



Accelerating efficiencies and effectiveness in federal health agencies with artificial intelligence

The use of artificial intelligence (AI) is expanding rapidly in health care. Predictive tools and models are playing a growing role in the health care industry due to advances in technology and increasing availability of electronic data.

AI isn't a singular technology, but an umbrella term that includes using deep learning, machine learning and natural language processing, among other methods, to perform intelligent tasks we often associate with the human mind such as learning and reasoning. In its simpler forms, AI has been with us for many years, but is now becoming more widespread and sophisticated in its applications. AI is already underway in several avenues of the health care industry. AI helps people with diabetes regulate their blood sugar. It automates prescription refills. It matches call center customers to the person most qualified to assist them. With the convergence of algorithmic advances, data proliferation and tremendous increases in computing power and storage, the opportunities for AI in health care will only keep growing.

While these practices have been rapidly progressing in the private sector, federal health agencies are also seeking ways to leverage these ever-evolving technologies to automate repetitive tasks, make data-driven decisions and improve overall agency effectiveness. Artificial intelligence offers substantial value to federal health agencies through the numerous ways it can be applied to streamline tasks, create efficiencies and facilitate decision-making.

It is predicted by Gartner that by 2021, 80% of emerging technologies will have AI foundations.¹ With the enormous amount of data that the 21st century has brought to our fingertips, regular desktop computers can no longer handle such capacity. High-performance computing (HPC) refers to the practice of aggregating computing power in a way that delivers much higher performance than one could get out of a



80%

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Natural language processing (NLP)

refers to the use of mathematics or linguistic techniques to describe and interpret the meaning of speech and text.

Machine learning uses advanced statistics and computer science to find patterns in data that can help make better predictions of future events.

Deep learning is a subset of machine learning that tries to mimic the structure and function of the human brain. It uses sophisticated mathematics on lots of data to produce insights that cannot easily be generated with other approaches.

typical desktop computer.² High-performance computing is most commonly used by scientific researchers and engineers, however it is also leveraged by federal agencies such as the U.S. Department of Defense, National Aeronautics and Space Administration and the Food and Drug Administration. Computing power has reached a point where big data sets can be easily manipulated in record time. The processing power behind HPC allows data scientists to create complex machine learning and deep learning models that are capable of ingesting larger and more diverse data sets. As federal agencies look to utilize AI and HPC to further deliver on their missions, the extensive experience from the private sector offers agencies proven methods and identifies ways those methods can be best utilized.

Ways to use AI to address federal health challenges

While artificial intelligence is not the answer for every challenge federal health agencies are enduring, it is well-suited for use cases where huge data sets come from many sources and need to be integrated and analyzed quickly to help individuals take action. This can help agencies drive better performance, generate better outcomes and produce a better patient or user experience. Below are some cases that have been used successfully in the private sector and in some government entities, that federal health agencies may want to consider.



Better performance

Increase operational efficiency, speed and consistency

AI automates repetitive or tedious agency tasks and quickly helps discover patterns and anomalies to lower the total cost of care and help federal employees work at the top of their field.

- **Clinical documentation improvement:** Federal agencies that partner with provider organizations can take advantage of NLP to identify clinical indicators found in many disparate places in a patient's electronic medical record, such as lab reports, doctors' and nurses' notes, problem lists and prescription information. NLP unlocks this information from unstructured (free-form) data to better understand each case and identify information that may be missing from searches of only tabular information. This can help avoid incomplete or improper coding of the medical care events. NLP-based searches provide more complete and accurate documentation that leads to more accurate reporting of care processes and quality.
- **Case reviews:** Payers, including the federal Medicare and federal/state Medicaid programs, can use NLP to better understand clinical documentation and how that documentation supports coding processes used by providers. Case reviews that would otherwise take hours when done by humans can be done in minutes, and more accurately, by computer-aided NLP. By using NLP to let the computer do the most tedious case review tasks, case reviewers have much more time to review cases in ways that take full advantage of their expertise.
- **Payment integrity:** Payment integrity is all about ensuring payments made from one organization to another are made correctly and appropriately, minimizing over- or under-payments for health care services. Predictive modeling via machine learning or deep learning can help federal and state auditors identify improper claims faster and more accurately than ever before, avoiding an abundance of improper payments.
- **Prior authorization:** To promote the appropriate use of high-quality care, federal and state programs would benefit from relevant prior authorization information, insurance coverage rules, formulary rules and potential drug-to-drug interaction information, all of which needs to be available to them and to the provider and payer organizations they work with, in real time. Machine learning and NLP can work together to produce insights from these disparate sources of information.



