

Bio:

Dr. Kenneth L. Weiss, MD is the Founder and CEO of Automated Brain Spine Iterative Scan Technologies, ABSIST LLC and its ImagiCenter® venture, “personalized medicine reimaged”®. Harvard, Michigan, Stanford and Ohio State University trained, he is a National Merit and John Harvard Scholar; world-renowned academic neuroradiologist, MRI expert and visionary innovator; with scores of peer-reviewed papers, international presentations, US Patents, Copyrights, and Trademarks.

In the last seven years, Dr. Weiss has been issued five US patents describing novel methods used to auto-prescribe, analyze, reconstruct, label, localize, display, and guide multimodality medical imaging and intervention. Dr. Weiss is widely recognized for his intellectual property involving automated spine numbering and prescriptions, which is now commercially available.

A diplomat of the American Board of Radiology (ABR), Dr. Weiss maintains ABR certification of added qualifications (CAQ) in neuroradiology. Dr. Weiss maintains an academic and clinical appointment as Professor of Radiology at the University of Miami Miller School of Medicine.

Dr. Weiss is passionate about teaching the next generation of radiologists and improving healthcare worldwide by providing advanced disruptive imaging technologies that enable faster and more accurate personalized imaging; reducing time to diagnosis, time to treatment and healthcare costs.

Hello and Welcome Ken.

Before we dive into your technology – tell me, do people ever ask you, what does a neuroradiologist do?

Jurgen, thank you for the kind introduction and opportunity to share my world, technologic innovations and vision with your Podcast audience.

Sometimes people ask, “so ... are you a brain doctor do you read films or make the images?” The answer is yes to all.

A day in the life of a neuroradiologist begins in the reading room. A dark sound proofed room with walls covered by multiple high-resolution computer display screens and a floor littered with CPU's, cough drop wrappers and reference books. You shimmy your ergonomic chair up to your read-out station and grab hold of your gaming mouse. A few clicks on the keyboard and you're into the PACS or Picture Archiving & Communication System. The PACS is not your friend. It keeps statistics on everything you are doing from how long it takes you to click open a patient's imaging study and read it, to how many cases you read in a day or how long you have stared at a

particular image. I won't get into lunch or bathroom breaks here but you get the picture, time is everything.

Onto the patient list. The neuro reading room patient list will only contain studies involving the brain, head & neck or spine. Neuroradiologists specialize in the neuro axis. On any given day, in a busy teaching hospital there will be several hundred neuro cases that need to be interpreted. A neuroradiologist may be responsible for some 50 -100 CTs and MRI per day. At the high end, that's reading one case every 5 minutes. Unfortunately, as research bears out, the faster you read - the more mistakes you make and the poorer your patient's outcome. The patient list is long, scrolling and scrolling won't get you to the end of it. The emergency room and outpatient centers keep adding cases. There is no beginning, middle or end to this job.

The neuroradiologist's task is to interpret the images and determine not only the cause of the patient's current symptoms but also what may be lurking in the shadows that could cause future grief, such as an incidental lung nodule. We also suggest other imaging studies or specific images to obtain in order to firm up a diagnosis. We track the progress of a disease state by comparing today's images to the patient's prior images. There can be over 1000 images in a single MRI study and that study often needs to be compared to several previous exams. And you, the neuroradiologist have just minutes to view literally thousands of such images, dictate all of the findings, conclude with a diagnosis or likely differential and click on the next case.

But sometimes you open a case and time stops. Your brain doesn't fully compute what your eyes are seeing, your fingertips tingle as you reach for the landline phone and frantically call the referring physician to get the patient to surgery immediately. So while you're saving your patient, what is the PACS doing? It is recording just how slow you are to click onto the next study. There are no snaps for you. According to your productivity statistics, you could have just as easily been talking to your broker. This is about the time in my day I start thinking about my childhood cartoon hero, Mr. Wizard the Lizard. He would grant Tooter the Turtle a magical chance to be anything he wished. Then Tooter would get over his head and callout, "Help, Mr. Wizard!" Mr. Wizard would rescue him with the incantation, "Drizzle, drizzle, drizzle, drome; time for zis one to come home." To my chagrin, no Mr. Wizard exists -so I had to invent ways to decrease the amount of time it takes to accurately interpret Neuro studies. While anyone can read films fast- being accurate as well is the critical challenge.

I understand that your innovations are directed predominantly to MRI and CT scans. Can you provide an overview of your technology and its impetus?

While my inventions are predominantly directed towards MRI and CT scans, they may be applied more broadly across the spectrum of diagnostic imaging to include digital radiography, ultrasound, nuclear medicine, particularly positron emission tomography PET scans, and DEXA

scans.

