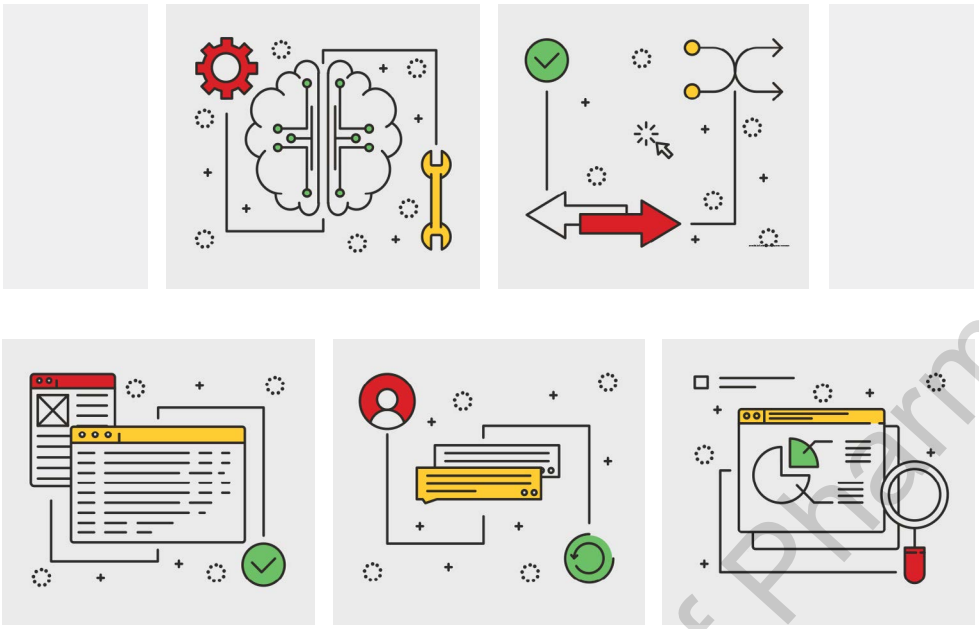
Artificial Intelligence Key to Improving HEALTHCARE QUALITY, REDUCING COSTS

▶ *Trend Watch: AI Implications for Healthcare are Widespread*



Artificial Intelligence (AI) is key to building a better healthcare future, according to a recent survey of 500 U.S. healthcare leaders on their attitudes and usage of the technologies. Most — 94% — responded that their organizations continue to invest in and make progress in implementing AI. The inaugural OptumIQ Annual Survey on AI in Health Care indicates a tipping point in the adoption of AI in the industry, estimating an average investment of $32.4 million per organization over the next five years. Also among the survey's findings:

- 33% of those surveyed expect AI will improve the patient experience
- 33% anticipate AI will decrease per-capita cost of care
- 31% believe AI will improve health outcomes.

The report states that positive ROI could be seen in as soon as four years.

Employers (38%) and health plans (20%) expect ROI sooner — in three years or less — while hospital executives expect a longer wait of four to five years.

Many have plans, but progress is mixed across sectors. Three-quarters (75%) of healthcare organizations are actively implementing or have plans to execute an AI strategy. Forty-two percent of those organizations have a strategy but have not yet implemented it. Employers are furthest along, with 22% reporting their AI implementations are at a late stage, with nearly full deployment.

First Wave of AI Implementation

The survey found that respondents are looking to AI to solve immediate data challenges from routine tasks to truly understanding consumers' health needs. Of those health organizations that are already investing in and implementing AI:

- 43% are automating business processes, such as administrative operations or customer service;
- 36% are using AI to detect patterns in healthcare fraud, waste and abuse; and
- 31% are using AI to monitor users with Internet of Things (IoT) devices, such as a wearable technology

Hiring and Training a Top Priority

With more organizations seeing the benefit of adopting an AI strategy, 92% agree that hiring candidates who have experience working with AI technology is a priority for their organization. As a group, employers agree most, at 96%.

To meet this need, nearly half (45%) of healthcare leaders estimate that more than 30% of new hires will be in positions requiring engagement with or implementation of AI in the next 12 months. However, health organizations seeking to hire experienced staff will likely face talent shortages.

