visions

MAGAZINE FOR UK HEALTH PROFESSIONALS
UK Edition // No. 4 // August 2021

Can You Spot The Anomaly?

Canon

The quality and accuracy of an image can be the difference between spotting the anomaly and missing it. With a century's experience in imaging excellence, Canon are committed to producing the best image quality. Our entire portfolio is dedicated to products that generate exceptional images, including medical equipment.

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The VISIONS magazine covers Canon Medical across the UK's regions and, as such, reflects products, technologies and services for this particular area. The mentioned products may not be available in other geographic regions. Please consult your Canon Medical representative sales office in case of any questions.

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// EDITORIAL

Welcome to VISIONS UK Summer 2021
Warmer days and expanding lockdown liberties are hopefully bringing a sense of optimism to you all alongside a renewed sense of moving through the global pandemic. We are still in awe of your resilience under pressure and continue to stand by your side to keep your imaging systems running smoothly.

It is this sense of partnership, underpinned by our continued focus on innovation here at Canon Medical, that will help to find the answers to some of the greatest challenges facing healthcare today. Nothing can be solved by working in silos, we need to all work together.

Sharing and expanding knowledge for the benefit of all is a theme to this issue. We are excited to announce our newly refreshed Medical Imaging Academy website designed to deliver an interactive mix of accredited CPD training, education and problem-solving content to customers and the wider industry. As we slowly return to face-to-face training and applications support, we will also continue to offer quick and instant access to videos, how-to guides and webinars.

Examples of how we are serving the imaging community abound, as usual, in VISIONS UK as NHS and independent hospitals share their experiences of how new imaging systems boost efficiency and improve patient care.
We also feature our continuing partnership with Manchester United Football Club. It explains how we work together in not only supporting the sports health and wellbeing of football players, but also how important research is, in collaboration with NHS clinicians and Universities, to help gain new scientific insights that may eventually cascade into mainstream healthcare and help others live more active lives.

And it is not just our long pedigree in exceptional imaging quality that powers our passion for patient care, we are also conscious of the health of the planet for future generations. We hope that you'll be inspired by the launch of our Green Guide for UK Diagnostic Imaging to steer your department towards greener thinking in support of the NHS' net zero carbon targets and wider climate change initiatives.

Assuring you of our continued commitment,

MARK HITCHMAN
Managing Director
Canon Medical Systems Ltd

// CONTENTS

10
Gaming takes Medical Imaging to the Next Level
COMPUTED TOMOGRAPHY

14
Manchester United Post Match Analysis
SPORTS SCIENCE

22
Unlock Knowledge, Anytime, Anywhere
MEDICAL IMAGING ACADEMY

26
C-Armed and Ready
X-RAY

30
A Green Guide for UK Diagnostic Imaging
CSR REPORT

46
CT: The Exceptional Past, the Phenomenal Present and the Exciting Future
COMPUTED TOMOGRAPHY

CMSUK Fundraising Cyclist Extraordinaire

As part of a huge fundraising effort to raise awareness and £7500 for the installation of solar panels into a medical facility in rural Uganda (working with partner CO2balance), Andrew Spanswick, Regional Service Manger at Canon Medical Systems UK, contributed to this 2021 project by cycling in the Chase the Sun event this summer. Burning the rubber from Minster to Burnham-On-Sea, East to West, Andrew completed a 205- mile trip in just under 16 hours. Fellow colleagues joined for parts of the route, in an amazing union of support. Raising £1430, Andrew's contribution to the company fundraiser was no mean feat, alongside the company virtual pub quiz, raffles and more. Watch this space for fundraising project Solar Panels 2.0.

Andrew Spanswick finishes fundraising cycle in style

Scan here to find out more

First Canon Medical AI-Assisted CT Scanner in Northern Ireland

The first AI-assisted CT scanner in Northern Ireland has been ordered by Causeway Hospital in Coleraine, County Londonderry, part of Northern Health and Social Care Trust. The new scanner will strengthen radiology services and improve diagnostic waiting times for the local population, at the same time as having a net-zero carbon footprint to support health sustainability targets.

The Aquilion Prime SP CT from Canon Medical Systems UK will be situated in the main radiology department to support its Emergency Department imaging requirements and scheduled inpatient procedures. It is powered by an Advanced intelligent Clear-IQ Engine (AiCE) and is the world's first CT scanner using Deep-Learning reconstruction. It produces exceptionally detailed imaging for clinical interpretation at the lowest possible dose for patients.

The CT scanner will be delivered with a net-zero carbon footprint due to the robust carbon offset initiative run by Canon Medical UK. This will greatly assist the Trust's sustainability reporting for the system as all CO2 from manufacture, shipping / delivery and energy consumption for the lifetime of the equipment has already been offset to a high-impact carbon reduction project.

"We are delighted to strengthen and renew our long-standing partnership with Canon Medical. The new Aquilion Prime SP CT will be our second CT scanner within Causeway Hospital and will greatly benefit the local patient population around the Causeway Coast giving greater access to CT imaging capacity to improve diagnostic waiting times," states Rachel Brown, Trust Lead CT Radiographer at Northern Health and Social Care Trust.

The first Canon Medical AI-assisted CT scanner in Northern Ireland has been ordered by Causeway Hospital in Coleraine, County Londonderry, part of Northern Health and Social Care Trust.

A Perfect Picture for Obs and Gynae Ultrasound Patients

Microvascular imaging and matrix probe innovations enhance detail and resolution for better quality diagnostic ultrasound care in the North East

Obstetrics and Gynaecology patients at The James Cook University Hospital in Middlesbrough and Friarage Hospital in Northallerton are benefitting from improved ultrasound imaging and fewer invasive procedures due to the arrival of seven new ultrasound systems.

