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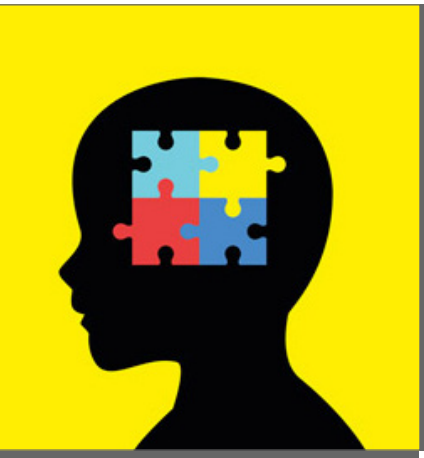

Seeking faster autism diagnosis

Cognoa scores FDA breakthrough designations

By Liz Hollis, Staff Writer

Palo Alto, Calif.-based Cognoa Inc. received breakthrough device designations from the U.S. FDA for its digital diagnostic and digital therapeutic devices for autism. Cognoa's digital precision health platform weds machine learning and predictive analytics to parental inputs and diagnostic data and responses to therapeutics to create more personalized care. The single platform aims to help clinicians to come to accurate diagnostic and therapeutic decisions faster and modify treatments.

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Inside

Global Kinetics' PKG yields real-world data to change management of PD patients

By Tamra Sami, Staff Writer

PERTH, Australia – A recent clinical trial showed that Australia's Global Kinetics Corp.'s Personal Kinetigraph (PKG) could help change the way Parkinson's disease (PD) is managed, with clinicians reporting that the additional data the device yielded were significant enough to change the management of nearly one-third of the patients participating in the study.

A wrist-worn device that looks like a smartwatch, the PKG measures patient movements and creates data-driven reports that allow clinicians to make

See Global Kinetics, page 4

Partisanship outshouts pleas for unity on drug prices, health care issues

By Mari Serebrov, Regulatory Editor

The morning after U.S. President Donald Trump called for unity on bipartisan issues such as bringing down prescription drug prices, ending the HIV epidemic within the decade and advancing the development of treatments for childhood cancers, members of the House of Representatives were back at their battle lines, hurling names and accusations at each other.

The battle ground consisted of several committee hearings Wednesday on the status of *Texas v. the United States*, a lawsuit brought by a number

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New point-of-care MRI a major draw for Canadian and provincial investments

By David Godkin, Staff Writer

Ottawa and the Nova Scotia government will spend nearly CA$2 million (US$1,520,000) over three years to make a broad business case for a new neuroimaging system developed by Toronto-based Synaptive Medical Inc. Housed at Halifax, Nova Scotia's Queen Elizabeth II Health Sciences Center, the Evry superconducting MRI's real test, officials have said, will be its impact on provincial health care overall.

"Working with a leading Canadian medical technology company represents an exciting opportunity to not only drive innovation in

See Synaptive, page 6

Step toward implant?

Columbia researchers use deep learning to translate brain signals into speech

By Stacy Lawrence, Staff Writer

A brain implant that translates thought into speech for those without that capacity sounds like science fiction. But now New York-based Columbia University researchers have become the

See Columbia, page 7

BioWorld MedTech's Orthopedics Extra

Executive Editor Holland Johnson on one of med-tech's key sectors

Read this week's edition

Financings

Kfar-Saba, Israel-based **Cathworks Ltd.** reported the completion of a $30 million series C financing round led by Deerfield Management. The Cathworks system received U.S. FDA 510(k) clearance on Dec. 19, 2018.

Mountain View, Calif.-based **DNAnexus Inc.** reported closing a $68 million financing. The funds were raised from existing investors, GV (formerly Google Ventures), Foresite Capital, TPG Biotech, Wuxi Nextcode, and Claremont Creek Ventures, as well as debt and equity financing from Innovatus Capital Partners LLC. The financing supports the deployment of DNAnexus Apollo, an advanced platform for multi-omics and clinical data exploration, analysis and discovery.

Appointments and advancements

3M Co., of St. Paul, Minn., said its board will nominate CEO Mike Roman to serve as chairman following the company's annual meeting of shareholders May 14, 2019. Inge Thulin, 3M's current executive chairman, has reported his intention not to stand for re-election and to retire June 1, 2019. At its annual meeting in May, the 3M board will consist of 12 members, 11 of whom will be independent directors.

