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ARTIFICIAL INTELLIGENCE & YO

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-CHRIS COBURN, CHIEF INNOVATION OFFICER, PARTNERS HEALTHCARE SYSTEM, BOSTON

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Editor's Note



rtificial intelligence (AI) may conjure up images from the pages of science fiction, but in reality, it's already here—and it's transforming health care. Al uses the power of computing to detect trends in large amounts of data and even make predictions This has implications for everything from prevention and diagnosis to treatment and managing day-to-day life with a chronic condition. In this issue, we take a deep dive into how AI is already being used by doctors and researchers and look into its potential use in the future. To kick things off. we asked our staff and contributors to tell us what they think about this groundbreaking development.



FROM THE WEBMD TEAM

What about AI and health excites you the most?



ΚΑΥΥΑ ΚΟΡΡΑΠΑΡΟ Sophomore, Harvard University, leader of GirlsComputingLeague, inventor of systems that use AI

NEEYANTH KOPPARAPU High school senior, winner 2019 Davidson Technology **Research Fellow for using** AI in health diagnostics

AI can truly revolutionize

example is combining

AI with rapid whole-

genome sequencing,

diagnose rare diseases

in infants. This not

only helps achieve

quicker diagnosis and

health care. One

which can help

Both AI and health are readily accessible with open-source tools and datasets that couple the power of creativity from young minds with the strength of a community of collaborators. As students, we are excited to be able to harness the powerful potential of newly developed technology to make a tangible impact on patients.



JOHN WHYTE, MD, MPH WebMD Chief Medical Officer

AI will help patients diagnose conditions and manage their own care, thereby changing the health ecosystem from physician-centric to patient-centric. Patients will truly be in charge of their own data.



ERIC TOPOL, MD Director, Scripps Research Translational Institute

The essence of medicine is the human bond between the doctor and patient. This is our chance to get back what was the norm decades ago. It relies on augmentation or machine support, so that, ironically, we can use machines to get heightened humanity in medicine.

STAY IN TOUCH





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and make a difference for all of us.

treatment, it also saves significant cost. AI stands

to have vast impact to fill gaps in many areas

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Amount of time it took artificial intelligence to identify conditions like stroke and bleeding from brain CT scans—150 times seconds faster than radiologists.

1000110



humans AI software analyzed mammograms, with 99% accuracy. Percent accuracy with which an AI program diagnosed childhood asthma flares.

Amount of money AI applications could potentially save the United States health care economy each year by 2026.



The Age of Al

Meet your new partner in health: artificial intelligence (AI), So far, you may be only barely aware of the impact so-called big data is poised to have on research, diagnosis, clinical trials, new drugs, preventive

medicine, and even the relationship you have with your doctor. Much of what is happening is positive—"We can be more empowered as patients" thanks to AI, says one of our experts—but challenges remain as scientists and physicians, among many others in the field, learn how to harness vast amounts of data to improve health. We explore the current state of AI in "Artificial Intelligence & You" starting on page 27. — Current



SUGAR RISKS

People who drink as little as 3 to 4 ounces of sugarsweetened drinks a day may have up to 18% higher risk for cancer than those who avoid the stuff.

AGE AND INSIGHT

The results of an electrocardiogram (EKG)—a test of your heart's health—vary depending on age and sex. So, researchers trained computers to "guess" a person's age and sex based on EKGs. For people in good health for their age, the artificially intelligent computers guessed the correct age. But for people in above- or below-average health, the AI machines were wrong. The healthiest people seemed younger than they were, and the unhealthiest seemed older. This means that AI and EKG could one day be a

tool for evaluating overall health.

SOURCE: Circulation: Arrhythmia and Electrophysiology



DON'T SIP

Not even one drink a week is safe when you're pregnant. In an analysis of 24 studies that included 231,808 pregnant women, any amount of drinking during pregnancy increased risk of miscarriage. Among women who had one to five drinks a week during pregnancy, each additional drink led to a 6% increase in miscarriage risk.

> SOURCE: Alcoholism: Clinical and Experimental Research

Number of nonsmokers who are sometimes exposed to secondhand smoke at work. (One in 10 are exposed often.)



HEARTBREAK IS REAL

A broken heart, or other emotional stress, can lead to actual heart problems. With broken heart syndrome, your heart's main blood-pumping chamber temporarily enlarges and doesn't work very well. New research suggests that the heart condition may be connected to a higher risk for cancer. In a study of 1,604 people with broken heart syndrome, one in six of them also had cancer. Researchers don't know yet whether one condition might make a person more susceptible to the other.

SOURCE: Journal of the American Heart Association

OPTIMISTIC OUTLOOK

Think positive! You might live longer. In a study that followed about 70,000 women and 1,400 men for several decades, optimists lived the longest. In fact, regardless of the person's finances, health condition, or lifestyle factors—such as smoking and diet positive outlook increased life span by up to 15%. Optimists in the study were most likely to live past 85. Feeling pessimistic about your own chances? You can change. Optimism isn't a fixed trait. It's a psychological state that you can develop.

SOURCE: Proceedings of the National Academy of Sciences





CANCER TREATMENT TECH

Immunotherapy—medicine that triggers your own immune system to fight cancer—works wonders for the people who respond to it. But that's only about 30% of those who try the drugs. And doctors don't know how to predict who will benefit and who won't. But artificial intelligence (AI) can. Researchers fed images of tumors to computers along with information about the patient's response to an immunotherapy drug called a PDL1 inhibitor. The computers learned to match tumor characteristics with drug responses. Eventually the machines could tell by looking at tumors whether the drug would work.



CHOOSE CAREFULLY

When it comes to care for kids, not all ERs are the same. That's what pediatric readiness scores show. High scores go to hospitals that have staff, protocols, and facilities especially for kids. Researchers looked at the medical records of 20,483 extremely ill children who visited one of 426 ERs. They found that kids were most likely to survive their illness when they visited hospitals with the highest pediatric readiness scores. Where's the nearest kid-ready ER in your area?

SOURCE: Pediatrics

Upfront

WORTH A TRY

Curious about menstrual cups? The reusable period solution is as safe and effective as pads or tampons with no waste and at a lower cost, according to an analysis of 43 studies that included 3,319 women.

SOURCE: The Lancet Public Health

62%

Percentage of opioid overdose deaths that also involve other drugs, such as cocaine, benzodiazepines, and meth.

SOURCE: CDC

UNWELCOME GUESTS

Do you buy bagged salads? Beware of frogs and other animals, live or dead, whole or in part. A new study says this waking nightmare is more common than researchers previously thought. In the last

decade, the media covered 38 incidents in which consumers found an animal. or part of one, inside a package of greens. Three in four animals leapt, or tumbled, out of conventional produce, not the organic, pesticide-free stuff as you might expect. Frogs are the most common salad squatters, but other surprise garnishes have included two snakes, six mice, three birds, and a bat.

> SOURCE: Science of the Total Environment



Teens who don't date are less depressed and have better social skills, according to a survey of 600 sophomores. SOURCE: Journal of School Health



FASTING FEATS

Intermittent fasting isn't just the latest fad—it may bring serious health benefits. In a study of healthy, middle-aged adults, those who fasted every other day for four weeks lost 4.5% of their body weight, improved their fat-to-lean ratio, lowered cholesterol, and improved other measures of heart health. Even though they ate more than usual on non-fasting days, they cut their overall calorie intake by almost 40%. And there's more: Blood tests showed that the alternate-day fasters had lower levels of age-promoting proteins in the bloodstream. SOURCE: Cell Metabolism

JUST A NUMBER

It's never too late to benefit from exercise. Researchers have long believed that age and inactivity weaken a person's ability to develop muscle. But that may not be true. Exercise scientists compared muscle reactions to exercise in two groups of older men ages 60 to 80: master athletes who work out at least twice a week and healthy, ordinary guys who never got much exercise. After a workout, inactive men's muscles gave off the same biological signals of growth that the athletes' muscles did. No matter your age or fitness level, your muscles can still grow in response to exercise.

SOURCE: Frontiers in Physiology





People who dropped 300 calories a day (that's six Oreos) for two years lost 10% of their body weight and lowered their cholesterol, blood pressure, blood sugar, and inflammation.

> SOURCE: The Lancet Diabetes & Endocrinology



Percentage of employed people who have paid sick leave. HEALTHY HABITS

Living



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Online Support A VIRTUAL THERAPIST HELPS VETERANS OPEN UP ABOUT PTSD

UP TO 20% OF AMERICA'S VETERANS HAVE POST-TRAUMATIC STRESS DISORDER (PTSD) which, left untreated, can strain their relationships, threaten their jobs, and lead to drug or alcohol abuse. Many vets are reluctant to talk about PTSD—even to their mental health care providers—because of the stigma involved and the possibility that it could end up in their permanent health record. Researchers at the University of Southern California found that veterans were more likely to open up about their symptoms to a virtual, computer-based 3D therapist than they were to questions on a written health assessment. According to a report published in *Frontiers in Robotics and AI*, the virtual interviewer created a sense of anonymity and asked supportive, non-judgmental questions to build rapport and make veterans feel more comfortable expressing their feelings. —STEPHANIE WATSON

Male Body Image

IF YOU'RE DETERMINED TO MAKE 2020 THE YEAR THAT YOU GET IN SHAPE, MAKE A RESOLUTION TO DO IT SAFELY

BY Matt McMillen REVIEWED BY Michael W. Smith, MD, WebMD Chief Medical Editor



IN THE LAST FEW DECADES, CHILDREN'S ACTION FIGURES, LIKE GI JOE AND SUPERMAN, HAVE BECOME MORE MUSCULAR. And more recently, Facebook, Instagram, and other social media have become places that celebrate these extremes, via images of shredded celebrities and influencers.

It appears to have had an impact. In a 2019 study that included 7,000 young American men ages 18 to 24, more than one in five of them reported eating problems related to their desire for a muscle-bound body. To bulk up, they overate and took anabolic steroids or dietary supplements.

"We encourage people to be physically active and watch what they eat," says lead author Jason Nagata, MD, MSc, a pediatrician at the University of California San Francisco, who cares for teens and young adults with eating disorders. "But there's a subset of people who take those goals and behaviors to extremes, and it starts to take over their lives."

In addition to troubled eating patterns, obsessing over body image can lead to a condition called muscle dysmorphia, which convinces you that you're neither as muscular nor as lean as you believe you should be.

"Not being able to attain these ideals causes a lot of distress and withdrawal from activities one enjoys in pursuit of this body image," says Nagata. "Some people may no longer hang out with their friends because they're at the gym all day."

In addition to psychological harm, you risk damaging the body you want to perfect. Those hours in the gym require food for fuel, but if you don't eat right to keep up with the energy you've expended, your heart may slow and your blood pressure could drop. Both are dangerous. You also may compromise your bone health.

Anabolic steroids cause problems, too. They can stunt growth and, over time, may lead to heart disease, kidney problems, and liver damage, Nagata says.

Both boys and men have trouble talking about eating disorders, in part because they're more commonly associated with girls and women. If you're worried about a loved one, Nagata says you can watch for signs, like sudden weight gain and increased time in front of the mirror or on the scale, as well as spending less time with friends. "These behaviors cause a lot of distress," says Nagata. "You should seek a therapist or counselor trained to address eating disorders."

Nagata advises men who want to build muscle to focus their goals on sustainable eating and exercise habits that you can maintain long term—and pay less attention to how you look than to how you feel. His message for the new year: "Reframe your regimen to healthoriented goals versus physical appearance."

ASK YOUR DOCTOR

Q Are the dietary supplements I take safe?

That's a big unknown, because they are not regulated like drugs by the FDA and, in most cases, their health consequences have not been well studied.

Q How can I start exercising safely?

Set realistic, incremental goals rather than going from no physical activity to spending three hours at the gym every day.

Q How much exercise is too much?

Aim for 150 minutes of moderate exercise each week. More is fine, too, but if it starts to feel like a duty or obsession, ease off.

Q How will I know if I have a problem?

Warning signs include a preoccupation or obsession with personal appearance, body size, weight, food, or exercise in ways that worsen your quality of life.

Living

Step by Step

CAN'T GET YOUR 10,000 STEPS PER DAY? NO WORRIES. NEW RESEARCH SUGGESTS FEWER STEPS CAN STILL BENEFIT YOUR HEALTH.

BY Colleen Oakley REVIEWED BY Brunilda Nazario, MD, WebMD Senior Medical Editor



Search for the slideshow How to Start a Walking Program at WebMD.com.

YOU KNOW THE FEELING: You glance down at your Fitbit before bed and the number is far less than the 10,000 steps you were shooting for. But instead of grappling with guilt that you didn't hit the "magic number," if you got at least halfway there, you can rest easy. A new study found that just 4,400 steps reduced the risk of premature mortality in women by 41%. I-Min Lee, a professor of medicine at Harvard University and the lead author of the study, explains why.

Q Were you surprised by the results of your study?

LEE Yes and no. Previous studies have shown that when it comes to physical activity, "some is good, more is better," but there's little data on steps and health, particularly long-term health outcomes. I knew this was a critical gap in knowledge, since so many people monitor their step counts. But 4,400 steps per day is a very modest number of steps.

