency readmission." What they came up with "performed considerably better than the previous modelling approaches," they report, "and it was robust and stable with high precision." As well, the researchers said, "the model [can] continuously adjust to new significant features, different population characteristics and changes in the system."

== Access the article at [http://www.ijmijournal.com/article/S1386-5056\(17\)30088-6/fulltext?rss=yes](http://www.ijmijournal.com/article/S1386-5056(17)30088-6/fulltext?rss=yes).



'Predicting Residual Disease in Incidental Gallbladder Cancer: Risk Stratification for Modified Treatment Strategies'

An article in the *Journal of Gastrointestinal Surgery* notes that "re-operation is advised for patients with T1b or greater incidental gallbladder cancer" and that "the presence of residual disease impacts resectability, chemotherapy and survival." So the study "created a preoperative model to predict RD at re-operation." To do so, researchers "assessed the relationship between pathology data from the initial cholecystectomy and RD at re-operation with logistic regression and classification and regression tree analysis." The model they developed "delineates patient groups with variable percentages of RD and could be used to stratify high-risk patients for prospective trials."

== Access the article at <https://link.springer.com/article/10.1007%2Fs11605-017-3436-8>.



BMC Medical Informatics and Decision Making

'Imbalanced target prediction with pattern discovery on clinical data repositories'

Clinical data repositories "have great potential to improve outcome prediction and risk modeling," the paper's abstract says. But that requires "careful study design, dedicated data collection efforts and sophisticated modeling techniques." So researchers set out to "bridge this gap so that clinical domain users can perform first-hand prediction on existing repository data without complicated handling and obtain insightful patterns of imbalanced targets for a formal study before it is conducted."

To start, they proposed "an interpretable pattern model [that's] noise-tolerant for practice data." Then they "compared pattern discovery to clinically interpretable methods on two retrospective clinical datasets" and found that, "despite the imbalance challenge shown on other methods, pattern discovery consistently shows competitive cross-validated prediction performance."

Indeed, they found, "compared to logistic regression, naïve Bayes and decision tree, pattern discovery achieves statistically significant favorable averaged testing G-means and F1-scores." In fact, they reported, "without requiring sophisticated technical processing of data and tweaking, the prediction performance of pattern discovery is consistently comparable to the best achievable performance."

== Access the article at <https://bmcmmedinformdecismak.biomedcentral.com/articles/10.1186/s12911-017-0443-3>.

(continued on page 7)

Journal Scan: Hopkins, HealthPartners Research ...continued from page 6**'Risk Factors and Prediction Model for Inpatient Surgical Site Infection after Major Abdominal Surgery'**

Because "surgical site infections are a common source of postoperative morbidity and a marker of surgical quality," predicting their incidence "is limited and most models have poor predictive value." So researchers "sought to identify risk factors associated with SSIs and develop a prediction model for SSIs after major abdominal surgery." They identified 1,744 patients at Johns Hopkins Hospital undergoing pancreatic, hepatobiliary and colorectal resections and evaluated risk factors for inpatient SSI using multivariable logistic regression. Their findings: "SSI occurred in 7.6% of patients; factors associated with SSI included preoperative weight loss, emergency operations and colorectal resections."

As well, they found that "intraoperative and postoperative risk factors included estimated blood loss, maximum respiratory rate and perioperative transfusion," but "intraoperative hypothermia, hyperthermia, bradycardia, tachycardia, hypotension and hypertension were not associated with SSIs." Finally, "after controlling competing risk factors, transfusion, [certain] EBL, tachypnea and colorectal resection were independently associated with SSIs," and "an SSI scoring system was created by assigning two points for EBL or colorectal resection and three points for tachypnea or a transfusion." The model, the researchers add, "showed good discriminatory ability to predict SSI."

== *Journal of Surgical Research*, abstract only, May 18, 2017. DOI: <http://dx.doi.org/10.1016/j.jss.2017.05.018>

**'Predicting Adherence and Persistence with Oral Bisphosphonate Therapy in an Integrated Healthcare Delivery System'**

Because "examining drug exposure is essential to pharmacovigilance, especially for bisphosphonate therapy," researchers set out to "examine differences in four measures of oral BP exposure: treatment discontinuation, adherence, persistence and non-persistence." To do so, they quantified each measure, then used multivariable logistic regression to "compare age and race groups and the relationships of early adherence with subsequent adherence."