DNA sequencing company **llumina Inc.**, of San Diego, said Sue Siegel has joined the company's board, effective Feb. 5. Siegel is chief innovation officer at General Electric and CEO of GE Ventures.

Myomo Inc., a wearable medical robotics company based in Cambridge, Mass., reported that Ralph Goldwasser, its chief financial officer, is retiring, effective Feb. 18, 2019. Goldwasser will provide transitional services to the company for an expected three-month term under a transition and consulting agreement. He will be succeeded by David Henry, effective Feb. 18. Henry is joining Myomo from Eos Energy Storage, where he has served as chief financial officer since August 2017.

Other news to note

Cofactor Genomics Inc., of San Francisco, reported a $100,000 grant program to reward innovations with the Cofactor Immunoprism Assay. The program was unveiled at the 2019 Immuno-Oncology 360° Conference in New York.

Consure Medical Inc., of San Francisco, said its Qora stool management kits received an Innovative Technology contract from Irving, Texas-based **Vizient Inc.**, a member-driven health care performance improvement company.

A federal jury in Indianapolis has found an intravenous filter made by Bloomington, Ind.-based **Cook Medical Inc.** to be defective. It awarded $3 million to a Georgia woman who alleged she suffered medical complications after the filter deteriorated inside her body.

Immunexpress Inc., of Seattle, reported a partnership with the DRIVe Solving Sepsis Initiative, a collaboration in which the Division of Research, Innovation, and Ventures (DRIVe) will contribute $744,739 of a $3.2 million project for the development and commercialization of Immunexpress' Septicyte technology on the Biocartis Idylla platform. This development will result in a tool capable of a 90-minute, sample-to-result diagnosis in patients suspected of sepsis. DRIVe is an initiative of Biomedical Advanced Research and Development Authority within the U.S. Department of Health and Human Services.

Omron Healthcare Inc., of Lake Forest, Ill., and **Physiq Inc.**, of Naperville, Ill., reported a collaboration to integrate the former's FDA-cleared device, Heartguide, a wearable blood pressure monitor, into the Pinpointiq platform to monitor at-risk patients in an outpatient setting.

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Cognoa

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About 1 in 59 children has been identified with autism spectrum disorder, according to estimates from CDC's Autism and Developmental Disabilities Monitoring Network. The company noted that the average age of autism spectrum disorder diagnosis has remained unchanged for more than 15 years, standing at more than 4 years of age.

"We believe [artificial intelligence]-based precision health can empower parents and their pediatricians to act on early concerns that are highly predictive of developmental delays, like autism, with potentially life-changing results for children and their families," Brent Vaughan, CEO and co-founder of Cognoa, explained. "We are thankful that the FDA recognizes the critical need for innovative solutions to help address these challenges. We look forward to working closely with them to further our clinical studies and support our development."

The company said its diagnostic device is intended to help health care professionals provide a diagnosis of autism spectrum disorder in children between the ages of 18 months and 72 months who are at risk for developmental delays. That is important because a diagnosis often comes later, after the window of brain plasticity that is crucial to maximizing treatment outcomes.

With its therapeutic device, the company will aim to help boost socialization and responsiveness of children with autism spectrum disorder. The device will be intended for use outside the clinician's office to supplement existing therapies, giving patients timely and convenient access to care, with the potential of reducing wait times.

Earlier diagnosis

"Cognoa's diagnostic device is unique in that we expect it to be the first medical device intended for use by pediatricians and primary care physicians to enable a diagnosis up to two-and-a-half years sooner than the current standard of care," Vaughan told *BioWorld MedTech*. "The Cognoa device is also unique in that it engages both the parent and their child's trusted doctor to enable earlier diagnosis and treatment."

The company is hoping for a quick turnaround with the FDA. "We are focused on our product development and continue to work with the FDA to gain regulatory clearance. We expect to make substantial progress towards the goal of FDA clearance in 2019," Vaughan said.

In terms of other offerings, he noted that the company provides the Cognoa Child Development app via partnerships with employers, payers and applied behavior analysis therapy centers.

Last fall, Baltimore-based Learn Behavioral, a network of providers serving children with autism and other special needs, reported a partnership with the company that aims to improve the timeliness of care. The company's solution will be deployed in nine regions within the Learn network. Just last month, the company said Cambia Health Solutions Inc., of Portland, Ore., would incorporate its evidence-based platform within its subsidiary health plans.