Q Where did the more well-known goal of 10,000 steps per day come from?

LEE It likely originated as a marketing tool. In 1965, the Yamasa Clock and Instrument Company in Japan sold a pedometer called "Manpo-kei," [which roughly translates to] "ten thousand steps meter" in Japanese. But, for many older people especially, 10,000 steps per day can be a very daunting goal. That's why we wanted to investigate whether this number was necessary to lower mortality rates.

Q Is 10,000 still a good goal? Or should women now shoot for 4,400 steps a day?

LEE If you can get to 10,000 steps per day, that's fantastic, and I certainly would not dissuade you from that goal. For those who are inactive, though, that might not be achievable. Most people average 2,500 steps per day just doing normal activities, like going to the bathroom, walking around the office and getting the mail, so adding 2,000 steps per day more to your usual routine is very doable.

Q What do you hope women will take away from your study?

LEE Just move more. Even a modest number of steps is associated with lower mortality. You don't need to go walk for miles or hit the gym. The extra 2,000 steps (which is about one mile) can be accumulated throughout the day. Once you get into the habit of not sitting around so much, you'll be surprised by how easy it is to get the extra steps.

4 TIPS

WHEN IT COMES TO STEPS, A LITTLE BIT AT A TIME ADDS UP THROUGHOUT THE DAY. TRY THESE SMALL CHANGES TO YOUR DAILY ROUTINE.

WALK AT WORK . Take a 5-minute stroll on your lunch break.

2. DON'T PICK PARKING SPACE

Park several spaces farther away from your destination than you normally would.

3. SPREAD OUT HOUSEHOLD CHORES

For example, if your laundry is in the basement, rather than waiting until your laundry basket is full to take it downstairs, try taking your dirty clothes down each day.

4. Have a dance party with your children, grandchildren, or even pets.

Smart Trainers

CAN YOU IMAGINE GETTING REAL-TIME FEEDBACK AND CUSTOMIZED TIPS ON YOUR WORKOUTS WITHOUT HIRING A PROFESSIONAL? LACE UP YOUR SNEAKERS: YOUR NEW PERSONAL TRAINER IS HERE.

BY Kara Mayer Robinson

REVIEWED BY Michael W. Smith, MD, CPT, WebMD Chief Medical Editor

THIS IS NEXT-CENTURY EXCITING. From apps that automatically adjust your workout when you're sore to pants that help you nail your yoga pose, artificial intelligence is quickly morphing into your new personal trainer.

"While AI can't do everything a human personal trainer can do, it's an affordable way to get useful feedback each and every time you work out," says certified personal trainer Jeanette DePatie. Here's a taste of what's out there.

SMART APPS

"With AI technology, you can get all-inclusive personal coaching through smartphone apps," says certified personal trainer Caleb Backe. AI-powered apps measure variables like your fitness level, eating habits, and data from your wearables, then bring them together to tailor your workout to your needs.

The running app Vi, for example, gets to know your daily routines, music preferences, and effort zone and personalizes instructions based on how you're doing. It uses a human voice to give you real-time feedback as you run. Other apps, like SportMe, Podium, and AND/life, measure changes in your activity to tell you how to level up.

BRAINY MACHINES

AI is helping gym machines get to know you better so you can ratchet up your results.

Nautilus, for example, has a new platform called Max Intelligence for the Bowflex Max Trainer M6 and M8 cardio machines. It uses cloud-based, adaptive technology to coach you through personalized workouts. It gives you voice directions and encouragement to help you power through. TrainerRoad uses AI technology for cycling workouts. It measures your cycling efficiency to help you get stronger and faster.

YOGA GURUS

Yoga is getting technical, too. Several companies offer AI yoga instruction with pose detection to give you feedback on your form even without a teacher in the room.

High-tech fitness wear makes it seamless. Nadi X yoga pants measure your movements and use gentle vibrations to help you perform perfect yoga poses, says DePatie. Pivot Yoga just introduced a shirt with 16 sensors that track your movements and tell you if they need tweaking.

WISE WEARABLES

Speaking of wearables, you'll find an AI-coaching wearable for just about every body part.

Smart sneakers like Under Armour's Hovr Connected Sneakers measure your speed, pace, distance, and gait for real-time feedback.

Sensoria has AI-powered running socks. "Besides monitoring pace, distance, and time, these socks come with pressure monitors that feed data to an AI coach that helps you with your running form," says DePatie.

Hexoskin's Tech Shirt has wires and sensors to measure your breathing, heart rate, and how well you sleep. Athos Core's shorts and shirts measure your heart rate and muscle activity.

Polar recently unveiled its newest watch, Ignite, which collects sleep and recovery data overnight. In the morning, it suggests specific workouts based on how rested you are.

Next up in AI fitness tech? We can only imagine.

4 TIPS

CERTIFIED TRAINER JEANETTE DePATIE SHARES TIPS FOR WORKING OUT WITH AI-POWERED TECHNOLOGY.

USE YOUR BRAIN

• "Your Al trainer isn't a doctor. If you feel pain or if something about your workout doesn't feel right, get professional help."

2. OPEN YOUR EYES "Stay aware of your surroundings. Don't obsess over your tracker to the point where you're unaware of traffic or people around you."

3. BROADEN

"Not all progress is measurable. Don't forget to enjoy the better mood and quality of life that comes with fitness but may not be tracked by your watch."

MONITOR . YOUR PRIVACY

"Think carefully about how and when you share your tracking data and make sure you set a good, solid password. Devices can be a source of data breach."

Beauty

INSIDE OUT



Paging Dr. App NEW TECHNOLOGY IS PAVING THE WAY FOR PERSONALIZED

SKIN CARE

"ARTIFICIAL INTELLIGENCE IS THE WAVE OF THE FUTURE IN SKIN CARE,"

says Joshua Zeichner, MD, director of cosmetic and clinical research in the department of dermatology at The Mount Sinai Hospital in New York City. He cites apps like one that uses your smartphone to scan your face to create a customized sheet mask and another that uses your phone's camera to perform a skin analysis and provide a personalized skin regimen. "Algorithms can help evaluate your skin and aid in decision making to choose the best products for your needs," says Zeichner. But, he adds, no app will ever replace a face-to-face consultation with your dermatologist. —LIESA GOINS

Beauty

earch for the article Your Guide to Anti-Aging Skin Care Essentials at WebMD.com



Four Innovations

THESE NEW TREATMENTS PROMISE TO CHANGE THE WAY DERMATOLOGISTS TREAT SOME OF THE MOST COMMON SKIN AND BODY ISSUES

BY Liesa Goins REVIEWED BY Mohiba Tareen, MD, WebMD Medical Reviewer

IN DERMATOLOGY, ADVANCES IN TECHNOLOGY HAVE THE POTENTIAL TO SIMPLIFY SOME OF THE MOST COMPLICATED TREATMENTS.

"It's a brave new world that we're entering," says Rebecca Tung, MD, a Mohs surgeon and dermatologist in Winter Haven, Florida. "Our goal as physicians is to be able to use technology in a way that helps patients be healthier and help us understand if treatments are working." These advances are the most helpful and exciting options doctors have for no-brainer solutions to some frustrating problems.

SCALPEL-FREE BIOPSY

"An evolving technology is reflectance confocal microscopy (RCM) or scalpel-free biopsy," Tung says. This technology is available at academic and research institutions where it serves as a real-time imaging tool that can be useful in diagnosing cancerous lesions. The device essentially uses a probe that acts as a specialized microscope, she explains. By using backscattered light through the skin, it creates an image of what lies beneath the skin's surface to determine if a growth is benign or cancerous without requiring an incision.

Tung says this technology has exciting potential because it can reduce the number of biopsies needed to determine if a lesion is cancerous. "RCM can be advantageous to people who have a genetic predisposition to atypical moles, have a large number of atypical moles or have a genetic syndrome." She also sees this as a tool to help improve surgical outcomes to help determine the margins that need to be removed. And she foresees the opportunity for RCM to help monitor the skin's response to noninvasive skin cancers without requiring biopsies. "It's a game-changer," Tung says.

NONINVASIVE SKIN TIGHTENING A device currently in clinical trials offers dermal micro-coring that lifts and tightens the skin without requiring surgery, says Robert Anolik, MD, a dermatologist and professor of dermatology at New York University School of Medicine. "The concept is similar to a fractional laser where thousands of pinpoint areas of the skin are affected, but not the entire surface," he says.

Instead of a laser, this technique uses finegauge needles to core out small sections of the skin that then heal and trigger collagen remodeling that creates a tightening effect, Anolik explains. Since the needle is so small it leaves no scar and requires minimal downtime-usually just a few days of pinkness, depending on how aggressive the treatment is. "This is a new concept that can lift and tighten with no surgery involved. I'm excited because we need innovation in the area of skin tightening," Anolik says. "This never-seen-before approach has potential for scarless non-surgical skin lifting."

INJECTABLE CELLULITE TREATMENT

"At least 85% of women have cellulite, so it's a common problem. But it's always been very

difficult to treat," says Joely Kaufman-Janette, MD, a dermatologist in Miami. So she's excited about the ease of an injectable treatment for cellulite that researchers are currently studying. The drug, called clostridium histolyticum or CCH, is an enzyme that breaks down the collagen fibers that cause the dimpling effect associated with cellulite in the thighs and buttocks. "CCH chemically acts on collagen types 1 and 3 and helps to dissolve the fibrous band that causes the depression or dimple in the skin so the skin looks smoother," she explains.

The injectable treatment is minimally invasive, requires no topical numbing or preparation, and is similar to receiving facial injectables, Kaufman-Janette says. "We haven't had anything like this in the past, so this would be the first of its kind."

"This is exciting and promising for treating cellulite if the studies show it leads to long-term results," adds Papri Sarkar, MD, a dermatologist in Brookline, Massachusetts, and president of the New England Dermatological Association. "It's an interesting approach and it's always good to have more options to treat cellulite."

ELECTROMAGNETIC MUSCLE STIMULATION FOR BODY CONTOURING

"The newest body contouring devices are ones that focus on building muscle," says Anthony Youn, MD, a plastic surgeon in Troy, Michigan. The new approach to toning areas like the stomach and buttocks is a non-invasive treatment that uses high-intensity focused electromagnetic technology to stimulate muscle contractions. "This technology is interesting because you can make an improvement without undergoing surgery," he says.

The devices stimulate 20,000 muscle contractions in a 30-minute treatment that results in stronger, more toned muscles in a targeted area. Whereas liposuction requires surgery to reduce fat, these muscle stimulators have fat-reducing benefits coupled with increased muscle tone.

"After four treatments spaced out over two weeks, patients are seeing an increase in the thickness of muscle and a reduction of fat with results lasting upwards of six months or more," says Youn. "This is a new paradigm in cosmetic medicine."

DIRTY SECRET

"I wash my hair just once a week."



"Shampooing just once or twice a week is fine. The detergents in shampoo can be harsh and strip hair and the scalp. Overwashing can fade dyed hair more quickly, dry the scalp, and worsen frizz and dryness. Most people shouldn't wash more than every other day.

"The natural oils in your scalp have protective qualities. As you brush the oils through your hair, they coat your strands to form a barrier against environmental

stressors like UV rays and wind and help reduce heat styling damage. Plus, the oils help seal in moisture to prevent dryness, brittleness, and breakage.

"If you have very oily hair or seborrheic dermatitis (which is a type of eczema), consult your dermatologist on how often to shampoo. Otherwise, it's fine to use a dry, powder-based shampoo between washes to absorb excess oil and refresh your hair without lathering up."

AISLE DO

SMARTPHONE SKIN CARE

TAKE A LOOK AT THESE EXPERT-APPROVED SKIN CARE APPS.

APP PICK



SkinVision (skinvision.com) "While this app certainly doesn't replace annual skin exams, you can save photos of spots on your skin and track changes over time, which may spur you to make an appointment and show it your doctor."

Rhonda Klein, MD, nartner Modern Dermatologu Westport, Connecticut

APP PICK



SkinSAFE (skinsafe products.com/apps) "If you have sensitive skin, allergies, or want to avoid certain ingredients, this app simplifies the process. You can easily search thousands of skin care products, cosmetics, and household products by name or ingredient." Kara Shah, MD, president, Kenwood Dermatology,

Cincinnati, Ohio

APP PICK

IHYDRATE (ihydrate moo.dae

"Hydration is essential for avoiding fine lines, wrinkles, and dark eve circles. If vou struggle to remember to drink up, try this app, which measures how much you should drink and monitors your progress.

Gretchen Frieling, MD, dermatopathologist, Wellesley, Massachusetts

THE OPINIONS EXPRESSED IN THIS SECTION ARE OF THE EXPERTS AND ARE NOT THE OPINIONS OF WEBMD. WEBMD DOES NOT ENDORSE ANY SPECIFIC PRODUCT, SERVICE, OR TREATMENT

Skin Smarts

SKIN DIAGNOSIS IS GOING HIGH TECH. LEARN WHICH SKIN CONDITIONS ARE DIAGNOSED WITH THE HELP OF ARTIFICIAL INTELLIGENCE-AND WHERE WE GO FROM HERE.