Guerbet Partners With IBM WATSON ON AI ANALYTIC TOOL

Guerbet, a U.S. affiliate of the global specialist in contrast agents and solutions for medical imaging, has an ongoing collaboration with IBM Watson Health in medical imaging. Watson Imaging Patient Synopsis is a radiologist-trained AI tool that extracts relevant patient information, summarized into tailored, specific, and concise single-view reports to better inform diagnostic decisions. Guerbet will become the first reseller of Patient Synopsis, in addition to IBM and Guerbet's ongoing efforts to co-develop and distribute innovative, clinical decision support solutions. Earlier this year, Guerbet signed a joint-development agreement with IBM Watson Health to develop an AI software solution supporting liver cancer diagnostics and care that will add to Guerbet's Digital Services portfolio in the near future.

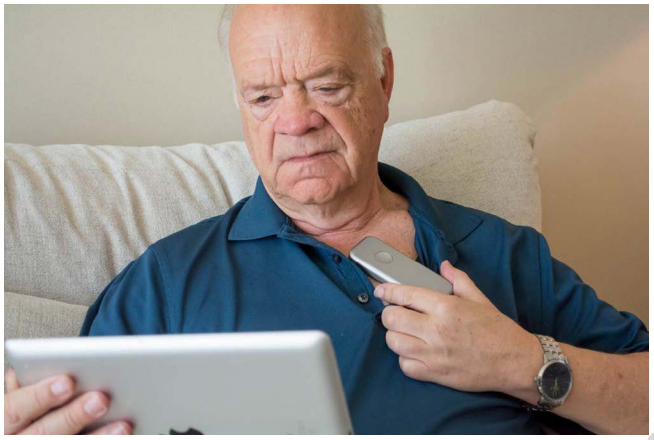
AI to Reduce PARKINSON'S ASSESSMENT TIME

Medopad, the fledgling UK health tech start-up, has partnered with Chinese technology colossus Tencent to speed up assessment of Parkinson's disease. The companies, working in association with Parkinson's Centre of Excellence at King's College Hospital in London, are launching a research and development project, which uses motion capture technology to track patient movements and AI to assess them. Video analysis technology programmed with deep learning and image recognition is used to evaluate the severity of a patient's condition. It is hoped that AI will reduce the time needed for such assessments from the current 30 minutes to just three.

Medopad will embed the AI technology and capabilities for the video analysis of Parkinson's disease, supplied by Tencent, within its mobile app, meaning doctors will be able to assess people in their own homes.

Ray Chaudhuri, professor of movement disorder and director of Parkinson's clinic of excellence at King's College London, says, "Tencent brought the latest technical support to Parkinson's diagnosis, and Medopad provides an app-based approach to our consultation, which is traditionally carried out in clinic. In many ways, the cooperation between the two will revolutionize the way that we care for people with Parkinson's."

AI Detects Heart Murmurs BETTER THAN CARDIOLOGISTS



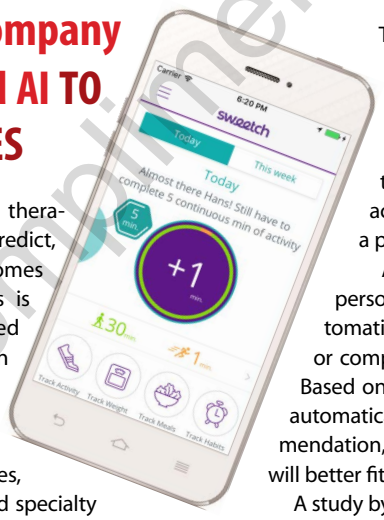
Eko, the makers of digital stethoscopes, unveiled a neural network AI algorithm that is able to detect murmurs better than a group of cardiologists. The study, titled Artificial Intelligence Detects Pediatric Heart Murmurs With Cardiologist-Level Accuracy, involved teaching a computer to spot suspicious murmurs by first giving it thousands of previously diagnosed sound recordings. The computer analyzed these for unique audio signatures and found enough nuances to be able to identify murmurs in a sample auscultation.

The neural network AI algorithm was trained on thousands of heart sound recordings. The algorithm was then tested on an independent dataset of pediatric heart sounds and compared to gold-standard echocardiogram imagery. Five pediatric cardiologists also listened to the heart sound recordings and independently made a determination whether a recording contained a murmur. This advancement will help narrow the clinical skill gap between the 27,000 cardiologists in the United States — the experts at murmur detection — and the 3.8 million other clinicians who are less experienced in the identification of heart murmurs through a stethoscope.