"Cognoa's diagnostic device is unique in that we expect it to be the first medical device intended for use by pediatricians and primary care physicians to enable a diagnosis up to two-and-a-half years sooner than the current standard of care.

Brent Vaughan
CEO and co-founder, Cognoa Inc.

Feedback for the development app, which, so far, has been used by more than 250,000 families, has been positive. Vaughan said parents like that it can help them obtain answers sooner, allowing for earlier diagnosis and treatment. "Regardless of whether their child's development is on track or not, parents have reported feeling empowered with our evidenced-based activities to support their child's unique developmental progress. We have also received strong support and enthusiasm from clinicians wanting to participate in our clinical studies," he added.

When asked about the potential for going to other markets, Vaughan said the U.S. is the main focus right now, but the company will evaluate expansion. Also, the company is looking to go beyond its first therapeutic area of autism. "We intend to develop further devices based on our precision health platform for ADHD and other behavioral health indications. We are committed to generating and sharing clinical data and trials and submitting further results to peer-reviewed medical journals," Vaughan said.

Another company trying to help identify those with autism spectrum disorder early is Madison, Wis.-based Neuropointdx, a division of Stemina Biomarker Discovery. Last fall, the company, which focuses on metabolomics, unveiled the Npdx AA test. That test identifies metabolic subtypes associated with the condition. (See *BioWorld MedTech*, Nov. 2, 2018.) The test, provided through Neuropointdx's CLIA-certified laboratory, may be used to screen children as young as 18 months. ♦

Global Kinetics

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better treatment decisions based on personalized data for each patient.

Published in *The Journal of Parkinson's Disease* and conducted at the Parkinson's Institute and Clinical Center, the trial provided much more information to clinicians than is typically captured during routine clinical visits.

Currently, it is difficult to track a patient's motor symptoms when the patient is at home. Global Kinetics' PKG is the first FDA-cleared technology to provide continuous quantitative data on movement disorder symptoms including tremor, bradykinesia (slow movement) and dyskinesia (abnormal or impaired movement) in a non-clinical setting.

The technology is worn at home by patients for several days to help objectively monitor motor symptoms and the information is then transmitted to their physician for review during their next clinical visit.

Conducted from December 2015 through July 2016, the study was comprised of a survey completed by four movement disorder specialists to whom PKG data were available for four categories of patients: patients visiting the clinic for the first time, patients with fluctuations in Parkinson's symptoms, patients with an unclear Parkinson's symptom history and patients considering advanced therapy.

For each patient visit, the survey assessed whether or not the PKG provided additional information beyond what could be gathered through physician examination and patient-reported symptoms. An evaluation of the impact of the additional information on changes to clinical management was assessed.

Of the 112 surveys conducted in the study, 41 percent indicated that the PKG provided additional information to the physician. Of these surveys, 78 percent showed that the data resulted in changes to the patient's treatment plan. The most common new piece of information from the PKG resulting in treatment changes was precise information on when the patient was not adequately treated, referred to as "daily off times."

The trial marks the first "systematic evaluation of physician assessment on the value added by continuous objective measurement to the clinical consultation in a 'real world' clinical practice in the United States," the study authors said.

New PD insights

As such, these data offer new insight into the role of such technologies in the routine care of patients with PD. While many segments of PD research focus on the development of new therapies, we have learned there is also an opportunity to maximize the use of existing PD therapies in routine clinical care.

"Continuous objective measurement may offer a mechanism to objectively define PD motor symptoms, define treatment targets for motor function, and lead to a new paradigm for better monitoring PD patients, which may ultimately drive improved use of treatments we already have in our armamentarium as well as better outcomes for PD patients," study authors said.

> *"We are the first continuous objective measurement, especially in bradykinesia, which is the differential diagnosis of Parkinson's. Never before was there a way to continuously assess that.*
>
> John Schellhorn
> CEO, Global Kinetics

Integrating continuous objective measurement technology such as the PKG into routine clinical care required some initial training from Global Kinetics related to device logistics and physician training on interpreting clinical data, the authors said.

"These results demonstrate the real-world clinical benefits that PKG can provide to patients and clinicians in their continuing effort to optimize Parkinson's therapy, and manage symptoms effectively," Global Kinetics CEO John Schellhorn said.