BY Kara Mayer Robinson REVIEWED BY Mohiba Tareen, MD, WebMD Medical Reviewer



ARTIFICIAL INTELLIGENCE (AI) IS RAMPING UP HOW DERMATOLOGISTS DIAGNOSE SKIN CONDITIONS, EVEN SERIOUS CANCERS LIKE MELANOMA. While far from perfect, it's promising. "We're only just starting to scratch the surface of what's possible," says Bobby Buka, MD, CEO of the Dermatology Specialists in New York. We asked Buka for the 4-1-1.

Q How is AI working now?

BUKA Currently the most impactful AI is focused on diagnosing pigmented lesions, which includes some of the deadliest cancers, like melanoma. The color and distinct boundaries means AI has the best chance of identifying atypical features.

Q How does it work?

BUKA There's one technology called Melafind that uses infrared light to evaluate pigmented lesions up to a few millimeters below the skin. Then sophisticated AI algorithms evaluate that scanned data to diagnose serious skin cancers, including melanoma. There's also an app called SkinVision that allows you to take a picture of your own mole; it then uses a computer algorithm to try and give you an assessment of that mole.

Q How accurate is it?

BUKA While the technology is promising, the margin of error isn't yet small enough to warrant using it in lieu of a biopsy, for example. That being said, there are patients around the world without

access to quality dermatological care. For those patients, this kind of AI can already help save lives, and it's getting better all the time.

Q Can AI detect other skin conditions? BUKA It's still pretty limited to pigmented lesions. Rashes, for example, are much tougher to photograph and scan. They're also tougher to diagnose. A rash from a viral exposure could look nearly identical to a rash from a drug reaction. AI isn't sophisticated enough to conquer those nuancesat least not yet.

Q Can my smartphone app detect skin problems?

BUKA Apps like SkinVision and MoleMapper allow you to take serial photographs of your moles and track them over time. Being able to monitor these kinds of changes is extremely valuable when it comes time to make a diagnosis. On the other hand, apps that try to make diagnoses without a dermatologist are currently not very helpful. The accuracy rate is still too low, but the technology is improving.

Q What does the future look like?

BUKA AI is certainly the future, and it's only getting better. There's no question I'll be replaced in my lifetime by AI, but we're not there yet. Rest assured, we have some of the brightest minds innovating to get the diagnosing accuracy of AI closer to 100%. Until then, here's the best piece of advice when you have a skin concern: Go see a dermatologist.

HUMAN DETECTION

ALISN'T THE ONLY WAY TO SPOT SKIN CANCER LIKE MELANOMA. YOUR EYES ARE A POWERFUL DIAGNOSTIC TOOL. HERE'S WHAT THE AMERICAN CANCER SOCIETY SAYS TO LOOK FOR.

ASYMMETRY

• Check to see if one part of a mole doesn't match the other.

BORDER

 \angle . Are the edges of a mole irregular, ragged, notched, or blurred?

3. Look for color that isn't uniform, has shades of brown or black, or patches of pink, red, white, or blue.

DIAMETER

4. Is the spot bigger than ¼ inch across? That's about the size of a pencil eraser. Some melanomas are smaller, but this is a guideline.

EVOLVING

J. Is the mole changing in size, shape, or color? Keep watching so you can track it over time.



Winter Quenchers

GIVE SKIN THE MOISTURE IT CRAVES WITH THESE PRODUCTS HANDPICKED BY **NEIL BRODY, MD**, A BOARD-CERTIFIED DERMATOLOGIST IN MANHASSET, NEW YORK

Unscented Bar Soap, \$3

perfumes and it doesn't

dry out skin. I like a bar

because it doesn't leave

residue behind, and it's

mild and non-irritating."

"This bar soap has no

BY Kara Mayer Robinson REVIEWED BY Karen Grossman, MD, WebMD Medical Reviewer

1. HANDS ON

DermaTopix Intensive Hand Cream, \$20

"This hand cream absorbs so quickly and is so non-greasy that you can do normal activities like writing with a ballpoint pen within minutes of putting it on."

2. A SEAT AT THE BAR 3. TEATIME Dove Sensitive Skin Replenix Gree

Replenix Green Tea Antioxidant Moisturizing Lotion, \$44

"This winter-friendly lotion helps restore and maintain a healthy skin barrier function while preventing moisture loss. Its antioxidants and emollients help soothe dry, irritated skin."

4. STICK WITH IT

Q

Chapstick Original, \$2 "I love this product because it has the fewest contact sensitizers and highest amount of wax, and it does a good job of protecting lips with the least risk of an allergic reaction."

Search for the slideshow Your Winter Skin Hazards at WebMD.com.

5. GENIUS GEL

Aveeno Therapeutic Shave Gel, \$4

"This product is designed so that as the gel expands, it helps to lift hair off the surface of your skin, so it's easier to remove. It's gentle and somewhat moisturizing and leaves no residue."

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PICKS

EXPERT

Family



Virtual Distraction

NO MATTER HOW DIMINUTIVE THE NEEDLE, SHOTS HAVE ALWAYS INDUCED HOWLS AND TEARS FROM KIDS—ADULTS, TOO—AT THE DOCTOR'S OFFICE. THEN ONE PEDIATRICIAN GOT A GREAT IDEA. IN 2017, CHAD RUDNICK, MD, AN ASSOCIATE PROFESSOR AT FLORIDA ATLANTIC UNIVERSITY, FIRST INTRODUCED VIRTUAL REALITY HEADSETS into his private pediatric practice in Boca Raton, Florida, with the aim of reducing pain and fear in kids ages 6 to 17 who hate getting shots. "These virtual headsets depict rollercoaster and helicopter rides," he says. The experience is so immersive, it successfully distracts his young patients from incoming needles. "It's amazing," says Rudnick. "They don't even flinch." Rudnick published a successful pilot study in the journal *Pain Management* in 2018 showing 94% of kids reported feeling less pain and fear when using VR headsets. "There are now two additional studies being done in Canada, one at Rutgers University in the U.S., and one in South America, all inspired by our study," he says. Ask your pediatrician about virtual reality headsets at your child's next appointment. —LAUREN PAIGE KENNEDY

ANXIETY RELIEF



PREGNANC

Search for the article **Your Healthy Pregnancy Diet: Top Nutrients** at WebMD.com.

Family



Nutritional Boost

SOME PREGNANT WOMEN MISS OUT ON NUTRIENTS THEY NEED—AND GO OVERBOARD ON ONES THEY DON'T. LEARN WHAT YOU CAN DO TO IMPROVE YOUR NUTRITION.

BY Stephanie Watson REVIEWED BY Nivin C.S. Todd, MD, WebMD Medical Reviewer

AS SOON AS THAT PLUS SIGN APPEARS ON YOUR PREGNANCY TEST, YOUR NUTRI-TIONAL NEEDS CHANGE. Extra vitamins and minerals are essential to support your growing baby without short-changing yourself.

A study of 1,000 pregnant women published this past June in *JAMA Network Open* found that many women didn't get enough of vitamins A, C, D, E, K, and B6, as well as folate, choline, and minerals like iron, potassium, calcium, magnesium, and zinc. Doctors recommend that women take prenatal vitamins to ensure they get enough nutrients, which about 70% of women in the study did. But even with this supplemental boost, many pregnant participants fell short.

"Depending on which prenatal vitamins you get—over-the-counter, via prescription—the amount of nutrients that are in each supplement varies depending on the manufacturer," says Patrick Catalano, MD, one of the study's authors and vice chair of Obstetrics and Gynecology Research at Tufts Medical Center. "The other variable is diet."

While women in the study skimped on some of the nutrients they needed, almost all of them went overboard on sodium, getting far more than the recommended 2,300 mg daily. Although there aren't any limitations on salt intake in pregnancy, eating too much could make you swell up, especially in hot weather. "Swelling can be uncomfortable and limit your physical activity," Catalano says. Plus, foods that are high in salt, like potato chips and fast food, tend not to be good for you.

Study participants were also borderline high on folic acid and iron, likely because of their prenatal vitamins. Too much iron can cause constipation and worsen morning sickness.

How do you know if you need to tweak your pregnancy nutrition? No official nutritional recommendations exist for pregnant women—those won't be released until the government comes out with its 2020–2025 Dietary Guidelines for Americans in the next few years. Until then, look to your obstetrician/gynecologist for guidance. You may need more or less of certain nutrients based on your health status. For example, some women come into pregnancy iron-deficient because of heavy periods, Catalano says.

Take your prenatal vitamin, but think of it as a backup plan. "You're always better eating a healthy diet," Catalano says. Although no one diet is recommended during pregnancy, the government's MyPlate guideline (dividing each meal plate into quarters: fruits, vegetables, lean protein, and whole grains) or the Mediterranean diet are both healthy options, says Catalano. Limit foods that are high in salt, simple sugars (like soda), and saturated fat.

Ideally, start thinking about your diet early—as soon as you plan to conceive. Adopt other good-for-your-baby practices, too. "Don't smoke, get regular exercise, and eat healthy," Catalano says. "Doing these things before you get pregnant is really the key."

Family

Healthy Bugs, Healthy Baby

NURTURING AN INFANT'S RESIDENT BACTERIA. OR MICROBIOME. CAN YIELD HEALTH BENEFITS FOR YEARS TO COMP

BY Lisa Marshall **REVIEWED BY** Hansa Bhargava, MD, WebMD Senior Medical Editor



BY NOW, YOU'VE HEARD THE NEWS: The trillions of bacteria that inhabit your gut and other bodily regions can have a critical impact on your overall health. The same holds true for babies, new research shows.

"The microbiome is important for many aspects of health, from gut health to mental health to immune health, and we're finding that the first couple of months of life is a really critical window for its development," says Meghan Azad, a microbiome researcher and assistant professor of child health at the University of Manitoba.

Recent studies suggest that babies whose microbiome development is disrupted via a cesarean section delivery, early antibiotic use,

limited breastfeeding, or other factors are at greater risk for a host of health conditions, including asthma and allergies, respiratory infections, irritable bowel disease, type 1 diabetes, and obesity. But they also suggest that no matter how a baby is delivered, parents can take steps to get baby's bacterial ecosystem off to a good start.

BIRTH AND THE MICROBIOME

By the time people reach adulthood they host between 500 and 1,000 species of gut bacteria, many of them beneficial, which serve to fight off infection-causing microbes, digest food and metabolize nutrients, and interact with the central nervous system to influence mood and

BY THE

Percentage more

likely babies born

via cesarean section

adolescence than their

siblings born vaginally.

are to be obese by

Amount more likely

babies born via

cesarean section

to have allergies or

asthma by age 3.

Percentage of all

Percentage of

babies who are still

Number of years a baby's

first diet can impact his

or her microbiome.

breastfeeding at

6 months.

deliveries that are now

via cesarean section.

NUMBERS

cognitive health. The foundation for that bacterial collection is established by age 3, and what happens in the first three months of life is key.

"Babies are born with essentially no microbiome and a very immature immune system, and the two develop together, informing each other," says Azad, noting that the first microbes to colonize a baby's gut, skin, and mouth help teach the immune system what's harmful and what's not. "When there are microbes missing, and that immune system doesn't develop properly, there can be a greater risk of developing problems."

Vaginal birth, when possible, marks a critical step, exposing an infant to a diverse array of mom's bacteria as he or she passes through the birth canal.

"Babies born via cesarean section don't get that same degree of exposure," says Sara Edwards, PhD, a certified nurse-midwife and microbiome researcher at Emory University School of Nursing.

In one recent study, researchers looked at stool samples of 120 infants 10 times over their first year of life and found that those born vaginally had more beneficial bacteria and fewer harmful bacteria. Another recent study of more than 6,000 infants born in New York found that those born via cesarean section were twice as likely to develop food allergies or asthma by age 3.

"Evidence from this and other studies suggests that the bacteria a mother passes to her baby during vaginal delivery may serve to protect the child from developing asthma and food allergies," the authors concluded.

Edwards notes that even if a mother labors for a little while after her water has broken, that exposes an infant to beneficial microbes. In general, infants born via emergency cesarean section (after some labor) have a healthier microbiome than those born via scheduled cesarean section.

While it's too early for doctors to recommend it, some researchers have begun to study whether a practice called "vaginal seeding"-in which a cotton swab is used to inoculate a newborn's

skin, nose, and mouth with fluids from the birth canal—may be helpful for establishing a healthy microbiome in babies born via cesarean section. In the meantime, in cases when a cesarean section is unavoidable, Edwards says lots of skin-to-skin contact between mom and baby immediately after birth can help inoculate a newborn with mom's good bacteria.