"When it comes to healthcare, data almost always leads to better results because practitioners are able to make more informed decisions," says Dr. Nicholas Slamon, Pediatric Critical Care Physician at Nemours Children's Health System. "Eko's technology is leveraging the largest available dataset of previously captured heart sounds to elevate the skills of clinicians and in turn provide guidance on how to diagnose, and subsequently treat serious, often fatal cardiac conditions. It's a powerful advancement for the world of medicine."

Eko is currently pursuing FDA clearance for the algorithm and will be rolling it out with its existing cardiac monitoring devices upon securing regulatory clearance.

Digital Health Company Uses Gaming and AI TO MANAGE DIABETES



Sweetch, the first AI digital therapeutics solution that helps predict, prevent, and improve outcomes among people with diabetes is partnering with integrated healthcare system WellSpan Health. The partnership's first phase will provide Sweetch's mobile health app to WellSpan Health's 15,000 employees, including 200 primary care and specialty physicians and advanced practice clinicians in central Pennsylvania and northern Maryland.

The Israeli-based company is using principles from mobile gaming, the healthcare industry, and AI to develop a solution that can give patients insight on behaviors that can lead to diabetes.

The app enables prediction and prevention of diabetes by automatically learning and mapping life habits, without asking any questions. However, the app can't be used without an access code that would come from a person's healthcare provider.

After the system sends a highly personalized recommendation, it automatically learns how the user reacted or complied with this recommendation. Based on real-world behavior the system automatically starts tweaking the recommendation, so the new recommendation will better fit the user's life.

A study by Johns Hopkins published in the Journal of Medical Internet Research showed that patients in the Sweetch trial lost a mean of 3.5 pounds and improved weekly physical activity over the course of the three-month trial. Patients in the study also saw a decrease in glycated hemoglobin levels.

Frost & Sullivan: AI COULD SAVE $150 BILLION IN HEALTHCARE

Frost & Sullivan expects AI and cognitive computing to generate savings of more than $150 billion for the healthcare industry by 2025. These technologies are mostly used in healthcare to deal with the complexity and growth of medical data. Some of the real-world benefits of AI-enabled solutions are automated disease prediction, personalization of treatment pathways, intuitive claims management, and real-time supply chain management, which promise to ensure higher profitability and sustain competitive advantage for payers, providers, and pharmaceutical enterprises. However, their uptake in healthcare IT has been slow due to strategic and technological challenges. So far, only 15%-20% of end users have been actively using AI to drive real change in the way healthcare is delivered.

"AI in healthcare IT allows many providers to pursue precision medicine approaches based on the real-time integration of a patient's genomic, clinical, financial, and behavioral data to improve outcomes," says Koustav Chatterjee, industry analyst, transformational health at Frost & Sullivan. "For maximum impact, AI algorithms also consider the latest academic research evidence and regulatory guidelines before recommending personalized treatment pathways to high-risk, high-cost patient populations. AI is also used to expedite the process of clinical trial eligibility assessment and generate prophylaxis plans that suggest evidence-based drugs. However, physicians remain the key decision maker and should be the final authority on any AI-driven care plan."

In the next three to five years, the status quo is going to improve dramatically. Democratization of AI is now made possible by big IT companies such as IBM Watson Health, Microsoft, Google, Philips, GE Healthcare, Amazon, and Salesforce, which are offering cost-effective infrastructure support to modular and speciality-specific vendors, striving to help end users embrace precision diagnosis, treatment, and follow-up for patients and their family members across the care continuum.

Currently, the United States is the global hub of healthcare AI due to its strong performance across seven AI maturity metrics by Frost & Sullivan: investment, incubator, infrastructure, patent, talent, global collaboration, and end-user adoption. China has already established its dominance in AI, while Japan and India are gradually establishing footprints. Europe, on the other hand, is struggling to pioneer AI innovations due to restrictive data policies.

Linguamatics Earns AI LIFE-SCIENCES AWARD

Each year, Frost & Sullivan presents its Global Product Leadership Award to the company that has developed a product with innovative features and functionality that is gaining market acceptance. The award recognizes the quality of the solution and the customer value enhancements it enables.

