In Radiology, Man Versus Machine

Diagnostic Imaging February 11, 2016 Read original article

Call it artificial intelligence. Deep learning. Computer cognition. Whatever its name, it's the same thing – machines recognizing clinical problems in digital images ahead of the radiologists charged with making the diagnosis.

The artificial intelligence (AI) trend is new, but it's gaining ground quickly, according to industry experts. The advent of these technologies and radiology's growing interest in and dependence on them has been discussed at national and international meetings, including the RSNA, HIMSS, and SIIM annual meetings, during the past year. But, there's still a long way to go.

"We're just barely scratching the surface of using artificial intelligence in the last few years," said Eliot Siegel, MD, professor and vice chair of research information systems for the University of Maryland Department of Diagnostic Radiology and Nuclear Medicine. "There's an emergence of increasing interest in the largest companies in the world, including Google, Microsoft, Apple, and IBM, in actually starting to use these technologies for data extraction and evaluation."

AI opens the door for radiologists to compare new images with similar, existing ones, said Siegel who also serves as the chief of imaging for the VA Maryland Healthcare System and has spoken about AI use in radiology.

The Case for AI

In effect, AI is the next generation of clinical decision support – technology designed to enhance a radiologist's ability to identify and correctly diagnose any problems caught on diagnostic images. The trend first began with the introduction of electronic medical records (EMR) and the compilation of patient data in one central location. Its use has since expanded into clinical analytics, mining imaging data to improve medical treatment.

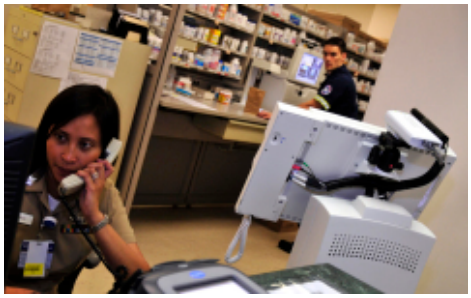
Any AI technology must be correctly loaded with clinical and peer-reviewed data that can be compared to any new images, Siegel said. Only then can it prompt a quicker, more accurate diagnosis. In fact, he said, in some cases, AI can cut the time invested in searching for comparative images by 80% to 90%.

"So many tasks that were previously run by humans can now be equally or better done by computers," he said. "Look at how we apply advanced computer technologies – the implication is huge with medical imaging."

When used correctly, he said, AI technologies house complex data

Your Top Articles

18 5The 5 Best Healthcare Jobs for 2016FierceHealthFinance



17 3Over-the-Telephone Prescription Bill Heads to SenateWBAA

126 7We Analyzed 35,000 Physician Salaries. Here's What we FoundDoximity Blog

15 6Should We Cap Hospital CEO Salaries?MD Magazine

from MRI, CT, ultrasound, and PET machines. Because it's held in the same repository, the information is easily searchable. Having such easy access will help you as you craft advice to referring physicians.

What Vendors Are Doing

According to industry vendors, mammography and breast cancer screening is the easiest segment of diagnostic imaging for testing AI efficacy. On average, said Steve Tolle, chief strategy officer and president for iConnect Network Services with Merge Healthcare, radiologists miss 15% of breast cancer diagnoses. These mistakes are largely due to fatigue or overlooking a malignancy because there's an assumption of normalcy. Machines, he said, don't get tired, and they view every part of an image equally.

AI can also take breast cancer diagnosis a step further, incorporating real-world, pre-existing images, said Igor Barani, MD, chief medical officer of deep learning healthcare company Enlitic. Instead of relying on BI-RADs or risk stratification, Enlitic's technology pulls the most relevant data from past images and makes them searchable to increase efficiency in designing a patient-care plan.

©studiostoks/Shutterstock.com

"Deep learning is particularly useful in radiology because there are a lot of data variables accessible in electronic formats," he said. "There's clearly a substantial need to speed up radiology given the growth of medical imaging and the pressure of medical imaging being seen as a big contributor to health care costs."

Alongside Enlitic, Merge Healthcare has partnered with IBM to introduce several AI tools. Work is underway to make them commercially available. For example, the company has developed an iPhone scanner that can diagnose mole malignancies with 90% accuracy, Tolle said.

In addition, this year, Merge plans to introduce a disease-specific audit service that offers more detailed – and searchable – information about cardiovascular disease, cancer, and chronic obstruction pulmonary disease. An EMR summarization tool is also in the works to help radiologists and cardiologists identify what information they might need from a patient's record to better understand their diagnostic images. Through the partnership, they also plan to introduce a smart MRI that can analyze entire images and pinpoint problems that need a radiologist's immediate attention.