FIRST FOODS IMPACT FIRST MICROBES

No matter how a baby is delivered, his or her first diet sets the stage for the microbiome. "Breastfeeding is the most important way to support a baby's microbiome," says Azad, who recommends breastfeeding exclusively for six months whenever possible, then continued breast feeding after the introduction of complementary food. In addition to passing beneficial microbes from mom to baby, breast milk contains compounds called human milk oligosaccharides (HMOs) which serve as food for key beneficial bacteria, including Bifidobacterium and Bacteroides. Research shows that babies born via cesarean section catch up faster, in terms of microbiome development, if they are exclusively breastfed. And one recent study of 323 infants found that those who were exclusively breastfed had a healthier and more diverse microbiome at 6 months than those fed with formula.

"Companies are trying to make formula as close to human milk as possible, which is a good goal, but it will never be the same," says Azad. "Each mom's milk is different and personalized for her own baby."

Edwards also recommends that moms minimize their own use of antibioticswhich can wipe out both good and bad bacteria-while they are pregnant and breastfeeding and be equally prudent with antibiotic use for their new babies.

And she cautions against introducing solid foods before 6 months, as they can prematurely alter the gut microbiome before it's ready, boosting risk of stomach problems. "This is a critical time of life in which the brain and body are developing, but the gut is also developing," says Edwards. "By nurturing it, we can actively promote a baby's health in a way that has longterm consequences."

3 TIPS

GIVE YOUR BABY'S BIOME A BOOST WITH A FEW POINTERS FROM RESEARCHER SARA EDWARDS, PhD.

1 DIRECT FROM MOM

• Offer breastmilk straight from the source whenever possible. Studies show it provides more good bacteria and less harmful bacteria than pumped milk.

2. MODERATION IN BATHING

Don't overdo it on the baths, which can strip baby's skin of beneficial bacteria.

3. Eat bacteria-rich

food like kimchi, kraut, yogurt, and kefir while you're pregnant and breastfeeding. The more beneficial microbes you have, the more you can pass to baby.



Family

Childhood in the AI Age

KIDS CAN POTENTIALLY REAP THE BENEFITS FROM SMART TECHNOLOGY—JUST DON'T FORGET THE GUARDRAILS, OUR EXPERTS SAY

BY Lauren Paige Kennedy

PARENTIN

REVIEWED BY Hansa Bhargava, MD, WebMD Senior Medical Editor



THE POTENTIAL FOR ARTIFICIAL INTELLIGENCE (AI) TO BENEFIT OUR KIDS IS REAL. For many of us, it's already integrated into our children's daily routines.

A robot named Milo taps the power of AI to teach children with autism spectrum disorder (ASD) better social and verbal skills in 39 U.S. states. Additional new research shows how using social robots at home with ASD kids can improve gaze behaviors, such as the ability to make eye contact with others.

AI also helps educators better predict which young students might struggle with ADHD and other learning disabilities through machine learning (a type of AI), which pulls data from hundreds of schools to identify clusters of at-risk kids that did not match previous diagnostics or who had been overlooked altogether.

But AI is not just for special educational needs. According to a 2019 study conducted by Edison Research and National Public Radio, the number of U.S. households with smart speakers surged by 78% in a single year (2017–18).

More and more kids without cognitive or emotional challenges have access to virtual assistants to learn new languages, improve manners, or even up their organizational skills. And let's not forget Apple's Siri, Amazon's Alexa, or Google's Assistant, on call to field homework questions at any time.

WITH POWER COMES RESPONSIBILITY

Like any great force, AI's scope and strength must be understood, respected, and carefully managed. Psychologist Richard Freed, PhD, author of *Wired Child: Reclaiming Childhood in a Digital Age*, urges parents to implement strict guardrails. "Despite being told how you are the digital immigrant, and your kids, the natives, you as parents must lead," he says. In other words, Alexa may be able to help your kid with her homework, but it can't teach her to problem-solve—and you'd never want your kid to outright cheat by asking a smart speaker for the answers. "You may be enamored with your child's digital facility," he says, "but don't mistake it for self-control. Kids don't have the brain development to set limits for themselves."

Elizabeth Milovidov, a law professor and digital e-safety consultant with the Family Online Safety Institute, agrees: "As a child online protection expert and tech enthusiast, I walk a fine line. I believe our children can benefit from digital assistance and convenience—while understanding the parameters of what they can and cannot do" when it comes to AI. She adds, "Digital parenting doesn't have to be perfect, but it does have to be present."

ASK THE RIGHT QUESTIONS UPFRONT

Milovidov advises parents to consider a series of questions before purchasing or downloading any type of AI-powered device or platform, be it a smart speaker like Echo Dot, a smartphone, educational

Continued on page 24

ASK THE EXPERTS

ARE KID-FRIENDLY SMART

DEVICES AVAILABLE? Jennifer King, a privacy expert at Stanford Law School, says, "Amazon has come out with a kid version of Echo Dot." The privacy settings are already built in.

HOW CAN PARENTS SET LIMITS WITH TEENS WHO ALREADY USE SMART DEVICES?

Parents should demonstrate screen-free behaviors they want to see in their child, Richard Freed, PhD, says. Implement digital-free zones: sporting activities, family vacations, dinnertime, or in the car.

HOW CAN I BEST SECURE MY KID'S DIGITAL PRIVACY?

Make it your business to set and check privacy settings on all smart devices kids can access, says online safety expert Elizabeth Milovidov.

DOES IT MATTER IF A MACHINE IS TEACHING A CHILD, VERSUS A PARENT?

Kids learning how to speak French or asking for homework help using a virtual assistant is only OK if a parent is still a key part of the process, Freed says: "Just as important as what's being said is who or what is saying it."

> Search for the Parenting Message Board at WebMD.com.

Continued from page 23

toys, or gaming apps. These queries fall into one of six familiar categories: who, what, where, when, why, and how.

Sample questions include: Who can my children communicate with through this device or platform? What is the worst-case scenario if I allow my child to use it? Where can I go to learn more about safety settings? When is my child most vulnerable online, and when should our family be device-free? Why is it difficult to enforce time limits? How can this technology benefit my family? (For additional advice on setting guidelines, see www.fosi.org.)

AI "can bring incredible opportunities to families," Milovidov says. "But parents need to stay informed of the potential risks in order to minimize harm."

PROTECT YOUR KID'S PRIVACY

Privacy concerns must be considered, says Jennifer King, PhD, director of consumer privacy, Center for Internet and Society, Stanford Law School. She's less concerned with children meeting a bogeyman online than she is with big corporations collecting a lifetime of data from your kids.

"We don't know what these corporations are doing with it," she says, citing recent revelations that Facebook hires overseas workers to transcribe Messenger communications to better train the platform's AI capabilities—meaning such correspondence is anything but private.

Smart speakers exist in their own ecosystem, says King, but who, exactly, is monitoring your child's digital queries? "If a kid asks Alexa to turn the lights on and off, OK. But these devices are being used for search," she says. "People talk to their devices, assuming no one is listening: 'Alexa, find me information about sexually transmitted diseases.' So much personal disclosure is going on." It's unclear, she says, how or if search is being monetized. So be aware, and let your children know, too, that the internet can sometimes be a surveillance state.

CONNECT IN REAL LIFE

In an age when even parents seem to have difficulty setting down their smart devices, it's essential to model balance to children, Freed says—especially with smart, AI-driven technology, which is "intentionally designed by psychologists and neuroscientists in Silicon Valley to be attention-grabbing, immersive, and addictive."

That means, Milovidov says, that "balance is key. As with all digital devices, make sure your child is not being overly exposed and spending all of his or her time interacting with machines instead of real-life friends and family members."



TEENS No ID Required

CIGARETTES ARE EASIER FOR TEENS TO GET THAN YOU MAY THINK. HERE'S HOW TO KEEP YOUR KIDS-AND THEIR LUNGS-SMOKE-FREE.

BY Colleen Oakley REVIEWED BY Hansa Bhargava, MD, WebMD Senior Medical Editor

THINK THAT CLERK AT YOUR LOCAL CORNER STORE IS CARDING TEENS BEFORE SELLING THEM SMOKES? Unfortunately, chances are he's not. Results from a recent study in Ohio suggest that more than 60% of cashiers in smaller shops, like convenience stores and tobacco stores, sell cigarettes to young adults without checking identification.

And though smoking has well-known health risks for everyone, it's especially bad for teenagers. "Since their brains are still developing, adolescents are more sensitive to nicotine's addictive effects," says Natasha K. Sriraman MD, MPH, and associate professor of pediatrics at Eastern Virginia Medical School. Even worse, "nicotine can also rewire a teen's brain to become more easily addicted to other drugs." According to the World Health Organization, teens who smoke are three times more likely than nonsmokers to use alcohol, eight times more likely to use marijuana, and 22 times more likely to use cocaine. And it's not just cigarettes parents need to be on the lookout for. E-cigarette use, also known as vaping, increased 78% in high school students between 2017 and 2018-and e-cigarettes contain almost five times as much nicotine as a regular cigarette.

Though those statistics are shocking-here's a positive one: Studies show parental influence can help keep teens tobacco-free. Here's how.

Communicate. Just like talking to your teens about drinking and sex, parents should talk about smoking and vaping and their health risks. And

the earlier, the better. Some kids start smoking as early as middle school (1.8% of middle schoolers have tried a cigarette, according to the CDC). The key is to make it a two-way conversation, says Sriraman. "Listen, don't lecture."

Practice what you preach. Kids who grow up in smoke-free homes are less likely to smoke. But if you do smoke and/or are trying to quit, all is not lost. "Studies show that parental honesty about the harmful effects of smoking and difficulty in quitting can have a positive effect on kids' views on smoking," says Sriraman. Frequent discussions about smoking and vaping are key.

Be honest about the risks. Detail everything from short-term effects (bad breath, yellow teeth, chronic coughs) to long-term consequences (emphysema, lung cancer, death). The more your teen knows why they shouldn't smoke or be exposed to nicotine, the better equipped they are to stand up against peer pressure.

Just say no. Set the expectation that smoking is not allowed, and let your teen know what the consequences will be, says Sriraman.

Be aware. Watch your teen's behavior-do they seem to be more secretive? Are they jittery or appear more nervous? If so, don't ignore the signs. "We as parents are here to protect our children, not be their best friends," says Sriraman.



The number of regular smokers who had their first cigarette by age 18.



The number of American youths who will eventually die from a smokingrelated disease.



The number of chemicals in cigarettes that are known to cause cancer when burned.

The number of kids in the U.S. who try a cigarette for the first time each day.



article Talking to Your Kids About Cigarette Smoking at WebMD.com.



Family

There's an App for That

APPS CAN HELP YOU TRACK EVERYTHING FROM VET RECORDS AND WEEKLY EXERCISE TO FIRST AID ESSENTIALS

BY Jodi Helmer

PETS

REVIEWED BY Will Draper, DVM, WebMD Medical Reviewer



WHETHER YOU HAVE ONE PET OR A MENAGERIE, KEEPING TRACK OF THEIR CURRENT MEDICA-TIONS, VACCINATION DUE DATES, and other health information is, well, no walk in the park. A host of health apps have made it easier to remember to give heartworm preventives, apply flea and tick control, or schedule wellness visits, according to Jim Dobies, DVM, veterinarian and president of UrgentVet in Charlotte, North Carolina, and Tampa, Florida.

"If [apps] help pet parents track and remember their pets' wellness care, I'm all for it," he says. He advises pet owners to consider these four pet health apps.

PET FIRST AID: The American Red Cross created an app for dog and cat owners with videos and illustrations featuring instructions for handling pet emergencies like burns, falls, and seizures. It also provides the locations of pet-friendly hotels in case you need to seek shelter during a natural disaster. "If you have to evacuate, the information is tremendously useful," Dobies says.

ANIMAL POISON CONTROL CENTER:

"Dogs eat everything," Dobies says. Thanks to a searchable database, this ASPCA-created app allows you to determine whether the slice of pizza or bouquet of daisies your dog, cat, or bird ate is cause for concern. The app provides details on more than 300 common toxins from medications to garden pesticides.

FITBARK: If your pet is getting a little too pudgy, the FitBark app might help. "A lot of pets don't get enough exercise," says Dobies. The app, connected to an activity monitor, tracks how much exercise your pet gets and helps you monitor changes in mobility.

VITUSVET: Access your pet's entire medical history in a single app. Dobies likes that it tracks medication reminders so pet parents never miss a dose of heartworm preventive or flea and tick control. You can also share vaccination records with boarding facilities, the groomer, or veterinarians at after-hours clinics who need information about medications and treatments. Search for the **Pets Message Board** at WebMD.com.

4 TIPS

BEFORE YOU DOWNLOAD A PET HEALTH APP, **JIM DOBIES, DVM**, PROVIDES SOME POINTERS.

SEEK OUT REPUTABLE PROVIDERS

Dobies suggests looking for apps developed by national organizations. In case of emergencies, you want to know that details about toxins and lifesaving treatments such as pet CPR are accurate.

2.matters

An app is useless unless you use it. "It's great if an app sends a push notification that a vaccination or heartworm preventive is due, but you can't swipe it away and forget about it. You have to follow through with an action," Dobies says.

3. SUBSTITUTE FOR PROFESSIONAL VET CARE

Even though apps can provide valuable information about your pet's health and wellness, regular veterinary visits are still a crucial part of good care.