In regards to computer tomography, I have developed the hybrid convolution kernel, wherein $1 + 1 = 1$. This technology combines two or more CT images in such a fashion as to optimize spatial resolution versus noise across all tissues, thereby significantly reducing the number of images to be stored, transmitted, and reviewed. Why look at multiple images, each optimized to display certain tissues, when a single image can be optimized to display everything? Incorporated into an iterative reconstruction algorithm, the hybrid convolution kernel can both reduce radiation exposure and facilitate interpretation.

When I started my radiology career in the early 80s, MR had yet to reach the clinical arena and CT scans were quite slow and of relatively low resolution. Back then, an entire ½ hour CT exam covering a particular body part could typically be captured on 1 or 2 sheets of film. In contradistinction, with today's ultrafast multi-detector dual energy CT technology, literally thousands of high resolution multiplanar, multicontrast images from head to toe can be generated in just minutes. The hybrid convolution kernel ameliorates such volume overload; its creation in part following the adage, dating back to Plato's Republic, "necessity is the mother of invention".

However, as a serial inventor that simply can't stop, there is undoubtedly more to the story. At risk of mixing metaphors, it is perhaps more accurate to say that, "necessity fertilized by incessant frustration and incubated with a touch of ADD as my wife never fails to point out, continues to bear fruitful and the occasional, not-so-fruitful innovation."

In regards to MRI innovation, which is the major thrust of my work, I have developed and continue to refine the ImagiCenter® and underlying Imagiscan® technology which screens for anatomic variance and pathology from head to tail in just 90 seconds and iteratively targets further imaging or therapy while the patient is still in the scanner. The concept is to seamlessly integrate at the point of care, intelligent next generation MRI and image-guided therapy. Through an innovative coupling of the most advanced imaging, artificial intelligence and proprietary technology with the highest level of professional interpretation, oversight and concierge level service, the ImagiCenter® will deliver an unparalleled personalized imaging experience; ultra-fast accurate and responsive to both patient and clinician.

In order to place this in context, could you discuss MRI's role in healthcare today, highlighting its current shortcomings and the areas in which your Imagiscan® technology would improve the outcome and the experience for the patient, the radiologist, and the clinician.

HealthCare is truly a mess; costly, inefficient, imprecise, impersonal, and frustratingly slow, often requiring the infirmed to navigate a maze of doctors, diagnostic centers, and insurance companies, each step eating up precious time and money. Imagine instead being able to be

diagnosed correctly and treated on the spot, even for complex conditions. The ImagiCenter's integrated multi-patented imaging technologies will turn this dream into a reality; cost-effective, ultrafast, accurate, and personalized.

The ImagiCenter® vision is to seamlessly integrate at the point-of-care, next generation diagnostic imaging & image guided-therapy. What conventionally may have taken up to 3 hrs and required 2 or more separate uncomfortably long imaging sessions, can now be done in 30 minutes or less. Not only fast, accurate, and personalized; the MR ImagiScan® is safe and does not expose the patient to potentially harmful x-rays. In but 90 sec, the ImagiScan® provides its initial color-encoded, fat-water-separated, auto-numbered holistic 3D screen from head to tail.

Accurate spine numbering is achieved even in the setting of anatomic variance. Our automated technology not only saves the radiologist time and consternation, it more importantly mitigates against the all too common occurrence of wrong level spinal surgery.

Rather than simply examining an anatomic region or regions based on your doctor's best guess as to where pathology may lie, the ImagiScan® iteratively targets its scanning sequences based on real-time image analysis in conjunction with the clinical exam. Let's say you develop lower extremity weakness. Your primary care physician or neurologist to which you might be referred likely knows that MRI is the diagnostic imaging test of choice, but where to look – the brain, spinal cord, lumbar spine or nerves roots? The ImagiScan® eliminates the guess work, honing in on the problem in minutes rather than potentially taking days or weeks with additional appointments or callbacks for further imaging and consultation.

Ken - Sounds like quite a time savings. Now we spoke specifically about Imagiscan® technology's neurologic applications – what about other areas of the body – is the technology applicable beyond the brain and spine?

Yes... While initially focused on the neuro-axis, our multi-patented Automated Brain Spine Iterative Scan Technologies may be applied throughout the body. For example, if a brain lesion suspicious for metastatic disease is detected, intravenous contrast may be administered and the entire body iteratively screened for a possible primary or additional metastases. If a suitable target is identified, an image-guided biopsy could then be performed within or outside the magnet, the latter using already acquired volumetric data sets for Stealth navigation.

If analysis suggests an acute stroke, additional sequencing to include MR angiography of the head and neck would be iteratively prescribed to confirm, further characterize, and establish the cause of the patient's infarction. If indicated, intravenous thrombolysis could be started and its efficacy monitored while the patient is still within the scanner. Should intravenous

therapy prove unsuccessful, intra-arterial thrombolysis or clot retrieval might then be performed with the iterative MRAs serving as a roadmap.