The Aplio i700 ultrasound systems from Canon Medical Systems update the imaging capabilities in Women's Health at South Tees Hospitals NHS Foundation Trust. The Trust will now be able to deliver Superb Microvascular Imaging (SMI), a colour Doppler technology that can visualise low-velocity microvascular flow in foetus and placenta, and matrix wide-band probe technology that offers better resolution in patients with higher BMI. The exceptional image quality will help give more confidence to clinical interpretation, meaning fewer patient image recalls and fewer invasive, internal probe examinations.

"First-time image success is better for our expectant mothers or concerned gynaecology patients," states Kendra Exley, Lead Sonographer at The James Cook University Hospital. "The SMI innovation on the Aplio i700 ultrasound systems means that we get a much clearer view of small vessels of the fetus giving confidence in what we are seeing. The matrix probes are also better for ladies with higher BMI as they can provide improved image penetration through abdominal tissue and avoid the need for uncomfortable internal transducers."

She continues, "We have a great relationship with Canon Medical and have worked with them for over 25 years. Image quality, reliability, value for money and the after-sales care and applications support are just a few of the many reasons we keep coming back."

"Delivering accurate and high-quality patient services in Obstetrics and Gynaecology is essential. So, too, is the selection of diagnostic ultrasound imaging tools that ensure the best possible image quality for making clinical decisions and providing comfortable examinations to patients. We look forward to continuing our close partnership working with South Tees Hospitals NHS Foundation Trust," states Rosie Beattie, Ultrasound Regional Manager at Canon Medical Systems UK. //

Seven Aplio i700 ultrasound systems from Canon Medical Systems update the imaging capabilities in Women's Health at South Tees Hospitals NHS Foundation Trust

Pictured:
Nicola Hunt, Trainee Midwife Sonographer; Danielle Vout, Sonographer; Kendra Exley, Lead Sonographer; Sean Gibson, Ultrasound Applications Specialist at Canon Medical Systems UK; and Penny Hepplestone, Sonographer at The James Cook University Hospital in Middlesbrough.

Gaming takes Medical Imaging to the Next Level

Superb CT image quality, at speed and at ultra-low dose expands clinical possibilities and improves positive patient outcomes

The insatiable demand for speed and high-quality graphics in the gaming industry has brought with it affordable, high-end computing power that is now being utilised in AI-assisted CT scanners in UK hospitals. For the first time high quality, ultra-low dose CT imaging at speeds fast enough to be used in real time on every patient has now become a reality.

Leighton Hospital, part of Mid Cheshire Hospitals NHS Foundation Trust, was one of the first hospitals in the UK to install a new CT scanner with a 'super computer' inside, and is now one of the first to receive the version two upgrade of the Advanced intelligent Clear-IQ Engine (AiCE). This maintains the incredibly low doses achieved previously, but further enhances the true-to-life image quality of patient scan images to deliver earlier diagnosis and treatment planning to improve patient health outcomes.

"AI-assisted CT has made the impossible, possible. Before, to produce high quality images at super low doses was not possible in useable real world time frames. Now, the Deep Learning Reconstruction algorithms on the Canon Medical range of Aquilion CT scanners has driven down dose to ultra-low levels – reductions of up to 92% below UK National Diagnostic Reference Levels – at the same time as delivering high-quality images never seen before. This is vital in an era where CT demand has grown exponentially as a frontline triage tool for earlier and more detailed diagnosis," states Dr Richard Hawkins, Consultant Radiologist at Mid Cheshire Hospitals NHS Foundation Trust.

"Dose is such an important factor in medical technology innovation. Take for example, a young patient with kidney stones - they potentially face a lifetime of CT scans and this has a cumulative radiation dose risk over time. Therefore, the sizeable reduction in the dose administered to patients at each scan, whilst still gaining excellent images for clinical decision making, is revolutionising medicine," he continues. "It is the ultra-low dose and clear quality images at high speed from AI-assisted CT that will underpin and drive forward CT, including recent calls for proactive CT screening for lung cancer. Identifying tiny cancers before they grow to an inoperable size will save lives and to do this with high quality CT equivalent to the dose of just a few chest X-rays is now possible. Furthermore, ultra-low dose CT Pulmonary Angiograms (CTPA) are now standard in pregnant mothers and more recently COVID-19 patients, many of which at this stage are young or middle aged. Low dose is essential for long-term health beyond the condition for which they are being treated."

"AI-assisted CT has made the impossible, possible. Before, to produce high quality images at super low doses was not possible in useable real world time frames."

Dr Richard Hawkins, Consultant Radiologist

"The computing power of Aquilion CT scanners with AiCE has been made possible by a partnership with NVIDIA, the company behind computer graphics processing units that are powering consumer gaming and driverless cars. This has helped to provide the high-performance computing power needed for the CT reconstruction technology inside our CT scanners, making AI-assisted CT affordable and accessible to all hospitals," states Mark Thomas, CT Modality Manager at Canon Medical Systems UK.

Leighton Hospital has AiCE on an Aquilion ONE / GENESIS Edition and Aquilion Prime SP CT, both installed by Canon Medical over the last eighteen months. //

Raft of 10/10 Customer Satisfaction Scores for Canon Medical UK

Healthcare customers give big thumbs up to responsive and proactive service team keeping UK imaging systems in working order

Meeting the imaging equipment service demands of NHS and independent healthcare institutions, and being well prepared for the Brexit transition period has served Canon Medical Systems UK well with a healthy start to 2021 in terms of customer feedback. The first half of the calendar year has delivered more than usual 10/10 customer satisfaction scores underpinning the company's promise of standing by the side of its customers in the provision and support of diagnostic imaging systems.