4. UPDATES

"You have to update your apps regularly or you're operating on outdated information," Dobies says. Discovering that an urgent vet clinic moved to a new address could delay lifesaving treatment.



of data to reshape research, diagnosis, treatments, drug development, and even your relationship with your doctor.

In the following pages, we look at some of AI's exciting transformations and the promises and challenges ahead as researchers continue to explore how this powerful tool has the potential to improve everyone's health today, tomorrow, and well into the future.

Nº ON



| Hŀ F

ARTIFICIAL INTELLIGENCE IS POISED TO **REVOLUTIONIZE PATIENT CARE, DRUG** DEVELOPMENT, AND DIAGNOSIS-DESPITE CONCERNS ABOUT PRIVACY, BIAS, AND DATA QUALITY

Matthew Might's son Bertrand was born with a devastating, ultra-rare genetic disorder.

Now 12, Bertrand has vibrant eyes, a quick smile, and a love of dolphins. But he nearly died last spring from a runaway infection. He can't sit up on his own anymore, and he struggles to use his hands to play with toys. Puberty will likely

wreak more havoc.

Might, who has a PhD in computer science, has been able to use his professional expertise to change the trajectory of his son's life. With computational simulation and by digitally combing through vast amounts of data, Might discovered two therapies





BY KAREN WEINTRAUB **REVIEWED BY** BRUNILDA NAZARIO, MD SENIOR MEDICAL EDITOR

"THE AVERAGE **PATIENT IS ALREADY** BEING TOUCHED BY AI IN HEALTH CARE."

that have extended Bertrand's life and improved its quality.

Similar artificial intelligence (AI) enabled Colin Hill to determine which blood cancer patients are likely to gain the most from bone marrow transplants. The company Hill runs, GNS Healthcare, found a genetic signature in some multiple myeloma patients that suggested they would benefit from a transplant. For others, the risky, painful, and expensive procedure would probably only provide false hope.

Hospitals and doctors' offices collect reams of data on their patients-everything from blood pressure to mobility measures to genetic sequencing. Today, most of that data sits on a computer somewhere, helping no one. But that is slowly changing as computers get better at using AI to find patterns in vast amounts of data and as recording, storing, and analyzing information gets cheaper and easier.

"I think the average patient or future patient is already being touched by AI in health care. They're just not necessarily aware of it," says Chris Coburn, chief innovation officer for Partners HealthCare System, a hospital and physicians network based in Boston.

ead our **special report** at

/ebMD.com/artificialintelligence.

AI has already helped medical administrators and schedulers with billing and making better use of providers' time-though it still drives many doctors (and patients) crazy because of the tediousness of the work and the time spent typing rather than interacting with the patient. AI remains a little further from reality when it comes to patient care, but "I could not easily name a [health] field that doesn't have some active work as it relates to AI," says Coburn, who mentions pathology, radiology, spinal surgery, cardiac surgery, and dermatology, among others.

Might's and Hill's stories are forerunners of a coming transformation that will enable the full potential of AI in medicine, they and other experts say. Such digital technology has been transforming other industries for decades-think cell phone traffic apps for commuting or GPS apps that measure weather, wind, and wave action to develop the most fuel-efficient shipping routes across oceans. Though slowed by the need for patient privacy and other factors, AI is finally making real inroads into medical care.

Supporters say AI promises earlier cancer diagnoses and shorter timelines for developing and testing new medications. Natural language processing should allow doctors to detach



PERCENTAGE OF AMERICAN HOSPITALS THAT HAVE SWITCHED TO DIGITAL MEDICAL RECORDS OVER THE LAST DECADE OR SO; MORE THAN HALF OF AMERICANS NOW HAVE THEIR HEALTH INFORMATION IN THE EPIC ELECTRONIC HEALTH SYSTEM.

themselves from their keyboards. Wearable sensors and data analysis will offer a richer view of patients' health as it unfolds over time.

"AI is definitely a game changer," says Might, who directs the Hugh Kaul Precision Medicine Institute at the University of Alabama at Birmingham, where he is trying to standardize a digital approach to diagnosis and treatment discovery for families with rare diseases. "No physician can know everything, but every physician should have access to an AI that does."

CONCERNS ABOUT DIGITAL CARE

AI, however, does have its limitations.

Some worry that digitizing medicine will cost people their jobs-for instance, when computers can read medical scans more accurately than people. But there will always be a major role for humans to shape the diagnostic process, says Meera Hameed, MD, chief of the surgical pathology service at Memorial Sloan Kettering Cancer Center in New York City. She says algorithms that can read digital scans will help integrate medical information, such as diagnosis, lab tests, and genetics, so pathologists can decide what to do with that information. "We will be the ones interpreting that data and putting it all together," she says.

The need for privacy and huge amounts of data remain a challenge for AI in medicine, says Mike Nohaile, PhD, senior vice president of strategy, commercialization, and innovation for pharmaceutical giant Amgen. In large data sets, names are removed, but people can be re-identified today by their genetic code. AI is also greedy for data. While a child can learn the difference between a cat and a dog by seeing a handful of examples, an algorithm might need 50,000 data points to make the same distinction.

Computer scientists who build digital algorithms can also unintentionally introduce racial and demographic bias. Heart attacks might be driven by one factor in one group of people, while in another population, a different factor might be the main cause, Nohaile says. "I don't want a doctor saying to someone,

AMOUNT OF TIME DOCTORS SPEND WITH ELECTRONIC HEALTH SYSTEMS AND DESK WORK FOR EVERY 1 HOUR THEY SPEND WITH PATIENTS; WHILE IN THE EXAM ROOM, ABOUT HALF OF A PHYSICIAN'S TIME IS SPENT IN DIRECT FACE TIME AND 37% IS SPENT ON ELECTRONIC TASKS.



'You're at no or low risk' and it's wrong," he says. "If it does go wrong, it probably will fall disproportionately on disadvantaged populations." Also, he says, today, the algorithms used to run AI are often hard to understand and interpret. "I don't want to trust a black box to make decisions because I don't know if it's been biased," Nohaile says. "We think about that a lot."

That said, recent advances in digital analysis have enabled computers to draw more meaningful conclusions from large data sets. And the quality of medical information has improved dramatically over the last six years, he says, thanks to the Affordable Care Act, the national insurance program championed by then-President Barack Obama that required providers to digitize their records in order to receive federal reimbursements.

Companies like Amgen are using AI to speed drug development and clinical trials, Nohaile says. Large patient

AI ALREADY TRANSFORMS **MEDICINE**. TAKE A LOOK AT **THESE CURRENT EXAMPLES.**

bone break.

ACCELERATE **STROKE RECOVERY**

therapist alone.

DETECT OSTEOPOROSIS

An Israeli company called Zebra Medical Vision uses Al to identify women who have tell-tale signs of the bone disease osteoporosis but don't know it. Zebra's computer algorithm crawls through X-rays in electronic medical records looking for small fractures in the spine's vertebrae that may have gone unnoticed but are characteristic of the disease. **Once identified, women** can get treatment before they suffer a devastating

Bionik Laboratories, in Toronto and Watertown, Massachusetts, uses robotics and AI to help patients recover from stroke. The digital algorithm detects arm motions that patients are struggling with and devises movements that the robotic arm then helps them practice. Sensors enable the system to adjust in real time, allowing the patient to perform many more recorded movements per hour-long session than with a human

DIAGNOSE RETINOPATHY

A screening system developed by a California-based company called Eyenuk Inc. can detect diabetic retinopathy, a leading cause of preventable blindness worldwide. Instead of waiting months for an appointment with a specialist, the EyeArt **AI Screening System can** deliver a diagnosis in less than a minute. The company is hoping to receive approval this fall from the FDA to begin marketing its system.

FINDING DRUG INTERACTIONS

SuppAI is a new, free algorithm that allows doctors and consumers to search for drug interactions with nutritional supplements. The tool was built on top of Semantic Scholar, an AI-based search engine that includes 175 million scientific papers. Searches can identify interactions between ginseng and antidepressants, for example, and show that in some cases, the combination can cause mania. With ginkgo, the search engine reveals that there are 80 possible interactions with other drugs, some quite dangerous.

AID IN DEPRESSION

Other projects under development include two at Harvard-affiliated McLean Hospital—one to identify people at risk for developing major depression so they can enroll in prevention trials and another to predict optimal treatment for people with depression.

"THE DATA WAS ALREADY THERE, BUT THE ALGORITHMS MAKE **IT ACTIONABLE.**"

data sets can help companies identify patients who are well suited for research trials, allowing those trials to proceed faster. Researchers can also move more quickly when they have AI to filter and make sense of reams of scientific data. And improvements in natural language processing are boosting the quality of medical records, making analyses more accurate. This will soon help patients better understand their doctor's instructions and their own condition, Nohaile says.

PREVENTING MEDICAL ERRORS

AI can also help prevent medical mistakes and flag those most at risk for problems, says Robbie Freeman, RN, MS, senior director of clinical operations at the Mount Sinai Health System in New York. "We know that hospitals are still a place where a lot of avoidable harm can happen," he says. Freeman's team at Mount Sinai develops AI-powered tools to prevent some of those situations.

One algorithm they created combs through medical records to determine which patients are at increased risk of falling. Notifying the staff of this extra risk means they can take steps to prevent accidents. Freeman says the predictive model his team developed outperforms the previous model by 30% to 40%. They've trained another system

NUMBER OF HEALTH APPS NOW AVAILABLE WORLDWIDE, 40% OF WHICH ARE FOCUSED ON HEALTH CONDITION MANAGEMENT.







to identify patients at high risk for malnutrition who might benefit by spending time with a hospital nutritionist. That algorithm "learns" from new data, Freeman says, so if a dietician visits a patient labeled at-risk and finds no problem, their conclusion refines the model. "This is where AI has tremendous potential," Freeman says, "to really power the accuracy for the tools we have for keeping patients safe."

While much of the information in these algorithms was already being collected, it would often go unnoticed. Freeman says that during his six years as a nurse, he frequently felt like he was "documenting into a black hole." Now, algorithms can evaluate how a patient is changing over time and can reveal a composite picture, rather than identifying 100 different categories of information. "The data was always there, but the algorithms make it actionable," he says.

Managing such enormous quantities of data remains one of the biggest challenges for AI. At Mount Sinai, Freeman has access to billions of data pointsgoing back to 2010 for 50,000 inpatients a year. Improvements in computing technology have allowed his group to make better use of these data points when designing algorithms. "Every year it gets a little easier and a little less expensive to do," he says. "I don't think we could have done it five years ago." But because

algorithms require so much data to make accurate predictions, smaller health systems that don't have access to this level of data might end up with unreliable or useless results, he warns.

BIG BENEFITS—BUT A WAYS TO GO

The improvements in data are beginning to yield benefits to patients, says Hill, chairman, CEO, and co-founder of GNS Healthcare, which is based in Cambridge, Massachusetts. Hill thinks AI algorithms like the one that suggests which patients will benefit from bone marrow transplants has the potential to save millions or more in health care spending by matching patients with therapies that are most likely to help them. Over the next three to five years, the quality of data will improve even more, he predicts, allowing the seamless combination of information such as tumor genetics with clinical data, such as a patient's response to medication.

At the moment, Nohaile says the biggest problem with AI in medicine is that people overestimate what it can do. AI is much closer to a spreadsheet than to human intelligence, he says, laughing at the idea that it will rival a doctor or nurse's abilities anytime soon: "You use a spreadsheet to help the human do a much more efficient and effective job at what they do." And that, he says, is how people should view AI.

ARTIFICIAL INTELLIGENCE & YOU



BOB BRISCO IS THE CHIEF EXECUTIVE OFFICER OF WEBMD.

EDITOR'S NOTE

WebMD CEO Bob Brisco spoke with Daniel Kraft, MD, the Stanford- and Harvard-trained doctor, scientist, and inventor whose research has focused on stem cell and regenerative medicine. He's also the Faculty Chair for Medicine at Singularity University, a collaborative educational program that helps organizations and individuals innovate with the help of breakthrough technologies like AI and robotics.

REVIEWED BY BRUNILDA NAZARIO, MD WEBMD SENIOR MEDICAL EDITOR

FUTURE DANIEL KRAFT, MD

Many people ponder the future, but few can truly envision it—and even fewer have the ingenuity to turn their visions into reality. Daniel Kraft, MD, is one of them. His is a truly pioneering voice in medicine. I've known his colleagues at Singularity University—Ray Kurzweil and Peter Diamandis—for many years, and it was my absolute pleasure to chat with Kraft about the astonishingly rapid pace of technological change under-

💽 What do you think the relationship between doctors and AI might become?

way in all aspects of medicine.

A: The relationship is going to be more synergistic and complementary. The radiologist of the future is not going to be replaced by AI, but the radiologist who uses AI may replace the radiologist who doesn't. The power of the blend of AI, machine learning, or whatever you want to call this convergence, is to narrow the gap and to upskill anybody-the consumer, the patient, the doctor-in a much more personalized, proactive, and, hopefully, preventive manner.