Better outcomes

Increase early disease identification and preventive treatment

AI can quickly process data, personalized for each patient, to provide information about patient risks, support decision-making diagnostics and therapeutic processes, identify other health issues and motivate preventive actions.

- **Early diagnosis and treatment:** Predictive models using regression techniques and other machine learning approaches are helping in the early identification and preventive treatment of specific conditions. As an example, current models can identify signals of dementia five to eight years earlier than the first diagnosis. In acute care situations, preventive models can alert providers about pending episodes.
- **Prescription benefit management:** Predictive models can be used to help identify the right intervention to make, at the right time. Models and supporting algorithms may use pharmacy data, lab results and other electronic health data to project outcomes under different treatment approaches, helping providers make better, evidence-based decisions.
- **Risk adjustment:** Machine learning, NLP and other forms of AI can help identify health risks and account for risk profiles when health care payments and other policies are made, and used to compare providers based on the quality of care.
- **Simplified population analysis:** Advanced analytics can be presented in a graphical or pictorial format, helping to quickly define and profile populations, simplifying and speeding time to analysis, and facilitating evidence generation to lower risks and improve outcomes.



Better patient experience

Personalize, simplify and deliver patient information at the right time

When paired with interoperability enhancements that allow the connection of complex data from many disparate sources, AI can help break down care silos, translating the complicated into easy-to-understand information, helping to improve the patient care experience.

- **Call centers:** AI helps call center agents and beneficiaries make actionable, data-driven decisions at an individual level, connecting insurance and other administrative records with information about program eligibility and clinical care. Interventions that make the most sense for patients, providers and caregivers can then be prioritized.
- **Care coordination:** With intuitive, configurable workflow designs, AI can help providers and federal and state program designers and managers get information critical to coordinating care effectively. Key risks and gaps in care can be identified and communicated to patients and caregivers. Programs and policies to ameliorate gaps and risks can be generated, tested and evaluated, with the consumer experience in mind.
- **Employee benefits:** AI can be used to provide reliable data about the availability and cost of health benefits and the services covered under competing benefit packages or about services offered by competing providers. Via chatbots and other approaches, AI can present information in real time and in an interactive manner. This information can then inform discussions about next best actions for employees to take so they can pick the benefit programs and covered services that are most useful for them.

Data and diversity of perspectives are the fuel

Before federal health agencies dive into utilizing artificial intelligence tools, it is important to have a solid foundation built on high-quality data and diverse perspectives. If the foundational data are unorganized or represent only some of the pertinent conceptual models, theories or perspectives represented in the populations of interest, even the most advanced data analytic tools may simply result in the wrong answers, provided at higher speed. AI needs data that are standardized, tested and collected from multiple sources that adequately represent populations of interest. A variety of conceptual models and analyst perspectives are required as well, to guide analytics and avoid bias.

AI is enabled by high-performance computing that can find previously unknown or unknowable patterns in huge and varied data at very high speeds, but it must be guided by a representative variety of relevant human interests and perspectives to make sure the answers AI provides are most useful.

OptumServe can help federal agencies implement artificial intelligence initiatives. Optum maintains a secure and reliable database covering nearly 240 million de-identified lives of data (spanning clinical, claims and employer benefits) used to foster innovation and research across health care.

While a seemingly endless amount of data exists, some agencies are not using data to the fullest potential:

- Agencies must be able to generate and collect a variety of data from multiple sources and with many different formats, at scale.
- Agencies must be able to curate and clean the data to make data useful. To use data in a way that fully enables sophisticated decision-making, agencies need:
 - **An understanding of conceptual and theoretical models**, blended with practical experience and diverse perspectives, that should guide data collection and analysis.
 - **The infrastructure to generate and capture proprietary data** and supplement these data with relevant third-party data.
 - **Centralized data** — Data lakes for raw data and data warehouses for structured, filtered and cleaned data, all of which are secured and governed well to assure appropriate and timely access. If data are trapped in silos, their utility is limited.
 - **Pervasive automation** — Digitizing processes and reducing manual interventions via AI make it easier to track metrics more accurately and offer further opportunities for improvement.