Previously, clinicians relied on patient-reported information using diaries, which weren't accurate because they were highly subjective.

Providing a patient record

PD is a progressive fluctuating condition that changes from patient to patient as well as from day to day, said Michelle Goldsmith, Global Kinetics' senior VP of business development and legal affairs.

"A patient with Parkinson's may see a clinician at 10 a.m., but by 4 p.m. she may not be able to get out of bed, and a clinician has no way of knowing that pathology unless there's an objective record."

"We provide over time an hour-by-hour and minute-by-minute assessment of how the patient is doing. Are there consequences of the medication that can lead to dyskinesia? In Parkinson's, you want to know what is happening over time, and that's how we distinguish the PKG," Schellhorn said.

First continuous measurement of bradykinesia

"We are the first continuous objective measurement, especially in bradykinesia, which is the differential diagnosis of Parkinson's," Schellhorn said. "Never before was there a way to continuously assess that."

In an earlier study, a panel of 11 movement disorder specialists compared Global Kinetics' PKG with other technologies, according to the article published in *Nature*.

The panel noted that only the PKG recorded bradykinesia, which may be the "most readily measured aspect of dopamine deficiency, and it can well act as a surrogate for those symptoms that are more difficult to measure," study authors said.

Bradykinesia refers to slowness of movement, which is related to the loss of dopamine responsiveness in brain cells and is

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of states that questions the constitutionality of the 2010 Affordable Care Act (ACA) after Congress reduced the personal mandate penalty to zero in 2017. House Democrats voted to intervene in the suit, which is on appeal to the Fifth Circuit.

A 2012 Supreme Court decision that the ACA was constitutional revolved around the law's individual mandate that required Americans to get health insurance or pay a penalty to the IRS. In its 5-4 ruling, the high court determined that the penalty for not purchasing health insurance is a tax and, therefore, constitutional.

With the penalty now at zero, the states that brought the current suit claimed the ACA is no longer constitutional because there is no tax. There is a lot more at stake today than there was in 2012, as provisions of the law have become more entrenched in U.S. health policy.

In his December ruling in the case, U.S. District Judge Reed O'Connor invalidated the entire ACA on constitutional grounds and because of its lack of a severability clause. Without such a clause, if one piece falls, the entire bill goes with it. That would include the Biologic Price Competition and Innovation Act (BPCIA), which was rolled into the 2,300-page ACA, Chad Landmon, chair of the intellectual property and FDA practice groups at Axinn, Veltrop & Harkrider LLP, told *BioWorld MedTech*.

O'Connor granted a stay on his decision pending appeal. If his ruling is upheld by the higher courts, the BPCIA could be thrown out, Landmon said. Should that happen, he predicted there would be a lot of litigation.

If the entire ACA were to go down, the divided Congress would have to quickly agree to pass the BPCIA as a standalone bill or come up with another remedy. Otherwise, all the gains that have been made in creating a biosimilar path in the U.S. could be called into question, along with the future of the biosimilar pipeline. Given the debates the first time around over the length of biologic exclusivity and growing concern about the price of new biologics, getting the BPCIA passed as is would be quite a challenge.

The biosimilar path wouldn't be the only casualty. Also gone would be the bans on excluding patients from insurance coverage for pre-existing conditions and the setting of lifetime caps on coverage. Such caps in the past were lower than the cost of some drugs today. Going back to an era of coverage caps and denial of coverage for pre-existing conditions would bring even more pressure on Congress to transform how Americans pay for health care and on drug companies, device makers and the entire health care industry to lower their costs.

Slim chance

The chance that O'Connor's decision will be affirmed on appeal is slim, according to experts testifying at the House Energy and Commerce Health Subcommittee hearing Wednesday. They pointed out that a case could be made that the individual mandate still stands, even though the penalty was reduced to zero.

> *"Moving from where we are stuck at the moment in health policy, like it or not, will continue to be a heavy lift.*
>
> Thomas Miller
> Resident Fellow, American Enterprise Institute

Thomas Miller, a resident fellow in health policy studies at the American Enterprise Institute, told the lawmakers that if the Fifth Circuit, which may decide the case by August or September, reverses O'Connor, "further litigation, for all practical purposes, would be over at that point," as it would be doubtful the Supreme Court would consider a further appeal.