Q: How do you envision our health data will be collected and used in the future?

A: I think we'll have more and more seamless ways to collect data, so we won't even have to think about it. For example, our sensored mattress will track our sleep in detail. And from that we'll gain, hopefully, very actionable insights. Think about having your own personal check-engine light. A modern car has 300 or 400 sensors. When your check engine light goes on, which is driven by software, it gives you an early warning to take your car to the mechanic. If my resting heart rate when I'm asleep is normally 56, but it starts climbing to 76, maybe that triggers a little alarm for both me and my primary care doctor to take a look at what's going

Q: How can data improve health care not just individually, but for everyone?

on with my cardiovascular status.

A: We now have a standard of care for

the general population. The average colonoscopy is at age 50. You start someone on a statin at 40 milligrams. But in reality, we want the data about patients like us. If I'm seeing you as a patient, I can pull up data on patients like you. And I think the potential is that we'll use this crowdsourced health care information for the doctor and individual and we'll enter a true era of precision medicine.

EMPOWERED AS PATIENTS."

Q: Could data also give us insights into treatment pathways that weren't available before?

A: We're still in the fax-machine era of medicine, where diseases are broadly categorized—for example, by high blood sugar in type 2 diabetes. I think we're going to start to understand disease at a much more personalized level. You can think about type 2 diabetes as subtypes 1 to 100, which means we'll be able to fine-tune the individualized diet for someone based on their microbiome, genome, and real-time bloodsugar response to diet.

Q: How might the power of prediction reshape preventive medicine?

A: Given that roughly 80% of health care outcomes are driven by our behaviors, we can shift from this reactive sick-care model—where we tend to wait for patients who show up in the ER with a heart attack, stroke, or stage 3 or 4 cancer-to being continuous and proactive. We'll start to take some of these new data points and use that as a continuous personalized coach to guide us across the health care journey.

"WE CAN BE MORE

Q: In an AI-driven health care world, how does the patient's role change?

A: We're going to move from the world of quantified self, where some of us use our wearable watches or Fitbits to track our sleep and our steps, to the world of quantified health, where the meaningful information like the synthesis of your sleep score or your cardiovascular fitness or your mental health score might flow to your doctor. I like to think of it almost like a FICO score for your wellness. We can be more empowered as patients using this information and be partners in our care with our clinical team.

Q: How might AI help broaden access to health care?

A: As technology gets exponentially cheaper, I think it can dramatically improve access to health care. I think it also democratizes access to information. In the near future, when you ask WebMD or Google a question about your abdominal pain, it knows whether you're a 65-year-old man who's already had an appendectomy or a 32-year-old woman who happens to be pregnant. It also knows your genomics and pharmacogenetics and behaviors. The answers are very different when it is given context.

Q: What kind of future applications do you foresee using AI in day-today medicine?

A: Instead of prescribing a patient a blood pressure regimen, we'll send them home with an app and a set of medications. And eventually, an AI-driven prescription system will help fine-tune the selection of blood pressure medicines to match what the patient needs (using a cuff-less blood pressure monitor that can fit in their watch). Taking it further, you'll even be printing personalized medications at home. Let's say you're on three blood pressure medications and a statin and a diuretic. You'll be able to literally print a combination pill at home that matches what you need that day based on your data. Your doctor will prescribe the actual medicines, but an algorithm will adjust them.



I have always been a techy

person. Even before I had

for everything. Now I need

so I tried out the little one-

the Amazon Echo Dot—and

I thought, If she can do all of

this, what's the big one going

to be like? So, I ramped up to

are using it for themselves or

Q. What does Alexa remind you

She reminds me to take my

medication, to eat three times a

day, to bathe every day. I'm also

When I put in laundry, I tell her

minutes. I can tell her to remind

to remind me to check it in 45

me at 1:00 to get ready for my

speaking engagement at 2:30.

And every day at 10 a.m. and

reminders as a text message.

2 p.m., she reminds me to play

music. If I'm not home, I get the

diabetic, so I need reminders

to give myself insulin shots.

that one. Now my Facebook

followers tell me that they

their parents.

to do?

Alzheimer's, I used my phone

reminders for so many things,

ASSIST

BY SONYA COLLINS **REVIEWED BY** BRUNILDA NAZARIO, MD. WEBMD SENIOR MEDICAL EDITOR

BRIAN LEBLANC LEARNS TO MANAGE HIS ALZHEIMER'S WITH THE HELP OF HIS AI-DRIVEN PERSONAL ASSISTANTS

Five years after he learned he had Alzheimer's disease, Brian Leblanc, now 59, continues to blog about life with the disease, speak at conferences, play in a band, and live independently. He credits his diet, exercise, and active schedule with the slow progress of the disease.

An estimated 5.8 million Americans have Alzheimer's disease. People living with the condition eventually rely on others for their care as the condition progresses. But artificial intelligence (AI) could help some care for themselves longer. For Leblanc, he gives a nod to his AI-driven personal assistants-though he jokingly calls them his girlfriends-Siri and Alexa. He tells us how they assist him in his daily life.



Q. Why do you have her remind you to play music?

On my foggy days, it actually lifts the fog. I have listened to songs that I hadn't heard in 40 years, and I still knew every word. It's another weapon in my arsenal that I use to fight this thing. It touches a part of you that was locked away. Music comes along and says, "Here's a key. Open it up and see what happens."

Even if you don't have dementia, if you're feeling down in the dumps, put on KC and the Sunshine Band's "Shake Your Booty" and see if you don't come to life. Music gives you a happiness that you never could have come up with on your own.

0. These were the things that your family members reminded you to do before. Do you prefer to have a machine remind you?

Yes, because when you have three different people asking you the same questions every day-Did you eat? Did you take a bath?-it frustrates you so much, and I would get angry. Later, I understood that they didn't mean to treat me like a child, but in the moment, I just lash out.

Q. Do you think that these Al-driven devices help you live independently perhaps longer than you could have otherwise?

Definitely, yes. If you're on medication and you don't take it, or if you don't remember to eat every day, there's going to be consequences. They help me remember to do those things.

THE NEW DOCTOR'S VISIT BY MATTHEW FRANKIN MD **REVIEWED BY** NEHA PATHAK, MD, WEBMD MEDICAL EDITOR

HOW AI HELPS A PHYSICIAN FOCUS MORE ON PATIENTS THAN PAPERWORK

As a practicing pediatrician, my passion lies in making sure my young patients feel their bestmentally and physically. But like most clinicians, my time is also regularly eaten up by everincreasing paperwork.

Charting is required for billing purposes and electronic health records and it generally takes me 10 to 15 minutes per patient, which adds up to 25% to 50% of my day. While I certainly understand how important it is, nobody becomes a doctor because they want to interact with paperwork. So when I was asked to be part of a pilot study with our parent organization to try digital solutions aimed at reducing charting responsibilities and provider burnout, I was eager to be involved.

I was about to find a game changer through artificial intelligence (AI).

I tried out a system called Saykara, an app for my phone that works as a virtual assistant. Once I get permission from a patient and their family and set it to ambient mode, the system listens in on the visit. It employs AI technology like machine learning and language processing to identify the important information I discuss with patients. Then, using past notes to identify trends, it automatically adds notes, diagnoses, orders, and more directly into the electronic health record

during the visit. I do review the system's work after each appointment, but the app learned quickly and edits are rarely if ever needed. I haven't had to change my speaking style or adjust anything during my appointments. It also quickly caught on to my mannerisms and the key phrases I use

ARTIFICIAL INTELLIGENCE **& YOU**



MATTHEW FRADKIN, MD IS A PRIMARY CARE PEDIATRICIAN WITH THE SWEDISH MEDICAL GROUP IN SEATTLE.

before summarizing key information, indicating I've discovered something unusual in a physical exam or delivering a diagnosis and treatment plan.

My patients and their parents have been happy to invite AI into our appointments, and all have approved of my using it. Kids and their parents are used to technology and talking directly to Alexa or a Google Home, and once I explain that it's to help with paperwork, everyone understands the need.

I know some worry that AI is going to take jobs away from people, but I've found that Saykara is giving me back my time so I can be more of the kind of doctor that I want to be. I'm also now able to focus 100% on the patient in front of me because there is no longer a computer separating us and I'm not regularly breaking eye contact or pausing the conversation to take notes.

After experiencing these benefits, I couldn't bear the idea of giving the app up, so when the three-month pilot program ended, I asked to keep using the AI system. A year and a half

later. I still am.

When it comes to innovations in health. I think the best digital solutions are the ones that make it feel like the doctor's office is becoming more analog-freeing us up from mundane tasks that machines can do so we can do what doctors do best: help people.



ARTIFICIAL INTELLIGENCE **& YOU**



ERIC TOPOL, MD. IS THE DIRECTOR OF SCRIPPS **RESEARCH TRANSLATIONAL** INSTITUTE, LA JOLLA, CALIFORNIA.

DEEP

HOW AI COULD TRANSFORM THE FUTURE DOCTOR/PATIENT **RELATIONSHIP**

BY STEPHANIE WATSON **REVIEWED BY** NEHA PATHAK, MD, WEBMD MEDICAL EDITOR

More than half of doctors spend 15 minutes or less with each patient-a timestrapped situation that has eroded the doctor/patient relationship. Cardiologist Eric Topol, MD, author of *Deep Medicine*: How Artificial Intelligence Can Make *Healthcare Human Again*, explains how AI might one day help doctors get back to caring for their patients.

Q: What elements form the foundation of the doctor/patient relationship?

TOPOL: First: trust. But that is only earned by the patient feeling that the doctor is present, totally listening, and genuinely interested in their health and welfare. Then being able to demonstrate compassion and empathy. And also elements like a very thorough physical exam, which is part of a patient feeling like they're really being looked after.

Q: Why aren't doctors able to forge the same kinds of personal relationships with patients that they could decades ago?

TOPOL: Many factors contribute, but if you were to go with one core issue, it would

have to be time, because that has been cut down to such a tiny amount compared to what it used to be. It's very difficult, if not impossible, to get the trust and sense of care established when you have so little time. Keyboards and screens further detract from the ability to connect-and decrease the face-to-face time with patients.

Q: How might AI help doctors regain that personal connection with their patients?

TOPOL: The AI that we're moving toward is able to synthesize a note from the conversation between doctor and patient, removing the need for a keyboard. But it's not enough to just catch the words. AI is taking out all the right elements to distill the conversation into a comprehensive and meaningful note. As AI gains momentum, we'll see a waning-and eventually the eliminationof keyboards.

Q: How can AI help with the diagnosis to take some of the burden off doctors?

TOPOL: No doctor can do justice to the typical patient's extensive data-the scans, the labs, and the medical history—and also be up on the latest medical literature that's pertinent to the patient. AI can synthesize the data, process it, assimilate it, and bring up the salient points from that review. That could be not only more accurate, it could also take out tremendous chunks of time that are currently required by doctors. We're not there yet, but that's where we're headed.

Q: How might AI also be a liability in the doctor/patient relationship?

TOPOL: All the productivity enhancement, efficiency, workflow improvement, speed, accuracy, and lower cost-these wonderful attributes that AI provides-could squeeze doctors even more: We want you to read more scans, see more patients. I'm hoping that doctors stand up for their patients and say, "We've been squeezed too much over the years. We're using this efficiency and productivity, all these enhancements, to get the gift of time, and we're going to spend twice as much time with our patients now to reestablish the relationship." It's really up to doctors to lead the campaign to make it better.

Q: What do you hope for the future of the doctor/patient relationship?

TOPOL: Care is the human bond, and we've largely lost that. We've got to get it back. We have one big chance here, if we do this right. I just hope that we can seize this opportunity.



BY SONYA COLLINS REVIEWED BY NEHA PATHAK, MD, WEBMD MEDICAL EDITOR

Artificial intelligence (AI) drives most of your interactions with social media. It determines which posts appear at the top of your feed and which ones don't make the cut. It serves up ads and suggests events, too. But AI also has a more serious job. Computers behind social media sites, including Instagram and its owner Facebook, continually scan posts for signs of suicide risk or self-harm. (When asked, representatives of Twitter would neither confirm nor deny the use of AI for these purposes.) The systems then flag the posts for a trained professional to review. This matters because as more social interaction takes place in the virtual world, those telltale physical signs of sadness or distress become harder to see. And, make no mistake, we are online more than ever. Each year, Americans spend more time online than the year before.





But "you can't see the slumped shoulders, the dragging feet, the breadcrumb trail that people leave," says Andrew Reece, PhD, a behavioral data scientist who developed algorithms while at Harvard University that predict the likelihood that an Instagram or Twitter user is depressed or has PTSD. "So what would those breadcrumbs be?"

That's where AI comes in. AI algorithms enable computers to identify warning signs of suicide that a real person might never see-or only see too late. Crisis responders all over the world are wielding these tools to save lives.

VIRTUAL CRIES FOR HELP

How can computers detect signs of trouble that people may not? Here's how the computers at Facebook do it, according to a statement from the social media giant. First, scientists fed



computers scads of posts until the machines learned to tell the difference between "I have so much homework I could kill myself" and true threats of suicide. Now every post that the AI system flags goes to a real person for review. The next step depends on the severity of the post.