Frost & Sullivan recognized text mining solutions provider Linguamatics with the 2018 Global Product Leadership Award for its industry-leading I2E natural language text mining platform. This intelligent solution generates insights from a wide range of unstructured and semi-structured data, empowering clients to efficiently integrate AI into their operations.

"I2E's data-driven query development approach ensures reliable results even where there is no annotated training data available," reports Kamaljit Behera, industry analyst for Frost & Sullivan. "It can obtain actionable results from unstructured data up to 1,000 times faster than the traditional keyword-based research."

Linguamatics also has created a separate interface for less experienced users, allowing them to find and use optimized queries that have been previously created and published, thus making it easy for new users to access the platform's power for their application areas. Furthermore, the platform employs intuitive reporting to present extracted information in a structured form.

Frost & Sullivan also noted that Linguamatics recently introduced iScite, a ground-breaking SaaS AI-based text analytics solution. iScite is built on Linguamatics' scalable NLP technology stack and includes an innovative answer-routing engine that empowers users to rapidly respond to business-critical queries.

"Linguamatics' solution combines enterprise, cloud-based, and hybrid implementation models, offering end users an integrated view for faster and well-informed decision-making," Mr. Behera notes. "This type of platform flexibility is unique and helps Linguamatics deploy innovative solutions in development and translational research environments."

OWKIN Unveils World's Largest AI-POWERED MEDICAL RESEARCH NETWORK

OWKIN, which builds machine learning technologies to enable medical and scientific discoveries, has launched the world's largest AI-powered medical research network. The OWKIN Loop Network is comprised of more than 30 hospitals and research institutions across the U.S. and Europe. The network enables researchers to train predictive models on real-world data at scale and transfer knowledge to a collective intelligence, benefiting fellow researchers, partner hospitals, and pharmaceutical companies to improve patient treatment and accelerate drug R&D.

These algorithms accelerate drug development by predicting toxicity, resistance, and sensitivity to treatment outcomes, and disease evolution. Researchers on the OWKIN platform are empowered to train predictive models on historically siloed, real-world medical data. OWKIN Loop is the first at-scale solution of federated learning for the healthcare industry, allowing researchers to extract insights, preserve patient privacy, and contribute to better patient outcomes.

"Access to patient data is critical for improving medical research," says Thomas Clozel, M.D., co-founder and CEO of OWKIN. "But the current patient data brokerage system hinders knowledge sharing and risks patient data privacy, resulting in knowledge silos at individual hospitals. We founded OWKIN to efficiently and intelligently transform hospital-level clinical data into predictive models ... to solve the most important medical challenges."

Linguamatic Text Mining at Sanofi: GENOTYPE-PHENOTYPE ASSOCIATIONS

Sanofi decided to annotate the association of human leukocyte antigen (HLA) alleles and haplotypes with diseases and drug hypersensitivity. There are some public resources that associate HLA alleles with more than 40 different autoimmune diseases, some cancers, infectious disease, and drug hypersensitivities, but none provides systematic annotation of these associations. Sanofi established a workflow for whole exome sequencing-based HLA typing and analysis that identified more than 400 HLA alleles. They used a Linguamatics I2E platform to analyze and search the literature to annotate the association of the HLA alleles with diseases and drug hypersensitivity. This project resulted in more than double the previous disease associations, and the curated annotations were fed into a searchable knowledge base for broad use within the Sanofi team. For this MS biomarker discovery project, Sanofi wanted to annotate the association of HLA alleles and haplotypes with diseases and drug hypersensitivity, as the HLA genotype is responsible for some 30% of the risk of MS and participates in almost every aspect of the disease.

Sanofi linguistically processed and indexed a literature corpus of 25 million PubMed abstracts and 4 million full text journal articles with I2E text analytics, using an internally developed HLA gene ontology, alongside Linguamatics I2E's dictionary of relationship verbs (e.g. causes, leads to, results in) and diseases ontology. This identified HLA alleles and haplotypes and their relationships with

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diseases and drug sensitivity. The Linguamatics I2E text mining query identified all the 22 previously published autoimmune diseases associated with HLA alleles and uncovered an additional 34 previously unpublished disease and drug sensitivity associations. These known and novel associations are stored in a database that can be searched through a simple web interface for HLA alleles and diseases.

The discovery of an additional 33 novel unpublished HLA allele disease and drug sensitivity associations provided Sanofi with a more comprehensive knowledge base from which it can now explore potential new biomarkers for MS.