However, an en banc reconsideration at the Fifth Circuit could be a wild card, Miller said. One scenario in that situation would be a Fifth Circuit decision that could narrow the degree of severability so it only affected ACA provisions closely related to the individual mandate, sparing titles such as the BPCIA. Then the Supreme Court would be more likely to accept the case on appeal, Miller said, with a decision possibly coming out in June 2020 – in the heat of the next presidential election.

Rather than discuss possible remedies Congress could pass should the ACA falter, Wednesday's hearings – at least the one held by the Health Subcommittee – were all about politics. "Sadly, we are here today primarily to score talking points or deflect them," Miller said in his written testimony.

"We are far better at defending or attacking the ACA in more of a continuous loop than we are at fixing it constructively," he told the lawmakers, as he urged them to write and enact more effective laws if they "want to fail less and succeed more in health policy."

Miller also acknowledged the difficulty of addressing the unintended consequences of the ACA. (One such consequence is that patients are paying a greater share of their drug and device costs.) "Changes in popular expectations, health industry practices and sunk-cost financial commitments since 2010 are substantial brakes on even well-structured proposals for serious reform," Miller said. "Moving from where we are stuck at the moment in health policy, like it or not, will continue to be a heavy lift." ♦

Synaptive

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diagnostic imaging," Steven Beyea, scientific director of the Province's Biomedical Transatlantic Imaging Center (BIOTIC) told *BioWorld MedTech*, "but to also translate that knowledge into the delivery of better health care for Nova Scotians."

Time is brain

BIOTIC describes itself as a world-class imaging center focused on research, development and commercialization of new imaging products and services. Its ambitions for provincial health care dovetail with Synaptive Medical's track record developing intraoperative navigation systems that provide automated, whole brain mapping of the human brain. (See *BioWorld MedTech*, April 16, 2018).

"Our long term vision has been to marry the DTI and navigation software launched a year ago with a superconducting, dedicated head-MRI," Synaptive Medical CEO Peter Wehrly told *BioWorld MedTech*. "We're just over the moon with its potential for better health care outcomes."

The Evry system is designed as a point-of-care imager in hospital emergency rooms for early detection of stroke following traumatic brain injury or unexpected symptoms of stroke. According to Wehrly, it will depart sharply from the "hub and spoke" model in hospitals where ER doctors make their assessments of patients at admissions and then transfer them to an imaging specialist.

"At some locations, you might get a CT scan and/or be sent down to get an MRI, but that typically would not be done very quickly," said Wehrly. "This is because many times the MRI is at a different location in the hospital or is already in use. Time, physicians tell us, is brain."

Of particular interest to hospitals may be the Evry's 2,200 pound footprint, well below MRI units weighing in at 10,000 pounds. It also takes up much less space than typical MRIs, which require, among other things, a helium quench pipe on the outside.

"Ours doesn't need that quench pipe; it's cooled internally," said Wehrly. "So the amount of space the Evry takes and its usability make it perfect for a point-of-care magnet." The machine can be moved swiftly from floor to floor in a standard sized delivery elevator and works easily alongside other technologies, Wehrly added.

Evry MRI machine; Synaptive Medical Inc.

Biotic's role over the next three years will be to assess the machine's usability as an emergency room imager at Queen Elizabeth II Health Sciences Center, Halifax's largest hospital. "Several groups have been interested," Wehrly said, "but BIOTIC was particularly quick to see the value of this technology and how it might help patients in Nova Scotia."

Poking the bear

In addition to a provincial grant of more than CA$1.2 million (US$912,000) and CA$700,000 (US$532,000) from Ottawa, Synaptive Medical is kicking in more than CA$1.36 million (US$1 million) of in-kind support (e.g., equipment, staff and servicing). Company sales of its Brightmatter brain mapping platform and other private investments, said Wehrly, have put Synaptive in a position to set the standard for point-of-care MRI in years to come.

"Shorter term, we hope to be on the marketplace, with Health Canada approval, later this year. We'll be submitting a 510(k) application for U.S. regulatory approval also in 2019 with an eye to getting approval sometime in 2020." An added wish along the way: to shake up the industry. "We hope to see how the big competitors in MR in the U.S. react. We're going to poke some pretty big bears," Wehrly said. ♦

Columbia

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first to generate sounds that are intelligible to human listeners via interpretation of brain signals. They made this promising advance by applying deep learning to neural data derived from five epilepsy patients during monitoring to identify a portion of their brain for surgical removal to quell severe tremors.