"Installing new systems is one part of the process to overhaul health ecosystems to be fit for the future in a climate of COVID-19 backlogs and growing patient capacity demands. But ensuring staff are well trained, supporting breakdowns, and resolving technical issues swiftly are also imperative to ensure the NHS and independent healthcare providers are on point to serve their patients well," states Paul Parsons, Director of Service and Customer Support at Canon Medical UK. "We've been through the whirlwinds of Covid and Brexit but feel in great shape to continue meeting the needs of our customers."

In testimony to its detailed Brexit scenario planning, Canon Medical delivered 100% of all new customer orders on time and in full since the end of the transition period. From MRI and CT to X-ray and Ultrasound, there has been no disruption to the supply chain supporting NHS and independent healthcare providers. UK spare parts deployment and stock planning have also been unaffected.

Meeting the imaging equipment service demands of NHS and independent healthcare institutions and being well prepared for the Brexit transition period has served Canon Medical UK well with a healthy start to 2021 in terms of customer feedback.

Emma Liddle, Operations Manager, Mobile Diagnostics at Ramsay Health Care UK states, "Recent experiences of customer aftercare from Canon Medical have been hugely responsive and delivered a positive impact to ensure continued service provision on our mobile scanning units. The service team and engineers go above and beyond the call of duty providing in-depth technical experience and support for our CT scanners."

NHS hospital customers also score Canon Medical UK highly. A CT/MRI Superintendent Radiographer in the South who needed support in early 2021 states, "We are very happy with the technical support Canon Medical provides – it resolves problems in a timely manner and always identify the correct replacement part swiftly to get us up and running as soon as possible. Its proactive thinking helps minimise delays to our patients."

"We are very happy with the technical support Canon Medical provides — it resolves problems in a timely manner and always identify the correct replacement."

Another CT radiographer based at a Northern hospital Trust added, "Canon Medical provide prompt technical support to keep our scanners fully operational and resolve any problems we encounter with a high level of communication and skill. This helps minimise delays to our patients and keeps our imaging services running. I had no hesitation in scoring them 10/10 recently." //

Luke Shaw in action at Old Trafford Stadium

Manchester United Post Match Analysis

Dr Steve McNally, Head of Football Medicine & Science, Manchester United Football Club expands on how imaging research into human health complements the ongoing health and wellbeing work for football players.

Why elite sports are looking forward to a bounce back of imaging surveillance and research work following Covid-19

We have all had to live life with limitations to reduce the spread of coronavirus. The sporting world has not been immune to this. Some sporting activities were permitted during the various stages of UK restrictions as the benefits of physical activity on people's mental wellbeing were well recognised. However, the ability to exercise, partake in group games and even watch live sporting events together has had an on/off approach in tune with the challenges of lockdown regulations.

Professional football has not been without its own constraints. Government exemptions for professional athletes to return to training and compete in some domestic events with no 'spectators', allowed our first team players to return to training grounds in a 'relevant persons' bubble, but it was without the usual privileges and normal routines. The nature of our sports medicine work at the Manchester United Football Club Medical Imaging Centre using the very latest generation MRI, CT and ultrasound systems from Canon Medical also shifted from proactive health screening, surveillance and research to purely reactive work. This meant we could only use the systems to make clinical decisions on injuries or existing conditions.

This pause on important knowledge development and sports science research projects has created its own backlogs on proactive surveillance and created black holes in our health data collection on emerging young athletes. It is certainly not the same as delays to NHS cancer care due to covid-19 that may be life and death situations for people, but there will be impacts on the speed and amount of knowledge we can cascade to wider patient populations from our research collaborations with NHS clinicians and UK universities.

Our dedicated medical imaging systems at the Carrington Training Complex in Old Trafford, provided by our official medical systems partner Canon Medical Systems UK, have been in place for over 8 years. It gives us an on-site facility to undertake quick examination of all our players, from first teams to junior leagues, without the publicity that can accompany player transfers to nearby hospitals. The range of imaging usually includes examination of injuries sustained during games or training, procedures to pre-empt and prevent future injuries and adjust training schedules accordingly, plus mandatory and proactive health surveillance in the areas of cardiac and MSK.

Cardiac profiling using Echo to avoid Sudden Cardiac Arrests and widen knowledge

Our cardiac profiling work is a mandatory requirement every two years for anyone undertaking vigorous training and competitive matches. This is governed by FIFA and aims to identify anomalies that can lead to potentially fatal arrythmias such as ventricular tachyarrhythmias and, in particular, ventricular fibrillation that can be the primary cause of Sudden Cardiac Arrests and Sudden Cardiac Death. Whilst relatively rare, the conditions are often asymptomatic and can be triggered by extreme physical exertion. We were grateful that assessments were undertaken as normal in July / August 2020 during a lift in Covid-19 lockdown restrictions and our cardiologists were able to do pre-season checks as normal. This involved our athletes undergoing a full structural and functional resting (baseline) ultrasound echocardiogram prior to exercise stress testing if indicated.

At the same time, we work with a number of luminaries to expand global knowledge of MSK and cardiology. Recently, a clinical study[1] of 42 of our elite adolescent male football players from the Academy was undertaken by the National Institute for Health Research (NIHR) Biomedical Research Centre at the University Hospitals Bristol NHS Foundation Trust and the University of Bristol. The participants completed simultaneous cardiopulmonary exercise testing (CPET) and exercise echocardiography measurement of Left Ventricular (LV) myocardial deformation by 2D strain imaging using a Canon Medical echocardiography ultrasound system. LV longitudinal and circumferential 2D strain and strain rates were analysed at each stage of incremental exercise and additional exercise of LV myocardial deformation and its relation to metabolic exercise parameters were evaluated at each exercise stage and in recovery.