They concluded that "BP discontinuation rates are highest for women during the first year" and that "among those continuing treatment in subsequent years, adherence rates were relatively stable." They also "found evidence that optimal adherence in the first year was highly predictive of optimal adherence in the subsequent one to two years." That means, they said, that "subgroups of patients receiving oral BP drugs may require different levels of support and monitoring to maximize treatment benefit, especially based on early patterns of use."

== *J Manag Care Spec Pharm*. 2017;23(4):503-12

**'Predicting 1-Year Statin Adherence Among Prevalent Users: A Retrospective Cohort Study'**

Predicting who is at risk of future nonadherence "largely focuses on predictions at the time of therapy initiation," the researchers said, noting that those users "are only a small proportion of all patients on therapy at any point in time." So "methods to predict nonadherence for established medication users, which have not been previously described in the literature, would be helpful to guide efforts to enhance the use of evidence-based therapies."

The researchers therefore set out to "test approaches for adherence prediction among prevalent statin users, namely the use of short-term filling behavior, investigator-specified predictors from medical and pharmacy administrative claims and the empirical selection of potential predictors using the high-dimensional propensity score variable selection algorithm." The researchers gathered medical and prescription claims data from a large national health insurer to "create a cohort of patients who filled statin prescriptions," then "defined six groups of adherence predictors and estimated 10 main models to predict medication adherence in the full cohort;" the same was done, they add, "for the population stratified based on the days' supply of the index statin prescription."

They found that "investigator-specified and empirically selected variables did substantially worse" than "the use of three pre-index adherence predictors alone" and that "the use of three indicators of post-index adherence" worked better than "the best-performing model using pre-index information."

== *J Manag Care Spec Pharm*. 2017;23(4):494-502

Thought Leaders' 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. Here's this month's question:

Q “How can predictive analytics best be used to support screening and care interventions based on social determinants of health?”

“So this is what I'd say: One of the things we learned from our research is that there is a need for better understanding of two things: 1) what social programs and interventions work best at improving both people's health and need for healthcare and 2) what individuals benefit the most from which kinds of services. Analytics can help with both of these questions, and once we know the answers, predictive analytics has the potential to help hospital staff find the people who will benefit the most and refer them to the programs with the greatest ROI.”



Sarah Thomas
Managing Director
Deloitte Center for Health Solutions
Washington DC

“Strong predictive analytics models incorporate environmental as well as personal health status variables to identify risk profiles for various outcomes (e.g., costs, readmissions, ER use, disease progression) Almost every outcome of interest will be influenced by social determinants. Strong predictive models will surface the key factors in play for an individual and how social determinants may be interacting with health status, provider quality and experience, availability of services, etc. The current state of research in this area relies on public data on social determinants imputed on a ‘place basis’ to the individual for whom a risk is being quantified. Providers who want to act on those risk scores will need more detailed information about a particular person and his or her needs. A good risk model will act as a screen that triggers a deeper investigation by the provider into the specific social factors that may be at play for an individual. In other words, a good predictive model will point the provider in the right direction, but cannot deliver all the answers. Getting all the answers will require close engagement with the patient, and the predictive model will have started that engagement in the right direction.

Note: We should not only think of this topic in relation to individual patients. The output from predictive models can also be aggregated to examine place-based problem areas and issues with populations. Too often the risk scores are only used for interventions with patients, but just as valuable are aggregate understandings about problems in housing, nutrition, violence, access, etc., that can best be addressed at a system level in collaboration with other agencies in the environment.”



Herb Fillmore
Senior Director for Strategic Innovations in Value-Based Care
3M Health Information Systems
New York

“Predictive analytics leveraging vast amounts of historical patient data has the potential to reveal the types, sequence and even timing of care interventions for individual patients. For example, this could help care coordination teams to focus their effort on interventions that, based on predictive analyses, are expected to have a positive impact for specific patients. This would support a tailored, individualized approach to caring for a patient.”



Thomas F. Bohrmann PhD
Co-Founder of and Director of Statistical Practice
Roundtable Analytics
Research Triangle Park NC

Thought Leaders' Corner

"Identifying at-risk populations based on social determinants of health and then tailoring healthcare delivery to them is a cornerstone of population health management. These patient indicators enable care teams to address the origins of health complications long before patients present at the emergency room and help to reduce costs via care coordination, care management and preventative care. By identifying socioeconomic factors, such as education level or economic stability, and combining it with predictive modeling, healthcare organizations can acquire more expansive views of consumers at risk for avoidable healthcare costs – improving risk prediction to better support early interventions."