These patients listened to four different speakers repeating single-digit numbers and eight sentences as their corresponding brain signals were recorded. From this data, the researchers then trained a computer algorithm that synthesizes speech, known as a vocoder, to create audible representations of the number sounds that was found to be recognizable to listeners three-quarters of the time. The research was published in the Jan. 29, 2019, issue of *Scientific Reports*.

Achieving accuracy

This is the first time this level of accuracy has been achieved and that intelligible speech has been the result of this sort of work. The researchers expect to continue to advance their efforts by monitoring brain waves during speech, as well as using long-term brain signal data from implantable devices, such as the Neuropace responsive neurostimulation device, to provide more detailed, continuous brain signal data to further train deep learning-based neural networks to translate thought into speech.

"The previous effort by us and others to reconstruct speech from the pattern of neural activity in a subjects' brain focused on simple computer models that was able to produce audio that sounded kind of similar to the original speech, but not intelligible in any way," Nima Mesgarani, the paper's senior author and a principal investigator at Columbia University's Zuckerman Mind Brain Behavior Institute, shared with *BioWorld MedTech*.

"In this study, we combined the state of the art in artificial intelligence with advanced speech processing algorithms to reconstruct sounds from the brain that were much more intelligible compared to previous research," he added. "This is a huge milestone, and we weren't sure we could reach it."

This research was designed to record neural activity while listening to speech sounds and to reconstruct the most similar possible sound to what the subjects heard without knowing what that sound was. It was conducted on the epilepsy patients of Ashesh Dinesh Mehta, a neurosurgeon at Northwell Health Physician Partners Neuroscience Institute who is a co-author on the paper.

The auditory cortex in the brain is comprised of millions of neurons with each tuned to a particular acoustic pattern. Some detect change in pitch, while other are tuned to specific letter sounds. The higher cortical areas also respond to specific words.

Prior research has established that when we listen or imagine listening to someone speaking, distinct brain signal patterns emerge. Similarly, when people speak or imagine speaking, distinct patterns of brain activity are recognizable.

In this research, a deep neural network (DNN), which is a machine learning algorithm, used the data that was detected to derive possible relationships between brain signals and heard speech. The DNN model is designed to learn and map out arbitrarily complex relationships between any two variables, in this case between brain activity and vocoder input. The DNN was trained with the data derived from these epilepsy patients and then tested to establish its performance.

Decoding intentionality

This is an early application of machine learning to the problem of deriving speech from brain signals. The researchers established that the more data input into the DNN, the more it improved. Brain signal data and speech provide two complex, interrelated data sets for deep learning to make sense of, offering a glimpse at the way AI-based tools can help to parse and make more useful the massive datasets that the health care system is continuously creating with everything from patient monitoring to medical imaging to genomics and beyond.

After training the DNN, the result was a robotic-sounding voice, like the consumer-oriented AI interfaces Siri and Alexa, that recited a sequence of numbers that listeners were then tasked to evaluate and report what they heard. These were then compared to earlier efforts to assess the relative improvement in intelligibility.

"We found that people could understand and repeat the sounds about 75 percent of the time, which is well above and beyond any previous attempts," said Mesgarani. "The sensitive vocoder and powerful neural networks represented the sounds the patients had originally listened to with surprising accuracy."

In addition to evaluating brain signals during speech or imagined speech and more continuous recordings of brain signals, the researchers also next plan to also advance their testing to more complex words and sentences.

"One of the biggest barriers has been the indelibility of the reconstructed sound. Our algorithm is the first to generate a sound that is actually intelligible to human listeners," Mesgarani noted. "We plan to test more complicated words and sentences next, and we want to run the same tests on brain signals emitted when a person speaks or imagines speaking. Ultimately, we hope their system could be part of an implant, similar to those worn by some epilepsy patients, that translates the wearer's imagined voice directly into words."

The notion of an implantable brain-computer interface that could aid severely paralyzed patients and others who have lost the ability to speak such as those with locked-in syndrome has been around for decades. But this research has established that the typical linear regression technique used to derive associations between brain signals and sounds is far inferior to a nonlinear, deep neural network approach.