The study showed that there is a specific response of longitudinal and circumferential myocardial performance to exercise stress; this provides knowledge that in the future might help differentiate between adaptive and maladaptive myocardial function in paediatric athletes and those with myocardial disease. It also provided the first initial reference data for 2D strain and strain rate values of the LV during exercise in the healthy adolescent elite athlete population. Gaining new science insights will help understanding of sporting cardiac matters and eventually cascade into mainstream cardiac paediatrics or wider cardiology to provide preventative protocols that help to save lives or give people greater opportunities to live more active lives beyond elite sports.

References
[1] *'Characterisation of LV myocardial exercise function by 2D strain deformation imaging in elite adolescent footballers' G.E. Pieles et al. European Journal of Applied Physiology, Oct 2020*

Sports science has not escaped Covid imaging backlogs

On the flipside, some of our other proactive imaging programmes have had to stop completely during Covid-times. The recovery of this is very important to us as it can leave black holes in our data on emerging or established athletes. For example, our performance imaging programmes now have two cohorts of U18 and U17 professional players without information which is a huge disappointment following a five-year focus on muscle scanning and cartilage mapping. We use MRI spectroscopy to undertake muscle talent scans to code muscle fibre type. This tells us who can 'twitch' calf muscles quickly or slowly to identify performance characteristics. This information is vital to understand the potential of individual sportspeople and manage team performance over the long-term.

Aaron Wan Bissaka, Marcus Rashford and Timothy Fosu-Mensah training at the Carrington Training Complex

Another area of research halted during the pandemic crisis is our neurological data gathering via diagnostic imaging on the long-term effects of head impacts especially Chronic Traumatic Encephalopathy (CTE) that can lead to dementia. This has been under the spotlight for many years in impact sports such as football, rugby and boxing. Early 2021 saw the introduction of a new substitution rule if a player suffers a head injury, even if all replacements have already been used during the game. Whilst welcomed to safeguard professional player health, there is so much more that we need to research to understand the structural and functional changes in the brain from impact in sports. Greater knowledge will help to introduce unified national protocols to protect the long-term health of elite and grassroots sportspeople.

Juan Mata, Odion Ighalo and Paul Pogba indoor training at the Carrington Training Complex

The horizon is much brighter due to the powers of science and medicine

Despite the delays we have all had to endure due to the pandemic, research in sports imaging will bounce back. The Covid-19 horizon is looking much brighter due to the innovations of vaccines and evolution of disease treatments. This shows us the key positive from all the virus pandemic disruption and grief – that when science, medicine and research push the boundaries of existing knowledge, innovation expands, knowledge is enhanced and lives can be saved. This is a strong message to all involved in medicine and science, and why we continually quest to undertake our sports imaging research work at Manchester United Football Club. //

Game play action from Bruno Fernandes at Old Trafford Stadium

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Even during these uncertain times, we're still operating as usual to support you and your teams.

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5 Stevenage Training & Distribution Centre
4 & 5 Eastman Way, Pin Green,
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Unlock Knowledge, Anytime, Anywhere

Welcome to the Medical Imaging Academy

When time is precious, knowledge is key. This is the philosophy behind the newly refreshed online Medical Imaging Academy by Canon Medical Systems UK, delivering a myriad of CPD accredited training, education and problem-solving content to customers and wider industry.

The Medical Imaging Academy (www.medicalimagingacademy.co.uk) is your complimentary online resource library with live and on-demand expert training, face-to-face courses and a hub of invaluable how-to guides for healthcare professionals.

The Medical Imaging Academy is designed to help save imaging professionals time, to achieve optimal performance of imaging equipment and to develop deep user knowledge, which in turn, all help to provide the highest standard of care to patients. This is more important than ever as we strive to return to near normal in healthcare, create meaningful efficiencies to beat imaging backlogs and prepare for new intakes of patients needing procedures in the diagnostic imaging pathway. //

Sign-up to the website today:
www.medicalimagingacademy.co.uk

Start your learning journey here

The Medical Imaging Academy is your complimentary online resource library with both live and on-demand expert training for imaging healthcare professionals.

Personal development through CPD Accredited learning

Live webinars and on-demand expert training

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Q&A sessions with guest speakers

Key benefits

Sign up for free! Become a member to gain access to a multitude of on-demand and live education delivered by experts

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One stop shop where you can select what education or training suits your needs anytime, anywhere

We haven't forgotten the importance of live education! You can sign up, online to Upcoming Education, offering live webinars, hands on and face-to-face training

Empowerment Through Education and Resources

Register to expand knowledge and boost efficiency

Registration and access to the Medical Imaging Academy is free and open to everyone in the medical imaging industry. Regular visitors can enjoy constantly evolving on-demand education videos, how-to guides, webinars and be the first to book online to specially designed, socially distanced training courses and hands-on practical workshops.

Start your journey today. Logon to **www.medicalimagingacademy.co.uk** and register for 24/7 access.

Medical Imaging Academy

How-To Guides

Refresh, review, revisit. We have developed visual step-by-step how-to guides designed to be refresher training for imaging professionals when you need it most.

Accessible at any time and filtered by modalities, visitors can watch the guides in full or skip to a specific section.

