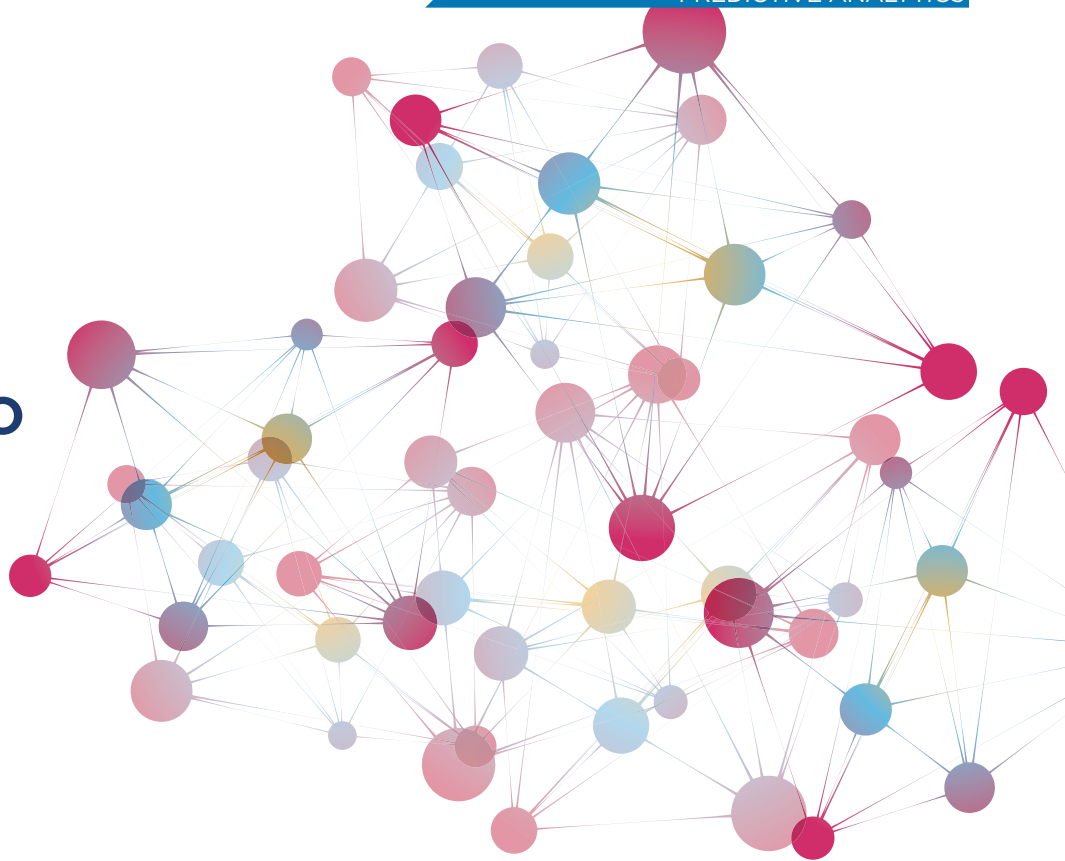


# Leveraging Predictive Analytics to Transform Health

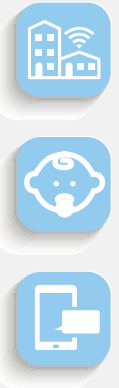


## GENERAL OVERVIEW

The National Academy of Medicine estimates the U.S. health care system spends [\\$765 billion](#) per year on unnecessary services, excessive administrative costs, and inefficient care. The use of predictive analytics in medicine holds tremendous promise to advance the quality of care, improve patient outcomes, and reduce waste. Predictive analytics uses electronic health data to: make predictions about the future state of an individual patient’s health status; facilitate the care of chronic conditions for entire populations; proactively identify patients at risk for disease, infection, or hospital readmission; and spot trends in quality and outcomes. Kaiser Permanente has used predictive analytics for the past 20 years by harnessing the power of its integrated care delivery system and health information, yielding better care for patients and savings for the entire health care system.

## QUICK FACTS

- 20 percent reduction in readmissions from the Hospital Transitions Program
- 50 percent reduction in antibiotic use in newborns from the Neonatal Early-Onset Sepsis Calculator
- 20 percent reduction in inpatient mortality compared using the Advanced Alert Monitoring System



## How Kaiser Permanente Addresses This Issue

Twenty years ago, Kaiser Permanente developed peer-reviewed, mathematical models for transfusion-related risks in adults and newborns. Since then, the organization has successfully developed, studied, and implemented models that improve patient outcomes on significant population scales.

- The Advance Alert Monitoring System uses patient comorbidity and physiologic parameters to calculate a risk score that

predicts, up to 24 hours before clinical deterioration, whether a patient needs placement in an intensive care unit (ICU). Remote hospital teams evaluate updated risk scores and notify a rapid response team when deterioration is detected. This program has

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facilitated early rescue of patients, reduced ICU length of stay and all-cause mortality, and prompted more timely discussions with families about their overall care goals.

