

# Biomedical Insights—Putting Data Science to Work for Patients

Data. Information. Computation. At the Stanford Center for Biomedical Informatics Research, we bring it all together to improve health and wellness through biomedical discovery and clinical care. From huge exabytes of data in health care and biomedical research, we're able to dig much deeper into risks, treatments, and more, gaining actionable insights. Our faculty, staff, and students are already advancing the state of the art in semantic technology, biostatistics, and modeling biomedical systems that could benefit clinical and translational research. We're putting data science to work for patients everywhere.

Yet we also know that improving human health is a big challenge, and that safety and privacy of patients make the role of data science far more complicated in health care than in other fields.

Our goal is to understand how we are ethically and responsibly using the power of data to personalize treatment and improve outcomes. Nigam Shah, MBBS, PhD, Associate Director for the Center for Biomedical Informatics Research, highlights three key activities that help us achieve that goal:

**Ask and answer questions that physicians commonly ask**

For example: "If we use androgen deprivation that blocks the production or effects of testosterone and other male hormones to treat men with prostate cancer, what is the impact on their risk of getting dementia or Alzheimer's disease?" This is one example of how we can use informatics to inform treatment.

**Ask and answer questions that physicians don't ask enough**

"What are the most common drug combinations in the United States? What are the risks posed by this polypharmacy?"

Data can help us answer questions that some clinicians may not think of asking. This process of discovery by asking and answering less common questions is greatly enabled by our structure as an academic medical center, with access to a large patient forum, specialized expertise, and state-of-the-art technology. Our efforts already have led to identification of an adverse cutaneous event of an oncology drug—a discovery made through analysis of patients' reports in online forums.

**Make true forward-looking predictions**

Informatics can help with predictive analytics that enable us to foresee wound healing, mental health issues, the costs of care, even mortality. Stanford Medicine runs a prediction model every night on newly admitted patients, to flag those at greatest risk of mortality in the next three to 12 months, and prompts the Chief of Palliative Care to schedule a conversation with the attending physician of those patients to discuss if they might benefit from a conversation around goals of care, advanced directives, or palliative care.

## Data as Consultant—A New Clinical Informatics Service

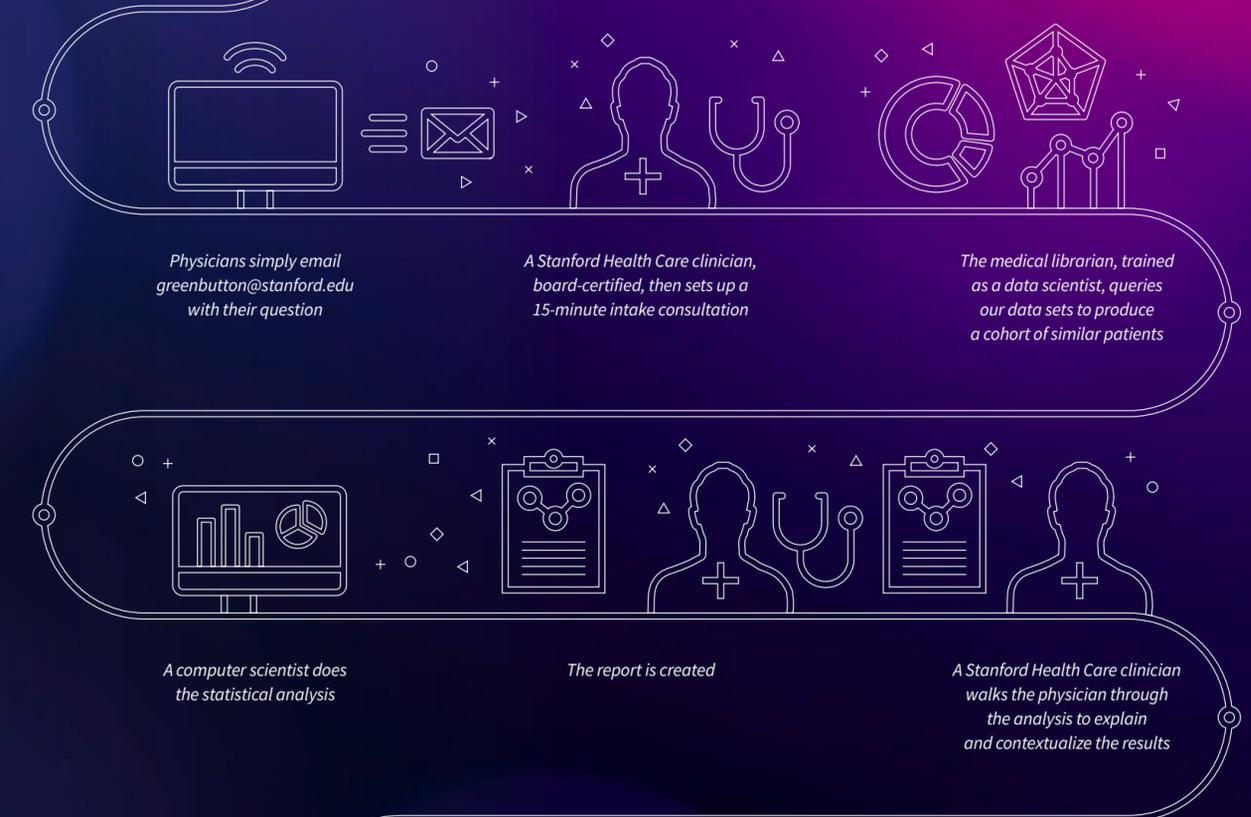
Doctors often ask, what happened to patients similar to mine? Now they have a way to find out. To enable precision in the practice of medicine, a new Stanford Health Care Clinical Informatics Consult Service uses routinely collected data on millions of patients to provide better care. By aggregating data from 150 million patient charts spanning Stanford's clinical data warehouse and national insurance data sets, the Informatics Consult provides a report with a descriptive summary of what happened to similar patients, the common treatment choices, and the observed outcomes.

Dubbed the "Green Button," the idea was the brainchild of a Stanford pediatrician, cardiologist, and biomedical informaticist.

Using a novel search engine developed at Stanford, we generate patient cohorts in seconds and perform statistical analysis to provide clinical answers.

With the Informatics Consult, a bedside clinician can request a consultation—similar to the way a clinician might request a consultation with radiology about an MRI, or with psychiatry or pathology to assess the potential of one treatment versus another. Within days, the Informatics Consult service produces a report outlining what happened to similar patients treated with each option.

The service is a great example of using data to enable better health care decisions.



Physicians simply email [greenbutton@stanford.edu](mailto:greenbutton@stanford.edu) with their question

A Stanford Health Care clinician, board-certified, then sets up a 15-minute intake consultation

The medical librarian, trained as a data scientist, queries our data sets to produce a cohort of similar patients

A computer scientist does the statistical analysis

The report is created

A Stanford Health Care clinician walks the physician through the analysis to explain and contextualize the results