Manu Varma
Business Leader
Philips Wellcentive and Hospital to Home
Framingham MA

"A lot of research shows that physical environment, specifically a person's housing status, is a major factor in his or her health condition and use of the healthcare system. The 'housing first' movement has been propelled by this conclusion. Given data about a population's physical environment as well as access to healthcare services, predictive analytics can help target screening and care interventions, optimizing the allocation of limited sources. In addition, patient education regarding the appropriate use of different care settings can be targeted more effectively. This is an important application of predictive analytics, as the Medicaid expansion experiences in the states of Oregon and California indicate that health coverage alone does not change people's behavior with regard to their use of the emergency department."



Ken Perez
Vice President of Healthcare Policy
Omniceil Inc.
Mountain View CA

"Social determinants of health are viewed as one of those extensions of traditional (claims) data that will allow us more accurately to identify patients for intervention. The problem has been getting hold of appropriate data. Data has to be complete and consistently coded, which it generally is not, because it does not fill an insurance business purpose. By the way, the Society of Actuaries published a study in 2013 entitled "*Nontraditional Variables in Healthcare Risk Adjustment*," by Syed Mehmud ASA, that readers may find interesting. You can find it at <https://www.soa.org/research-reports/2013/research-2013-nontrad-var-health-risk/>. While not all social determinants are addressed in the report, it does discuss a number of non-traditional variables that may be available in some datasets. But until this type of data is collected (and made available) more broadly, we will not be able to realize the promise of social determinants."



Ian Duncan FSA FIA FCIA MAAA
Adjunct Professor of Actuarial
Statistics, University of California;
CEO, Santa Barbara Actuaries Inc.,
Santa Barbara

"Yes, we've found social determinates of health to be very useful in predictive model development as well as case descriptions for health interventions. The data source at face value provides information about clear, actionable health risk issues -- like affordability and transportation -- but further analysis can uncover markers of weak cognitive abilities and/or stress levels, which health management can utilize in the design of a care plan. Good communication of analytic results to the clinician is important so a member's SDH profile can be interpreted and acted on to the member's benefit."



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Damon Shepherd MS
Principal Scientist
Lumeris
Durham NC

Norm Storwick FSA MAAA
Vice President and Chief Actuary
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13900 Riverport Drive, Maryland Heights, MO 63043 lumeris.com

Thought Leaders' Corner

"Historically, predictive analytics have depended solely on vast amounts of medical claims and clinical history data to confidently predict future costs and health outcomes. Unfortunately, with research showing up to 50% of a person's health status influenced by factors beyond their medical history, this model simply won't work. Social determinants of health can identify pockets of high health risk hidden in and outside of medical data. The revelations go beyond the available information of just age and gender, allowing for more precise risk stratification. Using socioeconomic data with new or existing models makes predictive analytics more accurate, robust and reliable.

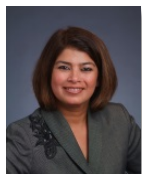
At LexisNexis® Health Care, our data scientists employ a variety of statistical methods and visualization techniques to conduct a comprehensive evaluation of the predictive power of different socioeconomic attributes, such as a person's built environment or community context, that touch on important health outcomes. The resultant observations are stored in a proprietary software tool and drive the development of risk scores to target high future costs, readmission risk and medication adherence using socioeconomic data alone. Social determinants of health can also be used for predicting health risk in conjunction with -- or in the absence of -- other risk adjustment models, improving the accuracy of existing models or predicting risk for individuals who have no or limited clinical history for any target of interest, such as low-intensity ER visits or high-risk pregnancy. With the availability of validated socioeconomic attributes and scores, social determinants of health can now be used to better coordinate proactive care management to improve health outcomes, reduce costs and improve member or patient satisfaction and retention. Using social determinants of health data sources to stratify the degree of health risk is a real game-changer in healthcare predictive analytics."



Kathy Mosbaugh

Vice President, Analytic Solutions
LexisNexis Risk Solutions, Health Care
Orlando

"Research is now showing that the social aspects of people's lives are equally important to their biology in determining whether someone will get sick and generate healthcare services. In some ways, the Frances Peabody quote, "The secret of the care of the patient is caring for the patient," has a comparative reality in predictive modeling. The secret of strong predictive analytics is in developing data to understand the person -- and not only the diseases the person may have. One often does that best by combining disparate databases, including claims data; socioeconomic data (such as by ZIP code); cultural data, often developed via census databases; member-specific data from member services systems; and other sources as available. Of course, medical data, including EHR data, pharmacy data and lab data, are very important in that realm as well. When we combine these disparate data sources in a usable way and in a timely manner, we produce the most robust predictive analytics."