"Our results show that a deep neural network model that directly estimates the parameters of a speech synthesizer from all neural frequencies achieves the highest subjective and objective scores on a digit recognition task, improving the intelligibility by 65 percent over the baseline method, which used linear regression to reconstruct the auditory spectrogram," summed up the paper. "These results demonstrate the efficacy of deep learning and speech synthesis algorithms for designing the next generation of speech BCI systems, which not only can restore communications for paralyzed patients but also have the potential to transform human-computer interaction technologies." ♦

Global Kinetics

Continued from page 4

often difficult for a patient to identify and for a doctor to assess.

Both panels noted that no other clinical or research grade technology could provide passive measures of bradykinesia, establishing the PKG as an essential objective measure of bradykinesia in clinical decision-making. (See *BioWorld MedTech*, Sept. 4, 2018.)

On the heels of the additional clinical validation, Global Kinetics reported that the American Medical Association has issued a set of new category III Current Procedural Terminology (CPT) codes that became effective in January.

The CPT codes allow the company to begin working with regional Centers for Medicare and Medicaid to make its case on why the Medicare-aged population in the U.S. should have access to objective measurements for PD.

The PKG has FDA 510(k) clearance in the U.S., CE mark in the EU and is listed on the Australian Register of Therapeutic Goods. It is reimbursed in the U.K. and the Netherlands and in some Nordic countries.

So far, more than 32,000 patient PKG reports have been supplied to 200 specialist clinics around the world, and more than 3 million recording hours have been provided. ♦

Product briefs

Bionano Genomics Inc., San Diego-based developer of the Saphyr single-molecule optical mapping platform for ultra-sensitive and ultra-specific structural variation detection in genome analysis, reported the publication of data from study that used Saphyr to detect the genetic disorder facioscapulohumeral muscular dystrophy 1 (FSHD1) in *Molecular Genetics & Genomic Medicine*. In a study of a five-generation FSHD1 pedigree, the Bionano platform correctly diagnosed the disease and normal haplotypes. Southern blot and molecular combing analysis confirmed the Saphyr results.

The authors said that based on their findings, Saphyr "is a reliable and accurate technique suitable for the molecular diagnosis of FSHD1." According to Bionano, the authors touted Saphyr's "moderate sample requirements and short time frame compared to Southern hybridization" together with its "potential to identify structural variants such as deletions, duplications or rearrangements."

Ischemaview Inc., of Menlo Park, Calif., said its Rapid imaging platform has been chosen for use in determining subject eligibility for the "Thrombolysis in imaging eligible late window patients (4.5-24 hours) to evaluate the efficacy and safety of tenecteplase," (TIMELESS) trial. South San Francisco-based **Genentech Inc.**, a member of the Roche Group, is sponsoring the study. The TIMELESS trial will evaluate the efficacy and safety of tenecteplase compared with placebo in patients with late window acute ischemic stroke. Genentech's Tnkase (Tenecteplase) is a U.S. FDA approved single-bolus thrombolytic, or clot-busting agent for use in mortality reduction associated with acute myocardial infarction.

Leviticus-Cardio Ltd., of Petach Tikva, Israel, and **Jarvik Heart Inc.**, of New York, reported at the National Research Center for Cardiac Surgery in Astana, Kazakhstan, that the Fully Implanted Ventricular Assist Device (FIVAD) has been successfully implanted into a human. Additionally, an article about the FIVAD implantation was published in the *Journal for Heart and Lung Transplantation*. FIVAD is based on technology created by Leviticus-Cardio that uses patented coplanar energy transfer to wirelessly power a heart pump produced by Jarvik Heart. The investigational device allows patients to walk around without any physical impediments for up to eight hours a day.

Welldoc Inc., of Columbia, Md., said it submitted for U.S. FDA 510(k) clearance of additional features of its Bluestar digital therapeutic. The new enhancements include continuous glucose monitoring (CGM) integration, as well as features to support individuals living with type 1 diabetes. Health care providers will also be able to receive their patient's CGM data, along with self-management data, in Bluestar's comprehensive Smart Visit Report.