- **The Hospital Transitions Program** uses patient comorbidity, physiologic measures, and utilization patterns to predict 30-day risk of readmission and determine the intensity of post-discharge intervention with outpatient care teams. A Kaiser Permanente multi-center, case-matched trial of this program demonstrated a 20 percent reduction in all-cause readmissions.
- **The Neonatal Early-Onset Sepsis Calculator** predicts the risk of sepsis in pediatric patients and prompts early and appropriate use of antimicrobial therapy. The calculator has reduced antibiotic use by nearly 50 percent in newborns in Kaiser Permanente Northern California and is now the industry standard.
- Through the **National Implant Registries** – with more than 2 million cardiology, cardiothoracic surgery, orthopedics, vascular, and neurosurgery implantable medical devices – Kaiser Permanente tracks outcomes, identifies best practices, and enhances quality of care for its 11.8 million members. Risk calculators powered by registry data enable shared decision-making at the point of care. The registries have also helped to reduce Emergency Department visits by 50 percent, safely shorten hospital stays, and reduce readmission rates.

## On the Horizon

The power to harness big data in targeted and clinically relevant ways will create even greater insights into the future health status of individual patients and populations. Analytical models will become increasingly accurate and utilized in health care – either running in the background as a safety net for providers or presenting information for clinical decision support. Kaiser Permanente's vision is to lead in the creation of a nimble and flexible care delivery system that is efficient and can quickly adapt resource intensity to match patient need. This involves identifying which patients are at high risk – or likely to be at high risk for an adverse outcome – and building appropriate care models. Leading-edge systems around the nation are working toward this goal.

## Selected Publications

Kuzniewicz, Michael W., Karen M. Puopolo, Allen Fischer, Eileen M. Walsh, Sherian Li, Thomas B. Newman, Patricia Kipnis, and Gabriel J. Escobar. "A Quantitative, Risk-Based Approach to the Management of Neonatal Early-Onset Sepsis." *JAMA Pediatrics* (2017), 171(4):365-371. <http://jamanetwork.com/journals/jamapediatrics/fullarticle/2604260>

Escobar, Gabriel J., Arona Ragins, Peter Scheirer, Vincent Liu, Jay Robles, and Patricia Kipnis. "Nonelective Rehospitalizations and Postdischarge Mortality: Predictive Models Suitable for Use in Real Time." *Medical Care* (2015), 53(11):916-23. <https://www.ncbi.nlm.nih.gov/pubmed/26465120>

Liu, Vincent, David Herbert, Anne Foss-Durant, Gregory P. Marelich, Anandray Patel, Alan Whippy, Benjamin J. Turk, Arona I. Ragins, Patricia Kipnis, and Gabriel J. Escobar. "Evaluation Following Staggered Implementation of the 'Rethinking Critical Care' ICU Care Bundle in a Multicenter Community Setting." *Critical Care Medicine* (2016), 44(3):460-7. <https://www.ncbi.nlm.nih.gov/pubmed/26540402>



## About the Permanente Medical Groups

The Permanente Medical Groups are composed of more than 22,000 physicians dedicated to the mission of improving the health of our patients and the communities in which we provide care. We practice in eight self-governed, physician-led, prepaid, multispecialty medical groups. Together with the Kaiser Foundation Health Plans and Kaiser Foundation Hospitals, we are Kaiser Permanente – an award-winning health care system that delivers Permanente Medicine to more than 12.2 million Kaiser Permanente members. We work collaboratively, enabled by state-of-the-art facilities and technology, to provide preventive and world-class complex care in eight states – from Hawaii to Maryland – and the District of Columbia.

## About The Permanente Federation

The Permanente Federation LLC (the Federation) is the national leadership and consulting organization for the eight Permanente Medical Groups (PMGs), which, together with the Kaiser Foundation Health Plans and Kaiser Foundation Hospitals, comprise Kaiser Permanente. The PMGs employ more than 22,000 physicians, approximately 90,000 nurses, other clinicians and staff, and provide care to over 12.2 million Kaiser Permanente members. The Federation works on behalf of the PMGs to optimize care delivery and spread Permanente Medicine – medicine that is patient centered, evidence based, technology enabled, culturally responsive, team delivered, and physician led. The Federation, based in Oakland, California, fosters an open learning environment and accelerates research, innovation, and performance improvements across the PMGs to expand the reach of Kaiser Permanente's integrated care delivery model and to lead the nation in transforming care delivery.

Please visit [permanente.org](http://permanente.org).

**PERMANENTE MEDICINE®**  
The Permanente Federation

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