Swati Abbott

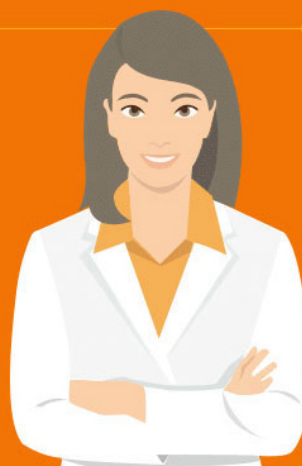
Chief Executive Officer, Blue Health Intelligence
Chicago

Health Leader College's Infographic...continued from page 1

But, it warns, "the volume of data collected and stored is only going to increase in the future, and without proper and effective use of this data, it is not possible to improve the healthcare sector. The medical industry as a whole needs to keep pace with other industries that are using innovative technologies to move ahead." Predictive analytics "is going to change the face of the industry for the better," the report says, adding that "everyone believes it is going to improve productivity and result in cost savings and operational efficiencies." Users of analytical solutions, it adds, "will perform better than their competitors" and, most importantly, "the quality of healthcare for patients will improve tremendously."

The healthcare field "is going to face many challenges when trying to implement predictive analytics," the report warns. "It will need support services from other industries, especially from the information technology sector." Specifically, it says, "there are various obstacles that hospitals will face in trying to make sense of the Big Data they collect: Often, there will be too much data, and some of it will not be in the proper format for analysis." In addition, the report cautions, "professionals working in the healthcare sector are largely trained only in medical subjects, and it will be difficult for them to implement predictive analytics without proper guidance from professionals who have expertise in information technology. Many healthcare workers simply do not know about the subject of predictive analytics."

(continued on page 11)

Health Leader College's Infographic...continued from page 10**BENEFITS OF PREDICTIVE ANALYTICS****TOP BENEFITS**

As well, the accompanying text says, "there are regulatory hurdles to implementing data collection and analytics solutions," so "hospital management needs to find solutions to these and similar issues if it wants to improve efficiencies, increase productivity, achieve cost reductions and provide affordable healthcare services."

That shouldn't be too difficult, the report concludes.

"The first step is to hire staff that is familiar with analytical tools and technologies," it says. "The right amount of resources must be allocated to projects involving data collection, management and analytics, and the support of professionals having expertise in statistical and mathematical analytics is also important." If they get predictive analytic right, it concludes, "hospitals can manage more patients with fewer staff and higher quality healthcare services can be provided to all patients."

Access the infographic at

<http://onlinenursing.regiscollege.edu/resources/mha/infographics/making-predictive-analytics-a-routine-part-of-patient-care-in-hospitals/>.

Industry News**Intermedix Announces Auto-Optimizer Capability for Provider Scheduling Solution**

Intermedix reports releasing a new auto-optimizer capability that "delivers valuable scheduling and resource allocation recommendations to emergency department medical directors." The company, which claims "significant investments in its predictive analytics and machine learning capabilities," adds that the auto-optimizer is an enhancement to its existing Tool for Optimizing Provider Schedules, part of its data science platform.

As EDs continue to face "considerable variability in patient volumes on an hourly, weekly and seasonal basis," a statement says, "TOPS utilizes granular data, statistical modeling and user-friendly visuals to provide tailored solutions to medical directors." The capability uses "intuitive dashboards, productivity profiles and data-driven demand models" to determine the effect various situations would have on capacity and patient flow – then aligns provider capacity with patient demand and helps determine optimal staffing for each hour throughout the day."

Intermedix says one of its main goals is facilitating "informed decisions based on accurate and dependable data." Visit intermedix.com.

**SourceLink Announces 2017 Medicare Enrollment Marketing Results**

SourceLink, a multichannel direct marketing firm, reports the results of its client acquisition efforts in the Medicare Advantage space with the release of a case study focusing on enrollment during the Annual Election Period across 15 different clients.

Those clients "used a measurable multichannel approach to maximize ROI and minimize cost per lead and enrollment," a statement says. "Central to this approach is the use of predictive modeling to identify the potential eligible prospects most likely to respond to direct marketing efforts and eventually enroll in the provider's plan."