Orthopedics Extra

Keeping you up to date on recent developments in orthopedics

By Holland Johnson, Executive Editor

Restoring movement, autonomic function in patients with complete paralysis

Researchers showed that spinal cord stimulation can immediately restore some voluntary movement and autonomic functions such as cardiovascular, bowel and bladder years after a paralyzing injury without any significant rehabilitation. "This was an opportunity to use epidural stimulation, combine my background in mathematics, collaborate with people from multiple disciplines including biomedical engineering and set up a truly innovative trial," said David Darrow, a neurosurgery resident at the University of Minnesota Medical School and a lead investigator for the E-STAND trial. He is also a senior neurosurgery resident at Hennepin Healthcare and University of Minnesota Medical Center. "We wanted to push the envelope for patients. Once we determined it worked, we moved on to knocking down other barriers to translation to patient care." In a study published Jan. 22, 2019, in the *Journal of Neurotrauma*, Darrow and his colleagues implanted the first series of female patients who both suffered devastating traumatic spinal cord injury. Both patients had no lower body function whatsoever and MRIs showing very little residual spinal cord at the level of injury. The two women were five and 10 years from injury and in their fifth and sixth decade of life, which is much closer to the average patient with spinal cord injury compared to the work of other investigators. "While we are excited for all this could mean for patients, there is still a lot of research to be done, both with this therapy and through other avenues, many of which we are studying at the University of Minnesota," said Ann Parr, assistant professor in the Department of Neurosurgery at the University of Minnesota Medical School. The article is titled "Restoring movement and autonomic function in patients with complete paralysis: Study demonstrates spinal cord stimulation as a treatment for chronic spinal cord injury."

New treatment for bone infection using copper-rich glass implant

A team of researchers, led by the Royal College of Surgeons in Ireland, have developed a new treatment for the particularly difficult-to-treat bone infection, osteomyelitis. Funded by the Irish Research Council, European Research Council and AMBER, the Science Foundation Ireland research center for materials science, the study was published in *Biomaterials*. The new treatment has developed a one-step solution that kills bacteria and promotes bone growth without using antibiotics. To do this, researchers combined copper particles with bioactive glass – a type of glass used for bone repair – and incorporated it into an implant designed specifically for bone repair. The copper-doped bioactive glass in the porous scaffold implant attracts blood vessels and bone cells, which accelerates bone repair. The copper ions in the implant also prevent bacteria growth. The ability of a single implant to improve blood flow and enhance bone healing as well as inhibit infection without antibiotic treatment is a significant advancement over most existing treatments. "Osteomyelitis is notoriously difficult to treat. Further work on the back of this research could lead to the complete development of a single-stage, off-the-shelf treatment. This in turn could reduce the need for antibiotics and bone grafting – thus also addressing issues with antibiotic resistance," the researchers said. The article is titled "Collagen scaffolds functionalised with copper-eluting bioactive glass reduce infection and enhance osteogenesis and angiogenesis both in vitro and in vivo."

The delicate balance of treating growing but brittle bones

Turning off a bone receptor protein could potentially treat osteoporosis in children without affecting bone growth. Adults are commonly treated for osteoporosis with drugs called bisphosphonates, which slow the activity of bone-absorbing cells called osteoclasts, allowing bone-building cells known as osteoblasts a better chance to work effectively. Since osteoclasts play an intrinsic role in the process of bone growth, there are concerns that bisphosphonates could negatively affect bone development in children. As of now, not enough research has been done to fully understand the potential consequences. However, according to a study published in *Bone*, Masahiko Takahata of Hokkaido University and colleagues in Japan have found early evidence that inhibiting a bone receptor protein could help treat osteoporosis in children without impairing bone growth. Through testing in rats, Takahata and his colleagues used an antibody to neutralize a bone receptor protein called Siglec-15. This receptor is involved in bone remodelling and regulates bone marrow production of osteoclasts. The team found that inhibiting Siglec-15 in the growing bones of young rats increased bone mass and strength without impairing growth. On the other hand, while normal bisphosphonate treatment also increased bone mass and strength, it caused bone abnormalities and growth retardation. These findings suggest that anti-Siglec-15 therapy could be an alternative therapy with an ideal safety profile for osteoporosis in children, the researchers say; but further studies are required, as osteoclast behavior in rats may not fully align with that in humans. The article, titled "Siglec-15-targeting therapy increases bone mass in rats without impairing skeletal growth," was published Feb. 1, 2019.