Envisioning the Future of Radiology: Intelligently Efficient

In the face of a challenging global pandemic, radiologists have stepped up to develop and execute new protocol requirements for patient safety and have modified operational workflows to accommodate increased patient volumes. But to reopen and remain operational while minimizing the transmission of COVID-19, some radiologists are experiencing stress[1] due to excessive workloads and lack of time to complete them, which can lead to physical, mental, and emotional exhaustion.

Addressing radiologists' challenges with a laser focus on smart improvements can help reduce burnout and positively impact patient care. Streamlining workflow and automating some of the administrative work can allow radiologists more time to spend on care, and less on tasks. Care delivery can become more precise and personalized, ultimately improving patients' health outcomes. With the assistance of advanced technologies and artificial intelligence (AI) tools, radiologists are able to acquire images with more clarity and perform studies in less time.

Leveraging Intelligently Efficient AI Tools

Using AI tools can help radiologists improve efficiency and keep pace with increasing demand. AI-powered imaging can make up for the additional time needed between each patient exam to execute disinfection protocols, for example. Smart improvements from AI, including deep learning algorithms can help radiologists make their diagnostic determinations faster and with a high degree of confidence due to the clarity and sharpness of the images.

"The need for efficiency is real," explained Jan Makela, President and CEO of Imaging at GE Healthcare, "and the potential for AI to improve the radiology workflow is immense. We want to help radiologists meet their goals for improving quality of care. To do that, we are incorporating AI and deep learning to develop easier processes and reduce some of the complexities in imaging, which will result in improved efficiency and a streamlined workflow."

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Employing AI tools in radiology has far-reaching implications in everything from image capture to reconstruction techniques to image access during reading and reporting. Advanced technologies in magnetic resonance (MR), computed tomography (CT) and molecular imaging (MI) are especially noteworthy regarding their delivery of remarkably sharp images, potentially obtained with shorter acquisition times.

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Advancing Image Reconstruction in MR with Deep Learning

The need to quickly get the right image the first time has never been more important. Radiology has experienced a 31 percent increase in MR procedures between 2007 and 2018[2], illustrating the necessity of an efficient workflow to handle increasing demand. Additionally, about 20 percent of MR exams need a follow-up or repeat exam, making the case even more critical.[3]

There is an inherent compromise in MR between image quality and scan time. Better image quality necessitates long scan times. Shorter scans, aimed to improve patient comfort and productivity, compromise image quality and diagnostic confidence. New deep-learning image reconstruction techniques in MR produce images with less noise and can even be used for patients who typically pose imaging challenges, including obese populations. GE Healthcare's AIR™ Recon DL*, part of the AIR™ family of products for MR, is using AI in the reconstruction process to deliver exceptional results in the form of finer detail and improved image quality. Incorporating this AI-powered technology, clinicians no longer need to choose between image quality and scan time. The full suite of AIR™ products, from AIR™ Coils to AIR™ Workflow and AIR™ Image Quality, provides fast, deep-learning reconstruction and can help alleviate the pressures MR clinicians are facing.

Saving Time with AI-Powered Spectral CT

In a perfect world, similar deep learning image reconstruction techniques that deliver exceptional MR images could be used with other complex imaging modalities such as spectral, or dual-energy CT. There are clear clinical benefits to using spectral imaging in areas such as oncology for tumor assessment and staging, and in vascular imaging to optimize contrast and for tissue characterization. However, a cumbersome workflow has presented obstacles to its widespread adoption, despite its diagnostic value. Workflow issues including difficulties in CT scheduling, increased reconstruction time, increased number of images, and increased interpretation time, substantially increase the radiologists' workload and hinder the use of dual-energy CT imaging in daily routine.[4]

AI-powered innovations are currently in development that will resolve some of the biggest challenges in dual-energy CT including image noise, undesirable texture, and the ability to scan challenging patients. GE Healthcare recently launched a bold vision to transform the image quality of dual-energy CT and address these challenges with the introduction of TrueFidelity[5], its AI-powered image reconstruction engine for use with GE Healthcare's Gemstone Spectral Imaging (GSI) dual-energy CT. Utilizing a deep neural network, deep learning image reconstruction for GSI is trained to effectively differentiate and suppress noise in imaging data, to produce TrueFidelity images. Running on a reconstruction server, the image reconstruction engine can natively generate all image types to support routine and fast workflow, even in acute care settings.

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Leveraging Advanced Engineering and Deep Learning Image Reconstruction in Next Generation MI

The capabilities of high-performance digital PET technology combined with ultra-fast CT are propelling molecular imaging (MI) from its primary applications in oncology to the preferred imaging modality across many clinical areas. PET engineering innovations such as the use of digital detectors and larger field of view capabilities have allowed manufacturers to improve the modality's sensitivity. And with the advent of novel tracers, the suitability of PET/CT expands to studies within the areas of cardiology, neurology infection and inflammation, to name a few.

The technology advances in MI have contributed to improvements in both image quality and scan time, as well as reduced radiation exposure, and now the application of deep learning image reconstruction is taking MI to the next level. GE Healthcare's Discovery™ MI Gen 2 is the embodiment of where MI is headed. Its high sensitivity engineering helps reduce scan times and can reduce amounts of radiation, while its AI-powered reconstruction produces remarkable images. The system is adaptable to many different anatomies and situations and provides the opportunity for a significant time savings for radiologists.

Putting Vision into Practice

"It's time for radiologists to work smarter, not harder," concluded Makela. "GE Healthcare is focused on developing radiology innovations that can help radiologists improve patient outcomes, and to do that in a more efficient environment, with AI tools and technology to support a streamlined workflow and remarkable clinical images."

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Addressing the challenges to patient care using more automated workflows and AI-powered imaging will allow radiologists to provide more precise and personalized care. AI tools in radiology are continually being developed that will supplement the radiologist's expertise and enable them to be more involved in clinical information flow and patient care.

To find out more about GE Healthcare's Intelligently Efficient innovations, visit our virtual GE Healthcare Experience, where you can explore broadcasts, webinars, and our product offerings.

* Not yet CE marked for 1.5T. Not available for sale in all regions.

1 https://doi.org/10.1016/j.acra.2019.12.029.

2 IMV 2018 MR Market Outlook report.

3 Andre et al J Am Coll Radiol 2015;12:689-695.

4 https://www.researchgate.net/publication/317152003_Dual-Energy_CT_New_Horizon_in_Medical_Imaging.

5 TrueFidelity for GSI is 510(k) pending, not commercially available in US.

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