SourceLink can identify prospects all the way down to the county level; Medicare marketers, it says, "are increasingly pressured to do more with less, and to resonate with and convert prospects quickly."

Metrics covered in the case study are average cost per lead and per enrollment, as well as overall response and conversion rates; it's available for download at sourcelink.com/healthcare.

PredictablyQuotable

Recent interesting and provocative quotes regarding predictive modeling and analytics

"As most hospitals have transitioned to electronic health records, patient data has never been more vulnerable. In 2016, over 27 million patient records were breached, as noted by the Protenus Breach Barometer. So far, 2017 has averaged more than one health data breach per day, with over 40% of these incidents attributable to insiders."

Nick Culbertson, Co-Founder of and CEO at Protenus, discussing data security and use of analytics to improve it.

"The introduction of value-based reimbursement and quality performance measures will increase the value of evidence-based data to document a clinical rationale and support medical decision making. Essentially, the clinical decision support system market will comprise a wide array of companies, ranging from established clinical content providers to vendors of medical devices, analytical services and workflow tools. This emerging ecosystem will encourage alliances and merger/acquisition activity, and underscore the necessity for a dedicated CDSS infrastructure vital to improving patient outcomes."

Victor Camlek, Digital Health Principal Analyst, Digital HealthGrowth Partnership Service, Frost & Sullivan.

"Analytics and artificial intelligence are only as successful as the data that drives them and the people who are empowered to use them effectively and efficiently."

Jean Drouin MD, Co-Founder of and CEO at Clarify Health Solutions Inc.

"By leveraging Big Data and scientific advancements, while maintaining the important doctor-patient bond, we believe we can create a health system that will go beyond curing disease after the fact -- to preventing disease before it strikes, by focusing on health and wellness. Whether it is health wearables or on-demand testing, better hospital software or algorithms capable of catching disease more effectively, rapid change is taking place because of increased access to Big Data and advanced data analytics."

Lloyd B. Minor MD, Dean, Stanford School of Medicine, in a new brief exploring the Big Data revolution, quoted in "How Big Data Analytics Underpins Every Healthcare Trend." Access the article at healthitanalytics.com.

"This is among the richest and most diverse medical datasets in the world -- much more than just a set of billing codes. And because the data come from our patients, the data are an incredible resource for UC hospitals to improve the quality of care we deliver throughout California."

Atul Butte MD, Priscilla Chan MD and Mark Zuckerberg

Distinguished Professor and head of the Institute for Computational Health Sciences at the University of California at San Francisco, discussing a project to consolidate data across five UC medical centers into one broad research database -- backed by a \$10 million grant from Facebook founder Zuckerberg and his wife, Chan -- that will be used to "speed drug discovery and development, improve quality care and identify disease patterns;" the research is part of broader efforts at UCSF to advance precision medicine and integrate machine learning into healthcare data. Access the statement at ucsf.edu/news/

"There's so much healthcare data, especially with electronic health records being adopted over the last 10 years. The potential for using that data for predictions, people haven't really figured out how to harness it."

Katherine Chou, project lead for Google Research, discussing University of Chicago Medicine's efforts to use data to predict health events. Access the article at chicagotribune.com/business/.

"Vocabulary standards can cover that sort of full landscape from things that we're measuring or observing about genetics to lifestyle variables to environmental factors. And so, inside a vocabulary standard, you have ways to represent each of these different kinds of variables and the assignment of codes and the standard names help you sort out -- and helps the computer understand -- the important differences between these kinds of variables. Once we get social determinants data represented in data standards, those elements can be shared and understood by diverse IT applications and put to use for the benefit of many in the health ecosystem."

Daniel Vreeman, research scientist at the Regenstrief Institute and the Regenstrief-McDonald Scholar in Data Standards at the Indiana University School of Medicine, emphasizing the increasing need for representing patient-reported and community-level SDH data using common clinical vocabulary standards. Access the article at healthdatamanagement.com/news/.

"I think hospitals and other providers see clearly the connection between social determinants and healthcare. They see it every day. And from this study we see that they are taking steps to do something to help their patients connect to programs that can address their needs. What we still need, though, is a better understanding of what programs work best and for which patients."

Sarah Thomas, managing director, Deloitte Services LP, and leader of Deloitte Center for Health Solutions, discussing a Deloitte survey that revealed that value-based care allows hospitals to better align their clinical care with health-related social needs. Visit deloitte.com.