On-demand Education

Immediate and live, the on-demand education offered by the Medical Imaging Academy is designed to watch anytime, anywhere. This not only improves user confidence on a daily basis, but also ensures that the functionality of the systems is being maximised to ensure a sound return on radiology investment. At the same time, it helps you collect CPD points throughout your learning journey.

Upcoming Education

As we gently return to face-to-face training and workshops the Medical Imaging Academy is proud to offer both hands on education courses in the classroom as well as continuing live virtual webinars. The registration process is simple and all done online for your convenience so you can sign up to upcoming physical and virtual courses.

"The Medical Imaging Academy complements the support and advice delivered by our team of application and clinical specialists. It also offers the flexibility to refresh training knowledge, recap how to perform certain functions or introduce new skills at any time". Mark Hitchman, Managing Director at Canon Medical Systems UK.

Turn to page 60 for our educational calendar

Hear from our customers

Jane Marling,
Lead Sonographer,
West Suffolk
NHS Foundation Trust

"Our sonographers are all really enjoying the sessions. They find them easy to access, varied and really interesting — something for everyone. It has been such a tough time over the last months and to be able to access these webinars in the comfort of our own homes, at a time that suits us, has been great."

Pilgrim Hospital, Boston welcomes two 'three-in-one' Ultimax-i angiography, fluoroscopy and radiography systems from Canon Medical. Pictured (L to R): Kelly Keir, Deputy Sister; Cesar Herrera, Senior Radiographer; Andrew Mayes, Applications Specialist at Canon Medical Systems UK; Dr Emmanouil Blevrakis, Consultant Interventional Radiologist; Nigel Allen, Radiology Operations Manager; Pieter Oberholzer, Service Engineer at Canon Medical Systems.

C-Armed and Ready

Upgrading patient services and speeding up diagnosis with new Ultimax-i imaging technology

Two new Ultimax-i multi-purpose digital C-arms from Canon Medical are now operational at United Lincolnshire Hospitals NHS Trust located at Lincoln County Hospital and Pilgrim Hospital, Boston.

The two 'three-in-one' Ultimax-i angiography, fluoroscopy and radiography systems update 20-year old redundant systems to provide clinicians with modern imaging insights to perform patient procedures and deliver prompt diagnosis and treatments. For patients this means reduced waiting times and local appointments, removing the need to travel to other hospital locations outside their locality. This is especially beneficial to paediatric patients who can now remain in their region without the need to be transferred over long distances.

The 'three-in-one' Ultimax-i angiography, fluoroscopy and radiography systems from Canon Medical.

The Ultimax-i was a unanimous choice by our radiologists and radiographers to update our fluoroscopy services," states Nigel Allen, Radiology Operations Manager. "We have worked with Canon Medical for many years, who have proven to be responsive and deliver superb service. The first system at Pilgrim Hospital went live smoothly at the end of March 2020 and despite the arrival of the Coronavirus pandemic, our second system also achieved go-live on time shortly afterwards with building contractors, installation teams and applications training showing full commitment to ensure there were no delays in the installation process despite the pandemic challenges."

He continues, "The Ultimax-i provides a super balance of low dose and exceptional image quality which the radiologists are extremely satisfied with. It is very intuitive to use and its versatility gives us interventional resilience as a back-up to our interventional suite should we be at full capacity or undergoing maintenance."

"The Ulitimax-i manages gastrointestinal studies, interventional radiology and angiographic procedures via a multidirectional and interactive digital C-arm. This gives super flexibility, ultimate image quality and at low dose," states Billy Erwin, Account Manager at Canon Medical Systems UK. "It has been a great case of two-way teamwork at United Lincolnshire Hospitals NHS Trust to have the systems installed during a national emergency. We look forward to a continued partnership with the Trust and supporting the needs of the imaging team." //

Dr Emmanouil Blevrakis, Consultant Interventional Radiologist at Pilgrim Hospital, Boston performs an image guided procedure using the Ultimax-i system from Canon Medical.

A Green Guide for UK Diagnostic Imaging

How to start making progressive steps towards the NHS Carbon Zero targets

Balancing the health of the planet with the ongoing needs of patients

It is no exaggeration to say that humanity is facing an environmental crisis. Whilst UK healthcare has had to steer through testing times with the Covid-19 pandemic threatening to overwhelm NHS capacity, other storm clouds are gathering on the horizon.

The impact of climate change and destruction of the natural world is having a dramatic environmental consequence around the world.

- A rise in air pollution is linked to heart disease, stroke and lung cancer;
- Heatwaves put pressure on the elderly and vulnerable people with pre-existing cardiovascular conditions or exacerbated breathing issues needing hospitalisation;
- Poor air quality and aeroallergens drive up the numbers of fit and well people being diagnosed with asthma or other respiratory related illnesses;
- Cancer rates increase through ultraviolet radiation, air pollution and environmental toxins;
- The spread of new and as yet unknown global infectious diseases and pests is accelerated by changing weather conditions enabling faster reproduction and replication.

This year, 2021, offers an unprecedented opportunity for positive change in UK healthcare. Reviews and reflections as a result of the coronavirus crisis look to reshape the future of healthcare provision and diagnostics capacity, plus the NHS has set its ambition to be the world's first 'net zero' national health service.

Coming up in November 2021, the UK government will host the 26th UN Climate Change Conference of the Parties (COP26) in Glasgow. This meeting will aim to accelerate action towards the goals of the Paris Agreement and the UN Framework Convention on Climate Change. Its success will help move progress at pace to inspire climate action and safeguard the health of our global societies and our planet.