For concerning posts that don't pose an immediate threat of suicide, the platform sends the person resources, including the option to connect with a crisis hotline directly through Facebook messenger. These hotlines keep callers or texters talking to get them through the crisis.

"Through Facebook, we're able to provide our services to a group of people we might not otherwise reach," says Ashley Womble, head of communications at the New York-based Crisis Text Line, an international crisis hotline and one of Facebook's partners in suicide prevention. "About 65% of people who contact us share something they've never told anyone else. So we know we are a first point of contact for many people."

Facebook reports urgent posts directly to local police in the Facebook user's area. If possible, first responders find the person, sometimes through cell phone pings, and check on them. To pinpoint which posts warrant emergency response, AI analyzes comments. "I'm here for you," for example, is less concerning than "Tell me where you are" and "Has anyone seen him/her?" Facebook said in a statement.

In 2017, the first year that Facebook used AI for this purpose, emergency responders made 1,000 in-person checks as a result.

A HELPLINE IN REVERSE

The proactive AI approach may address a crucial gap in mental health care for youth. "We were seeing massive amounts of disclosure online about what young people were feeling," says Andrew Sutherland, manager of the Online Crisis Intervention program at Zeal, a youth-centered non-profit in New Zealand, which uses AI to help young people in crisis around the world. "They didn't seem to be getting the support they need. We wondered if we could take it to them."

Before Facebook and Instagram started using AI for suicide prevention in 2017, Sutherland and Zeal's general manager Elliot Taylor started combing Instagram for red flags themselves. No AI-they just opened the app and searched for hashtags such as #depressed and #suicidal. "We'd see posts by people in distress and asked them if they wanted to talk," says Taylor. They only reach out to public accounts posting publicly available hashtags. The format worked because it's just not that unusual for teenagers to meet and talk to strangers online. In the U.S., nearly 60% of teens make new friends online. "They say, 'Thank you so much for reaching out' or 'Yes, I would like to talk.' They need some help, but the traditional means of accessing it [that is, seeking out help and getting it yourself] haven't been effective," savs Tavlor.

Soon after they started, Zeal adopted AI tools to increase efficiency. AI brought in more posts, for which Zeal needed more responders. The responders' job, like at any crisis hotline, is to keep kids messaging through their crisis. Today, the program counts on about 40 trained volunteers. They aim to grow to 200, working remotely around the world, in the next year.

A PICTURE'S WORTH A THOUSAND WORDS

AI's potential benefits extend beyond suicide prevention. Reece, the behavioral data scientist, trained computers to identify trends in the Instagram pics of depressed people. He and colleague Christopher Danforth fed the computer 43,950 Instagram photos from 166 users-71 of whom had a diagnosis of depression. Many photos were posted months before the diagnosis.

"We found that people who are developing depression post photographs, even without a filter, that are bluer, darker, and grayer than those of healthy people," Reece says. When they add filters, people with depression tend to prefer "inkwell," the one that renders photos virtually black and white.

Pictures from people with depression also contain fewer people than those of their peers. In a similar study, Reece and his colleagues showed that AI could detect changes in the language

KNOW THE SIGNS

Computers can detect online signs of suicide risk, but friends and loved ones can see them in real life. If you or someone you know shows any of these signs, call the National Suicide Prevention Lifeline at 1-800-273-TALK or text "Home" to the Crisis Text Line at 741741.

- Talks about being a burden to others
- Acts anxious or agitated, behaves recklessly

"WE ARE A FIRST POINT OF CONTACT FOR MANY **PEOPLE.**"

of tweets that could predict development of depression or PTSD.

Instagram and Twitter do not use Reece's algorithms. He created them as part of data science research to prove that the concept would work. Reece notes that this use of AI isn't ready for prime time. "There's a huge privacy question that we need to think about," he says. "Just because I can tell by looking at your tweets that you're depressed, it doesn't mean I should." He emphasizes conflicts that would arise if doctors, health plans, or employers analyzed social media in this way.

Still, the research reflects AI's potential to address countless health concerns. "It's like an echocardiogram for your social media," Reece says.

- + Talks about wanting to die or kill him/herself
- + Talks about feeling hopeless, of having no reason to live
- + Increases use of alcohol or drugs
- + Sleeps too little or too much
- + Withdraws or isolates him/herself





JOHN WHYTE, MD, MPH. IS THE CHIEF MEDICAL OFFICER OF WEBMD.

NEW DRUGS IN THE MAKING ARTIFICIAL INTELLIGENCE COULD HELP DETERMINE WHEN AND EVEN WHETHER A NEW DRUG MIGHT BE AVAILABLE

Drug development is an expensive, time-consuming, and often unsuccessful endeavor-developing new drugs can often take more than 10 years, cost more than \$2 billion, and fail nearly 90% of the time. And these numbers have not been improving, which is especially worrisome for people suffering from life-threatening diseases and patients with chronic conditions for which there are no good therapies or treatments. Researchers hope artificial intelligence (AI) can help speed up the process, create greater efficiency, and make the process less expensive. Take a look at four ways AI could do that.

BY JOHN WHYTE, MD, MPH

AI can find new and targeted drugs more

quickly. The discovery of new drugs is about predictions-that is, how well a drug may work for a specific disease and how individual persons who have the disease might benefit. AI can help fine-tune these predictions. AI might also help anticipate how new drugs, especially new drug structures, might function. And since drugs are often used in combination-most people take more than one medicine—learning how a new drug and existing drugs might interact is critical for researchers to see if it is worthwhile to pursue various phases of clinical trials.

Al can use the power of computing to tap

into large databases. AI can look at associations and patterns more effectively than human researchers to find new indications for existing drugs. For example, the drug Viagra was being studied for hypertension and heart disease when researchers noticed men who were taking it were having erections. In another example, researchers noticed that the drug Latisse, studied to

treat high eve pressure and glaucoma, also caused eye lashes to grow and become thicker. AI could help find those patterns sooner so that researchers don't have to rely on chance.

AI can improve clinical trial design, recruitment, and participation. Drug studies

have large dropout rates and often don't enroll enough women and minorities. Some trials never get started or completed because researchers lack enough participants. AI can help identify the reasons for dropout or lack of enrollment. That information could help refine a clinical trial's process and perhaps require fewer participants. This is especially important for rare disease studies that are limited by a small patient population available for well-designed trials.

Al could provide earlier warnings of serious

side effects. Every drug has risks and benefits associated with taking them. Sometimes serious side effects are not discovered until a drug has been on the market for a few years. In addition, the FDA sometimes requires additional safety studies after a drug is approved, which costs money. AI might help find these potential safety problems earlier, prevent harm to patients, and save time and money.

Finally, know that AI will not replace people with computers and robots, but it may change the type of work humans do. We always will need scientists, researchers heading up clinical trials, regulators, pharmacology experts, and patients to help develop the safest and most effective drugs.

FINDING MEANING IN THE DA

TWO YOUNG INVENTORS SHOW HOW AI CAN **PROVIDE ANSWERS ABOUT CERTAIN DIAGNOSES**

BY KAVYA KOPPARAPU AND NEEYANTH KOPPARAPU **REVIEWED BY** NEHA PATHAK, MD, WEBMD MEDICAL EDITOR

Ever since the term *artificial intelligence* (AI) was coined by computer scientist John McCarthy more than 60 years ago, researchers have been able to apply the powerful technology to a variety of applications, including many used in health care. Despite some obstacles, the intersection between health care and AI has the potential for a great partnership. The abundance of patient data-from doctors' notes and MRI scans to gene sequences-has allowed artificial intelligence to swoop in and help doctors and researchers create predictions with a high degree of accuracy.

But for patients, something is still missing. If a doctor determined you had terminal brain cancer, your first question would probably be "Why?" Unfortunately, because most powerful AI models are unable to explain their decisions, your doctor would be stuck saying, "because a computer told me."

Recently, advancements in the field of AI have allowed, if not yet an explanation, at least a kind of interpretation. These AI models can provide additional information about what is important in the given data.

As the creators of some of these AI models, we have seen firsthand that an additional step of interpretability adds to an AI's usefulness. For example, when we created a model to detect early signs of Parkinson's disease, we only picked up on problems with it after we looked at how the model interpreted MRI scans. Originally, the model claimed that random points in and out of the brain were important to its decision-making process. After realizing this, we were able to fix the model to more accurately detect early signs of the disease.

Most important, interpretability may build trust by providing additional insight into using AI. It brings us closer to a future of human/machine teams, allowing doctors to start to understand why the AI made its decision. And we need both: Without AI, we lose the ability to use vast amounts of medical data that could lead to more accurate diagnoses. Without human doctors, we lose empathy, reliability, and natural patient experiences. Integrating interpretable results into AI systems will be an important step toward using AI for a more accurate, cheaper, and accessible tool in the doctor's office.

NEARLY 4% **PERCENTAGE OF** DRUGS IN CLINICAL TRIALS THAT **RECEIVE FDA APPROVAL**

NUMBER OF NEW DRUGS THE FDA **APPROVED IN 2018**

902,323 NUMBER OF SERIOUS **COMPLICATIONS DUE** TO A MEDICATION OVER A NINE-YEAR PERIOD (2006 TO 2014)



ARTIFICIAL INTELLIGENCE **& YOU**



KAVYA KOPPARAPU IS A SOPHOMORE AT

HARVARD UNIVERSITY, AN INVENTOR, THE LEADER OF GIRLSCOMPUTINGLEAGUE AND A 2017 WEBMD HEALTH HERO AWARD WINNER.

NEEYANTH KOPPARAPU

IS KAVYA'S BROTHER AND A HIGH SCHOOL SENIOR WHO WAS AWARDED & 2019 DAVIDSON **TECHNOLOGY RESEARCH FELLOW**

"IT BRINGS US CLOSER TO A FUTURE OF HUMAN/ MACHINE **TEAMS.**"

Food



GETTY IMAGES

Basil Boost

TECHNIQUES KNOWN AS "CYBER AGRICULTURE" USE COMPUTER ALGORITHMS TO CREATE HEALTHIER, TASTIER PLANTS WITH NO GENETIC MODIFICATION REQUIRED TO STUDY HOW ARTIFICIAL INTELLIGENCE (AI) CAN AID THE WAY FOOD IS GROWN, researchers at MIT grew basil plants on a hydroponic farm, carefully controlling the intensity, duration, and color of light shined on the plants. They collected data about the plants and used a machinelearning algorithm to generate "recipes" of light, seeking the combination that would create the highest concentration of flavor molecules. The researchers found that 24 hours of light yielded the tastiest basil. The study suggests that computer tools can help farmers optimize plant growth. For example, the scientists are currently using these techniques to grow basil indoors with higher levels of compounds that could fight diabetes. That would make some impressive pesto. —ERIN O'DONNELL **NAYS**

Sous Vide Success

A SOUS VIDE MACHINE GIVES YOU A NOVEL WAY TO MAKE DELICIOUS, FOOLPROOF DINNERS FOR YOUR FAMILY—WITH LESS TIME AT THE STOVE

BY Erin O'Donnell **RECIPES BY** Brianna Beaudry

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use a sous vice machine Nothing beats hands-off cooking, especially when it yields a tender, tasty meal. That's one of the promises of a sous vide machine. This high-tech device (also called a thermal immersion circulator) allows you to cook foods—including meats, fish, veggies, and eggs—in water kept at a precise temperature.

The method involves placing ingredients in a zip-top bag, squeezing out the air, and then placing the bag for several hours in a pot filled with water. The sous vide machine clips to the side of the pot and heats and circulates the water and keeps the temperature consistent. (You can use your smartphone to control some brands.) This gives you time to tackle New Year's resolutions walk around the block, anyone?—while the food cooks. Sous vide fans say this technique prevents overcooking and makes meats butter-soft.

When the sous vide cooking is complete, you'll quickly sear the pork or chicken in a hot pan to brown the exterior, then serve.

WEEKNIGHT WONDER

1550.

Rosemary and Garlic Chicken Breasts

The sous vide technique helps keep chicken breasts tender and juicy. Lowering the bag gradually into the water—with the top open—pushes out excess air that makes the bag float and prevents the chicken from cooking correctly. Once the bag is just above the water line, zip it closed and drop it in the water. Serve the chicken with brown rice and vegetables, or use the slices to top a crisp salad.