OptumServe has extensive knowledge of diverse data sets, from claims and clinical data to genomics and electronic health record (EHR) data, to help federal agencies verify whether they have a strong foundation for AI methods to be built upon. We also routinely obtain and use federal, state and county data pertinent to health and health care, economic performance, social determinants of health and quality of life, political forces, criminal justice, housing, transportation and many other issues. OptumServe staff are diverse in culture and background and have decades of training and experience in many social, physical, engineering, computer science, and life science fields, as well as providing the variety of perspectives needed to maximize the gain from using AI to solve vexing problems.

AI is a collaborative effort

OptumServe brings together the varied perspectives of our clients and our data, analytics and the high-performance computing capabilities of the UnitedHealth Group enterprise to address the AI needs of federal health agencies.

Collaboration is key

Federal health agencies looking to AI to drive their missions need a dependable partner to help. OptumServe has a successful track record of building predictive AI models to improve the health and well-being of those we serve.

Our experience includes using AI for clinical, financial, administrative, social and policy applications.
Some examples of how we've helped federal agencies include:



Provider risk model

OptumServe developed a continuous learning system that included a suite of supervised models for a federal health agency to predict the likelihood a provider would have an improper payment based on the provider's characteristics. Both parametric models (e.g., Poisson and multinomial logistic) and machine learning algorithms (e.g., Random Forest) were used to develop the predictive models. Findings from a variety of program integrity initiatives measuring different aspects of improper payment and fraudulent behavior were used to:

- 1. Train the models** to identify characteristics associated with higher risk of improper payments and fraud, waste and abuse.
- 2. Predict future risk.** Provider characteristics were developed using a deep understanding of service types and their nuanced policies. Impact of provider characteristics on improper payments or fraud were estimated using a simulation technique to assist the agency in developing an actionable and defensible mitigation plan. Additionally, OptumServe developed a tool to create a singular risk classification that combined risk estimates based on multiple models to assist the agency and other stakeholders with developing and prioritizing their mitigation approach. Potential high-risk providers were identified using the individual and combined risk classification, and the agency was able to focus its resources on this cohort and, in turn, reduce the burden on low-risk providers.



Future health and economic impact of comprehensive tobacco control in the Department of Defense (DoD)

This study evaluated future health outcomes of 3.2 million TRICARE Prime beneficiaries ages 18–64. The sample included active duty and retired Military Service Members and their dependents. The authors estimated the economic impact of initiatives the DoD may take to further its efforts to transform the military into a tobacco-free environment. Simulations were conducted to predict the smoking status and risk of developing 25 smoking-related diseases and associated medical costs. Data for this study were obtained from the Centers of Disease Control and Prevention, TRICARE and the National Cancer Institute. Results showed that a comprehensive tobacco control policy within DoD could significantly decrease the prevalence and lifetime medical costs of tobacco use. A manuscript reporting study findings was published in *Military Medicine* (Yang, et al., Future health and economic impact of comprehensive tobacco control in DoD: A microsimulation approach. *Military Medicine*. 2018;183.)

Taking the next step

In order for federal agencies to get the most out of AI, it is important to understand the next steps to take to get there. OptumServe helps agencies work through problems that can be solved through use of artificial intelligence. We can work with agency staff to uncover opportunities within existing agency data sources and add new sources of data and additional perspectives to consider.

OptumServe can help create a nimble environment where AI can be provided either on-premises or in the cloud. We do this in an ethically sound manner that uncovers and then mitigates sources of bias to make sure analytics of all types are most useful. AI must be combined with a strong theoretical understanding of how data is generated, to avoid the potential biases mentioned above. Our data scientists work hand-in-hand with econometricians and statisticians to reduce the risk of developing unstable or biased models.

The successful use of AI is not a one-and-done process. AI needs to be built, operated and evaluated in a way that allows humans to recognize opportunities for improvement and take quick action where needed. AI is a collaborative effort, involving people and machines. Working together with our clients to update processes and models over time, AI can be applied to help federal agencies meet their changing needs and evolve over time to continually increase efficiency and effectiveness in their work. Together, we will improve health and the health care system for everyone.



Learn about OptumServe and how we help federal agencies deliver on their missions using artificial intelligence.

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About OptumServe

OptumServe is the federal health services business of Optum and UnitedHealth Group (NYSE: UNH). We are proud to partner with the Departments of Defense, Health and Human Services, Veterans Affairs and other organizations to help modernize the U.S. health system and improve the health and well-being of those we collectively serve.

Sources:

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