We must all work **#TogetherForOurPlanet.**

Why the environment needs to matter to UK imaging departments

Diagnostic imaging departments already operate with limited resources. Patient numbers grow every year with imaging demands exceeding imaging capacity, while workforces are stretched by unfilled posts or retirement rates. Although impetus for change is coming through national initiatives, this should also be balanced with avoiding future UK health explosions and pressures linked to the environment.

Climate change as a result of carbon emissions has been acknowledged at a national level and the NHS is aiming to be net zero by 2040.

What is net-carbon or a carbon footprint?

A carbon footprint is the total amount of greenhouse gas emissions caused by an individual or an organisation expressed as a carbon dioxide equivalent.

Carbon neutral or **net-zero carbon means** achieving zero carbon dioxide (CO2) emissions by eliminating the emissions or balancing removal often through carbon offsetting.

Five easy steps to a greener future that clinical departments can take now

As a leading supplier of diagnostic medical equipment to UK Radiology, it is Canon Medical's duty to balance the health of patient populations and providing the imaging tools that clinicians need now, with the need to look ahead and predict the long-term future factors of health.

This guide is written to provide advice and guidance to our diagnostic imaging community of radiographers, sonographers, radiologists, cardiologists, radiology service managers, imaging managers, as well as the health managers in procurement or sustainability roles. It is intended to provide practical steps that can be taken now to start working towards meeting the aims of the NHS' net carbon zero targets, at the same time as being aligned to wider digital health innovation transformation initiatives.

62% of carbon emission sources in the NHS are generated by 'medicines, medical equipment and other supply chain medicines'.

Step 1. Embrace imaging equipment innovation

Reduce departmental energy emissions at the same time as improving patient care

62% of carbon emission sources in the NHS are generated by 'medicines, medical equipment and other supply chain': medicines (20%), medical equipment (10%), non-medical equipment (8%) and other supply chain (24%) .

An easy hit for Radiology working towards decarbonising the NHS is a focus on the energy emissions from medical equipment that is used throughout the working day. This could include CT, MRI, ultrasound, interventional imaging systems and X-ray. Innovation in medical imaging is evolving at an astounding pace. MRI and CT scanners are frontline tools for patient diagnosis and patient triage and are well recognised for their versatility. The number of scans per year are set to rise.

- Evaluate models for energy consumption and carbon footprints at the same time as meeting clinical needs when the opportunity arises for new equipment selection.

- Official tender requests need to refresh, calling for imaging engine efficiency not requesting engine sizes in kw of CT scanners. Size does not matter. The larger the engine the greater the energy consumption. This does not correlate to better imaging results. Perhaps the question and selection criteria should be 'how efficient is your imaging engine'?

- Look for energy efficient innovation and features on medical equipment. Sustainability reporting on carbon emissions will be far lower if systems go into standby between patients, for example an 'EcoMode', or innovative features that have been designed to generate a system's own energy source such as CT gantry spin technologies.

- Embrace Artificial Intelligence (AI). Imaging AI is enabling greater image quality, faster and at a lower dose. This helps to deliver greater clinical confidence and better patient care with no additional energy draw. For example, Canon Medical's Advanced intelligent Clear-IQ Engine (AiCE) is a Deep Learning Reconstruction AI algorithm integrated into new CT scanners. It reduces overall energy emission per patient case and helps to remove the need for repeat scans.

- Select virtual equipment service whereby equipment engineers can make repair or diagnostic decisions remotely via IT infrastructure. This saves physical travel that has a carbon footprint associated with it, and also saves time on diagnosing an equipment breakdown, ordering a part and getting it fitted.

The Aquilion ONE Genesis CT scanner is a Gold Winner of the Innovation category of the international **Green Apple Awards**, an annual accolade to recognise, reward and promote environmental best practice around the world. Its small and light design needs less power compared to other models and can be installed in compact spaces avoiding costly renovations at hospitals.

A team working on water boreholes, to provide fresh and clean water for a community in Uganda, with one of Canon Medical UK's CSR partners, C02balance.

Step 2. Carbon conscious supply partners

An opportunity for green change via the NHS supply chain

By selecting supply partners with a carbon conscience helps reduce carbon footprint reporting and makes a positive difference to NHS sustainability reporting.

The 'Greener NHS' report highlighted two targets for the NHS to achieve net zero emissions: by 2040 (with interim 80% reduction by 2028-2032) for emissions under NHS direct control, and by 2045 (80% reduction by 2036-2039) including the wider NHS supply chain. By highlighting the supply chain as one of the greatest areas of opportunity for the first time rather than the traditional thinking of buildings, heating/lighting and vehicle fleets, it expanded the scope of potential for driving down emissions covering products procured from approximately 80,000 suppliers.

With NHS purchasing having the power to influence green change, the supply chain has an obligation to respond.

Look for external environmental accreditations

Sustainability accolades of NHS supply chain should always be underpinned by robust external, independent verifications. This could include the British Standards PAS2060 requirements, environmental management ISO14001 certification, auditing via partner status from the United Nations' Division for Sustainable Development Goals (DSDG), or ideally all of the above.

Canon Medical is one of the only UK medical equipment suppliers to be carbon neutral.

Every system it supplies comes with a **ZERO carbon footprint for the lifetime of its use inside the NHS.** This is because the entire carbon footprint of the system – from manufacture, shipping and logistics, through to the forecasted lifetime power consumption inside hospitals or clinics - has been taken into account and offset to a high impact project such as providing clean water bore holes or modern cooking stoves in developing countries.