These tools will make radiologists' jobs easier, but, Tolle acknowledged, there are still challenges to widespread adoption. First, many people still have a negative impression of AI from movies, such as The Matrix or 2001: A Space Odyssey, where machines endeavor

8 2Your Compensation Is About More Than SalaryMD Magazine

11 12Assessing the Competency of Older PhysiciansPhysicians Practice

8 17The Cadillac TaxNew England Journal of Medicine

9 1PA vs. MD Salaries: State-by-State ComparisonMidlevel U

to eliminate humans. More realistically, he said, it will be more difficult to secure approval from the Food & Drug Administration and sufficiently train radiologists and their staff to use AI technologies.

Ultimately, he said, this trend will only augment the radiologist's place in health care.

"We're working on a platform that really makes the radiologists what they were historically," he said. "Back in the day, doctors had to come to radiologists to look at pictures on the wall, and they had to talk with radiologists about the cases."

AI puts radiologists back in a strategic partnership with referring physicians because they can provide much more robust information about what they believe is going on with a patient and what treatments might be best.

"We're not trying to replace the radiologist," he said. "We're trying to give them a fighting chance of keeping up with volume and dealing with the occasional surfacing of something they haven't seen before."

Concerns

But, some in the industry worry increased use of AI brings significant challenges. According to Jenny Chen, MD, chief executive officer and founder of 3D healthcare printing company 3DHeals, AI use presents problems, while reducing the amount of time radiologists spend reading images.

As AI use increases and reduces time spent reading studies, the price tag on a radiologist's diagnostic time drops, perpetuating the trend toward commoditization, she said in an online forum.

It's also possible for a high level of AI accuracy to fall short of satisfying patients. Even with 99% diagnostic accuracy, there could be thousands of life-changing misreads. The result, she said, could be a slew of lawsuits.

"You only need one bad legal case to change the entire AI landscape, and this is true for any new health care-related technology," said Chen, who is also a former neuroradiology adjunct clinical faculty member at Stanford Hospitals and Clinics. "So, any AI company with the intention to replace an entire profession needs to tread cautiously into this mine field."

The challenges this trend faces are two-fold, she said. First, as an industry, radiology's reporting style is inconsistent, making data extraction for imaging interpretations complex and confusing. Imaging acquisition also isn't standardized. It will likely be difficult for a computer to recognize many variables, including positioning, motion artifacts, and anatomical variants.

Regardless of these potential problems, progress toward wider-spread AI use has picked up within the past year, Siegel said, opening up many more possibilities for improving radiology practice, reducing diagnostic errors, and enhancing patient care. Still, he said, the process is just beginning.

"We're really just in the first baby steps, and we need to keep learning," Siegel said. "The impact has been relatively small so far, but

I have confidence with emerging companies and start-ups that we'll see it grow."

Read Original Article

See Which Brand-Name COPD Treatment Option Has Preferred Coverage Over* Another

Sponsored by AstraZeneca

SYMBICORT® (budesonide/formoterol fumarate dihydrate) Inhalation Aerosol Is Still Preferred over* Advair® on CVS Caremark SilverScript Med D in 2016.[1]

Formulary comparisons do not imply comparable efficacy, safety, or FDA-approved indications.

AstraZeneca does not endorse any individual Commercial, Medicare Part D, or Medicaid plan or plans.

*"Preferred over" means that SYMBICORT has better formulary placement (at Tier 2 or lowest branded co-pay tier or better) and/or has less restrictions (PA or ST) than Advair.

Please see Important Safety Information about SYMBICORT below and full Prescribing Information, including Boxed WARNING and Medication Guide.

INDICATIONS

SYMBICORT is indicated for the treatment of asthma in patients 12 years and older (also see Boxed WARNING).

SYMBICORT 160/4.5 is indicated for the maintenance treatment of airflow obstruction in patients with chronic obstructive pulmonary disease (COPD), including chronic bronchitis and emphysema.

SYMBICORT is NOT indicated for the relief of acute bronchospasm.