MAKE IT

Fill a large pot with water and clip the sous vide machine to the side. Preheat the water by setting the final temperature to 165°F. With paper towels, pat 1¼ lbs chicken dry and set aside. In a small bowl, combine 1 tbsp finely chopped fresh rosemary, 1¹/₂ tsp olive oil, 2 minced garlic cloves, ½ tsp kosher salt, and freshly ground black pepper. Brush mixture over chicken. Place each breast in a quart-size zip-top plastic bag. Leave the bags unsealed and slowly lower into the water, displacing any excess air. Seal bags and fully submerge in the water. Cook 2 to 4 hours. Using tongs, remove chicken from water; discard the bag and herbs. Pat dry with paper towels and wipe away any excess rosemary. Heat 11/2 tsp olive oil in a large cast-iron skillet or sauté pan over medium-high heat. Cook chicken in hot oil for 3 minutes or until golden brown, turning once halfway through cooking. Remove from skillet, slice, and serve. SERVES 6

PERSERVING (50Z CHICKEN) 200 calories, 32 g protein, 0 g carbohydrate, 7 g fat (1.5 g saturated fat), 105 mg cholesterol, 0 g fiber, 0 g sugar, 460 mg sodium. Calories from fat: 30%

THE MIX

SOUS VIDE MACHINE + 2 BONELESS AND SKINLESS CHICKEN BREASTS, FRESH ROSEMARY, EXTRA VIRGIN OLIVE OIL, GARLIC, KOSHER SALT, FRESHLY GROUND BLACK PEPPER

SOUPER STARTER

Curried Carrot Soup

Here's a colorful—and flavorful—way to celebrate the season of soups. Serve a small bowl to start your meal or enjoy a larger bowl as your entree with a crusty whole-grain roll.

MAKE IT

Fill a large pot with water and clip the sous vide machine to the side. Preheat the water by setting the final temperature to 185°F. Place 11/2 lbs peeled and chopped carrots, 2 tsp olive oil, 2 tsp grated fresh ginger, 2 tsp curry powder, 1 tsp chopped shallot, 1 tsp salt, 1 clove garlic, and freshly ground black pepper in a gallon-size zip-top bag. Leave the bag unsealed and slowly lower it into the water, displacing any excess air. Seal the bag and fully submerge in the water. Cook for 2 to 4 hours. Using tongs, remove carrots and add to a blender with 2½ cups low-sodium chicken broth. Blend until smooth. SERVES 4

NEW YEAR'S SUPPER

Garlic and Thyme Pork Tenderloin

Goodbye, leathery pork. This method keeps the tender in tenderloin and provides an impressive option for your New Year's feast when served with roasted vegetables.

THE MIX

SOUS VIDE MACHINE +

CARROTS, OLIVE OIL, FRESH

GINGER, CURRY POWDER,

SHALLOT, KOSHER SALT, GARLIC,

BLACK PEPPER, LOW-SODIUM

CHICKEN BROTH

MAKE IT

Fill a large pot with water and clip the sous vide machine to the side. Preheat the water by setting the final temperature to 145°F. Season the pork tenderloin (about 1 lb) with salt and pepper and place in a gallon-size plastic zip-top bag with 1 roughly chopped shallot, 4 sprigs thyme, and two peeled, smashed garlic cloves. Leave the bag unsealed and slowly lower it into the water, displacing any excess air. Seal the bag and fully submerge in the water. Cook 1 to 4 hours. Using tongs, remove pork from the water; discard the bag and herbs. Pat pork dry with paper towels. Heat 1 tbsp olive oil in a cast-iron skillet over high heat. Add pork to hot oil and cook about 3 minutes or until browned on all sides, turning frequently. Remove from heat and rest for 5 minutes. Slice into ¼-inch slices. SERVES 4

PERSERVING (40Z PORK) 480 calories, 84 g protein, 2.4 g carbohydrate, 12 g fat (3 g saturated fat), 260 mg cholesterol, 0 g fiber, 0 g sugar, 590 mg sodium. Calories from fat: 39%

THE MIX

SOUS VIDE MACHINE + **1 PORK TENDERLOIN, KOSHER** SALT, FRESHLY GROUND BLACK PEPPER, SHALLOT, FRESH THYME, GARLIC, OLIVE OIL

PER SERVING (1¼ CUPS SOUP FOR ENTRÉE) 134 calories, 4 g protein, 24 g carbohydrate, 3 g fat (.5 g saturated fat),

0 mg cholesterol, 7 g fiber, 11 g sugar, 298 mg sodium. Calories from fat: 22%





BUILD A BETTER

Chili

BREAK OUT A BIG POT AND PREPARE TO GET CREATIVE. CHILI COMES IN AS MANY VARIETIES AS THE NUMBER OF PEOPLE WHO COOK IT.

BY Matt McMillen REVIEWED BY Hansa Bhargava, MD, WebMD Senior Medical Editor

"CHILI CAN BE INTERPRETED PRETTY MUCH ANY WAY YOU WANT, AS LONG AS YOU include chili peppers (or, more accurately, pods)," says New Mexico-based cooking instructor **Jane Butel**, author of the classic cookbook *Chili Madness*, first published in 1980 and now in its third edition. Meaty or vegetarian, with beans or without, chili often introduces people to hot, spicy food, says Butel. "That's just one reason it's so exciting." Check out her pro tips below.

MAKE IT

- Use pure powdered chili that has no additives. Chili powder blends have too much salt and other seasonings. All you want is the chili flavor.
- Cook your chili in a large, heavy pot. Do not cover the chili as it cooks, or you will spoil the texture of the meat.
- For the meat, buy a chuck roast, which has the ideal amount of fat, and cut it into ¼-inch to ½-inch cubes.
- Don't brown the cubed beef. If you do, the meat won't break down properly while the chili cooks.
- Cook with a neutral flavored oil, like vegetable oil. You don't want the fruitiness of olive oil.

- Before you add the chili powder, take the pot off the heat; otherwise, you'll burn it. Stir the powder in with the beef, then add the liquid and return to the heat.
- Be patient. Simmer for at least an hour, but two to three hours will greatly improve the flavor.
- Be really patient. To fully develop the flavors, refrigerate the chili overnight and reheat when it's time to eat.
- Top each bowl with your choice of cheese, sour cream, lime juice—whatever you like. If the chili is too spicy, the dairy will help tame the heat.



Game Day Spread

MAKE A WINNING SPREAD FOR THIS YEAR'S SUPER BOWL WITH A WIDE ASSORTMENT OF FROM-SCRATCH AND STORE-BOUGHT FAVORITES

BY Matt McMillen REVIEWED BY Hansa Bhargava, MD, WebMD Senior Medical Editor

WHEN DREW ADAMS THROWS A SUPER BOWL PARTY, he puts the emphasis on options. "Know what your guests like and give them a lot of things to try," says Adams, executive chef at Bourbon Steak in the Four Seasons Hotel in Washington, DC. But you don't have to do all the work on game day. Follow his tips on what to serve and how to divide the labor.

- Plan your menu, then make a prep list, noting how long you expect it will take to prepare each item.
- Play to your strengths. Recall what everyone raved about last year and make it again.
- Start with foods that take a long time to cook. Braising short ribs for sliders? Get them into the oven early and move on to the next item.
- Work ahead. Brine chicken wings and marinate meat the night before the game.
- Chop your garnishes at the last minute. That includes fresh herbs, scallions, raw onions, and grated cheese.
- Chicken wings must be on the menu. Stagger the baking so you have fresh, hot wings throughout the game, and make sure you have enough for everyone.

- mus by giving it a whir in the food processor with some liquid from a can of chickpeas.
- Give a kick to store-bought guacamole. Stir in chipotle peppers or pickled jalapeños.
- For your friends who don't drink, craft refreshing smoothies with spinach, melon, ginger, and a sparkling beverage like Orangina.
- Overprep! It's better to have too much than too little. Turn what's left into leftovers.
- Make many things from one ingredient. Sauté ground beef, pork, or chicken, then add it to tacos, stuffed peppers, and lettuce wraps.
- Play it safe. Keep cold items cold by placing serving dishes over ice. Divide the meat and refrigerate portions that can be reheated as needed.

MOBILE APPS

SECTION ARE OF THE EXPERTS AND ARE

PRODUCT, SERVICE, OR TREATMENT



HEADSPACE

"Its guided meditations lead to calmness and reduced stress, a combo that helps control hunger and improve food choices. Check out its mindful eating meditations next time you're at the table.



ATE "A photo-based food

journal, this app tracks your food choices and then goes further. You can enter your mood, why you ate, your hunger level, and other factors linked with mindful eating habits.



HEALTHY LIVING "From the Environ-

mental Working Group, this app scans barcodes and enables vou to make educated, healthy food choices based on nutrition, additives, and how processed the food is.



HARVEST

"This app guides your produce choices and recommends how to select and store fruits and veggies. It also points you to what's in season in your area. Like having a farmer in your pocket!"



MONASH FODMAP "An app that aids digestion! The app's simple green-yellowred light system helps you pick foods fit for the complex low-FOD-MAP diet, designed to ease diarrhea, consti-

pation, bloating, and

other IBS symptoms."

NOT THE OPINIONS OF WEBMD; WEBMD DOES NOT ENDORSE ANY SPECIFIC

Checkup

TAKE ACTION

Advancements in Diagnosis

ARTIFICIAL INTELLIGENCE STANDS TO INCREASE SPEED AND ACCURACY IN NUMEROUS MEDICAL DIAGNOSES, AND AN EARLIER, MORE ACCURATE DIAGNOSIS MEANS BETTER RESULTS FOR PATIENTS

FORTY PERCENT OF THE WORLD'S DIAGNOSTIC

IMAGES—X-RAYS, MRIs, CT SCANS—ARE CHEST X-RAYS. They pile up as they await a radiologist's interpretation. Researchers in the UK used 470,388 adult chest X-rays to teach a machine to review and rank them as normal, nonurgent, urgent, or critical. When a medical practice used this AI method to preview its X-rays, the computer ranked the X-rays with high accuracy. Images ranked as critical got a radiologist's attention in less than three days rather than the usual 11.

Many of the 5 million Americans who have heart failure will die from sudden cardiac death. An implantable device could prevent those deaths, but they're too expensive to give to everyone with heart failure and doctors can't predict who's at greatest risk of death. Researchers in Japan fed information about 529 heart failure patients, some of whom had already died, to a computer and found that it could predict with 91% accuracy who had the greatest risk of death. The AI system could one day tell doctors which patients can't live without an implantable heart device.

Macular degeneration and diabetic retinal edema are among the most common causes of vision loss. When doctors catch them early, treatment can slow these diseases and minimize vision loss—but people often get a diagnosis after irreversible damage has already occurred. AI could accelerate diagnosis and bring it to areas that don't have an eye specialist. Doctors at UC-San Diego used 200,000 eye images to teach a computer to detect these diseases. When they compared AI to the opinions of five ophthalmologists, they found the machine was 95% accurate. —SONYA COLLINS

Artificial Intelligence

BY Sonya Collins REVIEWED BY Michael W. Smith, MD, WebMD Chief Medical Editor



Amount of data created every day. (That would fill 150,000,000 iPhones.) Data creates the intelligence behind AI.

Amount of work time that AI-driven administrative assistant software can save registered nurses by completing non-patient-care tasks.





Percent accuracy of a new AI method to predict how a patient will do after brain surgery for epilepsy. (Doctors' current decision-making methods predict the outcome of this surgery with 50% to 70% accuracy.)



Amount of data expected to exist by 2020. 1 zettabyte equals 44 trillion gigabytes.

Amount that AIdriven robotics can reduce the length of hospital stays.







Speed that AI-driven software can interpret a mammogram compared to a human doctor.



JAMES STEINBERG

BY THE NUMBERS

Cold & Flu

ACCORDING TO THE CDC, ADULTS GET TWO TO THREE COLDS A YEAR, AND AS MANY AS 43 MILLION AMERICANS CAUGHT THE FLU DURING THE MOST RECENT FLU SEASON. THAT'S A LOT OF MISERY. HOW MUCH DO YOU KNOW?

BY Matt McMillen REVIEWED BY Michael W. Smith, MD, WebMD Chief Medical Editor



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Search for the article **Flu or Cold Symptoms?** at WebMD.com.

ANSWERS

FALSE

Different viruses cause the flu, and each year, a new vaccine must be developed to counter the three to four flu strains that experts predict will be the most common. Get a flu shot each fall, ideally before November. It doesn't guarantee protection, but even if you do get the flu, the vaccine may curb the severity of your illness.

2. true

Antibiotics treat bacterial infections, not the viral infections responsible for colds or the flu. In fact, if you take antibiotics when you don't need them, they may be less effective against bacterial infections that you catch in the future. Relieve your symptoms with rest and appropriate over-the-counter medications.

3. FALSE

Colds and flu spread easily, so stay home if you can for a day or two when you're most contagious. For the flu, you'll likely be contagious the day before and for five to seven days after symptoms start. If you must work, wash your hands frequently, sneeze and cough into your elbow, and avoid close contact with your coworkers.

4. true

Colds and the flu often share some common symptoms, such as a runny nose, a cough, and a sore throat, but fevers rarely accompany colds (though they're more common in infants and small children with a cold). Muscle aches, headaches, and tiredness also occur more often when the flu strikes.

5. true

Very young children, the elderly, people with weakened immune systems, pregnant or recently pregnant women, and those with chronic conditions like asthma, diabetes, and heart disease have a higher risk of serious flu complications, including pneumonia, that could require a hospital stay. For some people at high risk of serious flu complications, an antiviral may be an option; this medication works best taken within a day or two of developing symptoms. Take 10

ANSWERS FOR YOU