Canon Medical is one of the only UK medical equipment suppliers to be carbon neutral

Canon Medical's latest carbon offset report , externally audited and verified to UN Gold Standard criteria, highlights the cumulative numbers since it became a 'net zero carbon' medical equipment supplier. It shows not just how carbon has been offset to advantage the health of the planet, but also how the wellbeing of less fortunate people in developing nations is benefited every time there is a new installation of medical imaging technology to assist UK NHS healthcare provision. This includes:

- 24 million litres of clean water provided from deep water bore hole projects;

- 13,600 tonnes of wood saved, and not deforested, from the clean stove project; and cleaner, healthier air for families to breath inside their homes via modern stoves that emit less smoke;

One of Canon Medical UK's CT Mobile Units, ready for action.

- Children are able to go to school as no longer required to help their families to walk miles to clean water wells far from their villages, or help collect firewood for old inefficient style stoves

- Females have been empowered in remote villages as they are no longer have to risk long walks in search of water or firewood.

- Overall, 11,000 people have benefitted from the carbon offset project providing them clean water and modern stoves to avoid illness.

Fifteen relocatable Canon Medical CT scanners, deployed by NHS England's COVID-19 recovery plan to help with patient imaging backlog and winter COVID-19 preparations, had **zero carbon tonnes of emission for the NHS to incorporate into its environmental reporting totals.** The 1,161.75 tonnes had already been offset by Canon Medical's robust carbon offset scheme which includes the CO2 emissions during manufacturer and the lifetime electrical running of the system once inside the hospital estate.

Step 3. Take imaging closer to the community

Fewer patient journeys to hospitals means lower carbon emissions

Moving patient care out of the acute setting and into the community is on the horizon as part of the revaluation of UK health systems magnified by the arrival of Coronavirus. This will provide better infection control in the new Covid-era, give greater convenience for people to have appointments closer to home and therefore drive down carbon emissions due to less travel.

With the speculated introduction of Community Diagnostic Hubs, the conversion or introduction of new building facilities or mobile / relocatable buildings will also need to have environmental infrastructure considerations as part of the wider NHS infrastructure.

Whilst all new hospitals will have a new Net Zero Carbon Hospital Standard from Spring 2021 as part of the Government's Health Infrastructure Plan, will this include guidelines towards mobile units or community hubs?

Initial considerations to think about when redesigning patient imaging in the community includes:

- The use of low carbon building materials in remodelling facilities for use as Community Diagnostic Hubs or selecting sustainably built mobile / relocatable imaging units. This could include FSC certified wood and other building materials that have low environmental impact;

- Placement of mobile imaging units near to high density communities and where public transport links are good such as supermarkets or shopping centres. This removes the need for single use cars, taxis and promotes shared transportation or walking that emits lower overall emissions.

1,161.75 tonnes have already been offset by Canon Medical's robust carbon offset scheme

Make use of imaging equipment providers' online training and education programmes

- Selection of specially designed and compact imaging equipment to minimise space and keep construction costs and needs low. For example, the Vantage Elan MRI requires an overall installation area 29% smaller than previous 1.5T MRI systems and does not require a separate computer room.

- Maximise the use of digital health infrastructure and innovative imaging applications to power remote radiology reporting, support the efficient exchange of diagnostic images to patient records, and for pre-emptive equipment maintenance / service.

Step 4. Encourage and reward green behaviours

Cultural change within imaging departments is easy to achieve

Broadening knowledge within NHS departments and creating a self-propelling cycle of cultural change towards environmental consciousness should become part of the norms of radiology.

Encouraging wider green behaviours through extended training and education and rewards through internal award schemes or CPD will have a self-propelling positive effect on UK Radiology.

- Make use of imaging equipment providers' online training and education programmes. Learn new imaging techniques and protocols than can reduce repeat diagnostic scans and drive down power consumption. Plus reduce carbon footprints from travel to 'traditional' study days or industry events and widens the reach of training benefits within a hospital department.

- Ensure that the creators of tenders and procurement professionals understand the energy efficiency of modern imaging equipment. For example, requesting efficiency metrics to evaluate competitor systems.

- Move towards new generation innovations and embrace AI. Modern technologies have been designed to be more energy and workflow efficient. Fewer repeat scans and lower dose are better for patients and better for the environment.

- Keep an eye on waste. Review if necessary, recycle and reuse strategies to eliminate waste in the department. This includes single use consumables, packaging on supplies and even the disposal strategies for old imaging equipment. Do you know how much gets recycled versus put into landfill?

A community of children just outside of their local school. These are just some of the children who can live healthier lives, with the C02balance collaboration projects.

Step 5. The benefits of standardised medical imaging equipment

Uniformity equals scale, speed and less waste

Speed of access to modern imaging equipment is needed to catch up on Covid19 related imaging backlogs and decrease patient waiting times that existed even before the pandemic. Reducing choice of all the variable elements of imaging equipment and standardising the systems for routine patient diagnostic needs would give wider and quicker access to UK patient populations.

To use a car analogy, you wait longer and pay more when selecting bespoke features. The same is true of imaging equipment.

"It is estimated that carbon footprints of medical equipment can be reduced by a third when produced to a standard criterion. It can also greatly speed up the manufacturing process giving hospitals and clinics much quicker access to much needed modern diagnostic imaging equipment. Sometimes there can be too many variables of bespoke imaging equipment available to the NHS. Meetings and steering groups to decide upon specifications and evaluate features can slow down the procurement process and then add time onto manufacture and set-up. Lean decision making often translates into lower cost, scale and lower carbon footprints." //

Mark Hitchman, Managing Director at Canon Medical Systems UK

It is estimated that carbon footprints of medical equipment can be reduced by a third when produced to a standard criterion

The NHS (National Health Service) logo at the Springfields Medical Centre in the centre of Warrington. Canon Medical UK support and work with the NHS throughout the United Kingdom and beyond.