IMPORTANT SAFETY INFORMATION, INCLUDING BOXED WARNING

- **WARNING: Long-acting beta$_2$-adrenergic agonists (LABA), such as formoterol, one of the active ingredients in SYMBICORT, increase the risk of asthma-related death. A placebo-controlled study with another LABA (salmeterol) showed an increase in asthma-related deaths in patients receiving salmeterol. This finding with salmeterol is considered a class effect of LABA, including formoterol. Currently available data are inadequate to determine whether concurrent use of inhaled corticosteroids or other long-term asthma control drugs mitigates the increased risk of asthma-related death from LABA. Available data from controlled clinical trials suggest that LABA increase the risk of asthma-related hospitalization in pediatric and adolescent patients**

See more

- **When treating patients with asthma, prescribe SYMBICORT only for patients not adequately controlled on a long-term asthma control medication, such as an inhaled corticosteroid or whose disease severity clearly warrants initiation of treatment with both an inhaled corticosteroid and LABA. Once asthma control is achieved and maintained, assess the patient at regular intervals and step down therapy (eg, discontinue SYMBICORT) if possible without loss of asthma control, and maintain the patient on a long-term asthma control medication, such as an inhaled corticosteroid. Do not use SYMBICORT for patients whose asthma is adequately controlled on low or medium dose inhaled corticosteroids**

- SYMBICORT is NOT a rescue medication and does NOT replace fast-acting inhalers to treat acute symptoms
- SYMBICORT should not be initiated in patients during rapidly deteriorating episodes of asthma or COPD
- Patients who are receiving SYMBICORT should not use additional formoterol or other LABA for any reason
- Localized infections of the mouth and pharynx with *Candida albicans* has occurred in patients treated with SYMBICORT. Patients should rinse the mouth after inhalation of SYMBICORT
- Lower respiratory tract infections, including pneumonia, have been reported following the inhaled administration of corticosteroids
- Due to possible immunosuppression, potential worsening of infections could occur. A more serious or even fatal course of chickenpox or measles can occur in susceptible patients
- It is possible that systemic corticosteroid effects such as hypercorticism and adrenal suppression may occur, particularly at higher doses. Particular care is needed for patients who are transferred from systemically active corticosteroids to inhaled corticosteroids. Deaths due to adrenal insufficiency have occurred in asthmatic patients during and after transfer from systemic corticosteroids to less systemically available inhaled corticosteroids
- Caution should be exercised when considering administration of SYMBICORT in patients on long-term ketoconazole and other known potent CYP3A4 inhibitors
- As with other inhaled medications, paradoxical bronchospasm may occur with SYMBICORT
- Immediate hypersensitivity reactions may occur, as demonstrated by cases of urticaria, angioedema, rash, and bronchospasm
- Excessive beta-adrenergic stimulation has been associated with central nervous system and cardiovascular effects. SYMBICORT should be used with caution in patients with cardiovascular disorders, especially coronary insufficiency, cardiac arrhythmias, and hypertension
- Long-term use of orally inhaled corticosteroids may result in a decrease in bone mineral density (BMD). Since patients with COPD often have multiple risk factors for reduced BMD, assessment of BMD is recommended prior to initiating SYMBICORT and periodically thereafter
- Orally inhaled corticosteroids may result in a reduction in growth velocity when administered to pediatric patients
- Glaucoma, increased intraocular pressure, and cataracts have been reported following the inhaled administration of corticosteroids, including budesonide, a component of SYMBICORT. Close monitoring is warranted in patients with a change in vision or history of increased intraocular pressure, glaucoma, or cataracts
- In rare cases, patients on inhaled corticosteroids may present with systemic eosinophilic conditions
- SYMBICORT should be used with caution in patients with convulsive disorders, thyrotoxicosis, diabetes mellitus, ketoacidosis, and in patients who are unusually responsive to sympathomimetic amines
- Beta-adrenergic agonist medications may produce hypokalemia and hyperglycemia in some patients
- The most common adverse reactions ≥3% reported in asthma clinical trials included nasopharyngitis, headache, upper respiratory tract infection, pharyngolaryngeal pain, sinusitis, influenza, back pain, nasal congestion, stomach discomfort, vomiting, and oral candidiasis
- The most common adverse reactions ≥3% reported in COPD clinical trials included nasopharyngitis,

oral candidiasis, bronchitis, sinusitis, and upper respiratory tract infection

- SYMBICORT should be administered with caution to patients being treated with MAO inhibitors or tricyclic antidepressants, or within 2 weeks of discontinuation of such agents
- Beta-blockers may not only block the pulmonary effect of beta-agonists, such as formoterol, but may produce severe bronchospasm in patients with asthma
- ECG changes and/or hypokalemia associated with nonpotassium-sparing diuretics may worsen with concomitant beta-agonists. Use caution with the coadministration of SYMBICORT

Please see full Prescribing Information, including Boxed WARNING and Medication Guide.

You are encouraged to report negative side effects of prescription drugs to the FDA. Visit http://www.fda.gov/medwatch or call 1-800-FDA-1088.

Reference

1. Fingertip Formulary®. January 28, 2016.