Although ImagiScan's innovative technology saves minutes to hours in total imaging time, these savings may be lost to rounding error in an inefficient multi-week health-care process. By seamlessly integrating the ImagiScan® into point-of-care workflow, the ImagiCenter® will enable exponential time & cost savings across the entire process, reducing time to accurate diagnosis and effective treatment from days or weeks to just 1hr!

Everyone knows that time is money. But when it comes to imaging and healthcare, time is much, much, more. Not only do faster scans reduce diagnostic time, they also improve diagnostic accuracy by reducing patient motion artifact. Reducing time to accurate diagnosis & effective treatment, in turn significantly reduces mortality and morbidity. For example, if you or your loved one suffers a new stroke, time truly equals brain, every second matters. To be effective in the setting of acute ischemic stroke, IV therapy must be instituted within 4 1/2 hrs, the earlier the better.

I want to go back to something you mentioned earlier - you said that the initial holistic 3D screen is color-encoded, fat-water-separated, and auto-numbered; you also mentioned reducing the risk of wrong level spinal surgery in anatomic variances – presumably this relates to the auto-numbering. But could you go through the significance of each of these attributes: color-encoding, fat-water separation, auto-numbering.

The goal here is to provide a multi-parametric volumetric screen that can be rapidly acquired, assessed and accurately labeled. To do so, we utilize fast 3D Dixon sequencing which generates four types of contrast in a single acquisition. Rather than having to view the out-of phase, in-phase, fat and water images separately - each providing important information, we combine them with our novel color-encoding scheme to facilitate interpretation.

Using multi-channel phase array technology we acquire contiguous or overlapping sagittal volumes providing full coverage from the head to coccyx in three stations, each which can be acquired in a breath-hold. With this coverage the computer can accurately identify and label all spinal structures from top down to ensure appropriate numbering. Since the number of presacral vertebrae and ribs can vary, our technology ensures accurate labeling of all vertebrae even in the presence of anatomic variance.

When can we expect to see your technology in clinical practice and the first ImagiCenter®?

ET Counsel, Podcast #39 Transcript
Dr. Kenneth Weiss, MD - ImagiCenter®
www.ImagiCenter.net
<http://www.etcounsel.com/taking-medical-scanning-technology-to-the-next-level/>

As Siemens HealthCare has already taken a non-exclusive license to a subset of our intellectual property related to auto-spine labeling and prescriptions, some of our technology is already commercially available and in clinical use across the globe. We plan to further license our multi-patented technologies so as to achieve greater market penetrance and improve diagnostic imaging and healthcare more broadly worldwide.

The ImagiCenter® is actively seeking to site its FDA-approved next-gen 128 channel 3T Siemens Skyra MRI system. In addition to our IP & professional expertise, ABSIST LLC will provide the Proof of Concept – beta ImagiCenter® over \$3 million in MRI equipment and related service contracts. What we are looking for now is the optimal β ImagiCenter® clinical partner, possibly a large radiology practice, neurology practice or NeuroScience Institute. Later this year & beyond, we will be seeking satellite partners and venture capital to help us ramp up.

Real-time expertise to include image analysis, iterative scan prescriptions, and interpretations will reside on-site for our Proof of Concept center slated for the second half 2016. For our subsequent satellite sites, real-time expertise will be cloud based. The ImagiCenter® will employ machine learning in its beta-site and across the entire enterprise. Along with our steadily increasingly patent portfolio, this proprietary knowledge-base will strengthen the competitive advantage of our disruptive technologies. Over time, AI will play an increasing role and enable more rapid expansion of the Enterprise. Given the importance of cutting edge AI technology, we seek to partner with an industry leader in this burgeoning field

Where do you see the ImagiCenter® and your technology 5 years from now?

Exponential advances in AI as highlighted by several of your recent guests, should dramatically amplify our next-gen MRI technology. With the right partners, in five years the ImagiScan® will be the industry standard and the ImagiCenter® should achieve a market cap in excess of \$1Billion. Market forces, albeit somewhat muted in today's inefficient and ineffective multi-trillion dollar healthcare industry, will drive adoption of this disruptive technology.

The ImagiCenter's seamless integration of our proprietary imaging technologies promises to markedly reduce the time to accurate diagnosis and effective treatment with associated cost savings -a win for all. More than just a lucrative venture, the ImagiCenter® could spell the difference between full recovery & permanent disability, life & death.

It is my hope that there will be visionaries in your listening audience that will want to partner with the ImagiCenter® and help bring our innovative technology to their community and across the globe.

Please check out [ImagiCenter.net](http://www.ImagiCenter.net) for more information.