Canon Medical Systems is the UK's only medical equipment provider to be a Carbon neutral business meeting all PAS2060 requirements by the British Standards Institute and monitored independently to Gold Standards for UN Global Goals.

As part of the UK diagnostic imaging supply chain, Canon Medical supports the NHS' aim to be net-zero carbon by 2040 and will guide its radiology customer community in playing its part to identify positive green change.

Canon's corporate philosophy is Kyosei — a Japanese word that means living and working together for the common good. This is a principle that is embraced by all Canon employees and shapes the mission and values. It embodies the company's goal of contributing to the prosperity of the world and the happiness of humanity. It means taking responsibility for the impact of our activities, respecting our customers, the communities and countries we operate within, as well as our natural environment.

With a 100-year pedigree, superior green credentials and a focus firmly on the future health of people and the planet, Canon Medical can advise and guide the UK Radiology community on how to start making progressive steps toward the NHS Carbon Zero targets. //

References

Recent clinical evidence is included for reference within this article.

[1] *Delivering a Net Zero National Health Service, October 2020*

[2] *Diagnostics: Recovery & Renewal – Report of the Independent Review of Diagnostic Services for NHS England, October 2020*

[3] *Delivering a Net Zero National Health Service, October 2020*

[4] *Canon Medical UK Carbon Offset Reports produced by CO2Balance.*

[5] *Canon Medical – https://global.medical.canon/products/magnetic-resonance/Vantage_Elan-Compact*

Support Dogs – Hero Hounds Transforming People's Lives

For almost 30 years, national charity Support Dogs has been transforming their lives of people with a range of serious medical conditions – through its extraordinary canine heroes. The charity trains assistance dogs for children with autism and adults with epilepsy and disability, enabling them to lead safer, more independent lives. It specialises in three programmes:

- Autism assistance dogs for children with autism. The dogs are trained to provide safety for the child and reduce stress in social environments.

- Seizure alert dogs for adults with epilepsy. The dogs are trained to provide a 100% reliable, up to an hour in advance warning of an epileptic seizure, enabling the client to find safety and be in control over their seizure.

- Disability assistance dogs for people with physical disabilities and medical conditions such as MS or cerebral palsy.

The dog is trained to act effectively as an individual carer, providing 24/7 support and helping with a huge range of daily tasks tailored to the individuals needs such as fetching medication opening and closing doors, raising the alarm and assisting with dressing and undressing.

Support Dogs currently helps families across the UK and saves the NHS an estimated £19 million a year.

Support Dogs is unusual in that 1 in 4 of its dogs are either rescue dogs or were unwanted pets, and it prides itself on being the charity that gives unwanted dogs a second chance.

Whatever the condition and for whatever programme, its amazing dogs are trained to be consistent and reliable in the care they give and are truly life-transforming for their owners.

The pandemic throughout 2020 and 2021 has had a huge impact on many charities, including Support Dogs. There has been a disruption in training for many of the dogs. Trainers have had to turn to a virtual world, with the help of dog foster families learning from the specialist dog trainers over Zoom, to try maintain training as best as possible.

The numerous lockdowns have also caused difficulty for training dogs to interact with people and communities, making it incredibly difficult to complete training in optimum environments.

It's important, now more than ever, to spread the word of the Support Dogs charity – to continue this life-changing work, clear waiting lists and relieve the NHS where and when possible.

Providing over 1.2 million hours of support for families affected by autism, epilepsy or a wide range of medical disabilities.

Visit **www.supportdogs.org.uk** to find out more.

Our training has enabled us to develop 50 new partnerships...

94% say their perspective of what they can achieve in life has changed since their support dog. 77% say the number of care hours they receive from partner/child has reduce since their support dog

How super-dog Wadsley gave Brogan her life back

Seizure alert dog Wadsley is helping Brogan Evans live the lifestyle she enjoyed before she was diagnosed with epilepsy.

Before wonder-dog Wadsley came into her life, Brogan Evens was struggling to cope with up to four seizures a day.

Now Brogan, aged 24, is able to lead near-normal life, safe in the knowledge that Wadsley will give her a 100 per cent 48-minute advance warning of an oncoming epileptic seizure.

As well as gaining profound peace of mind, Brogan has been able to resume an active lifestyle and can now go swimming and climbing mountains. She can even play rugby – with Wadsley sitting by the touchline and making sure she's safe to continue by giving her a clean bill of health at half time!

Brogan developed epilepsy at the age of 17, when at one stage, she had up to 14 seizures a day. Her hopes for a career in the army as a dog handler had to be shelved.

"My life before Wadsley was miserable," she says. "I knew what life was like before and I wanted that back. I couldn't do anything. I couldn't have a bath or a shower in case I had a seizure and drowned or fell and banged my head. I couldn't cook or leave the house; so many of things that people take for granted I wasn't allowed to do any more I missed the independence I had before epilepsy."

After intensive training with Support Dogs, Brogan and Wadsley qualified as a seizure alert partnership two years ago and since then Brogan's seizures have dramatically reduced. And having Wadsley around during lockdown has been a huge bonus.

"Having Wadsley and getting to leave the house each day for his walk brought some normality into my life and actually reduced my stress levels," adds Brogan, who is studying for a personal trainer qualification.

"I've had a huge improvement to my quality of life. All the things I couldn't do before I can quite happily do now.

"The number of serious seizures has gone down – partly because I'm less stressed, and because I'm able to go out and live my life, which I couldn't do before. Emotionally I'm in a much better place too, and none of that would have happened if it wasn't for Support Dogs and my best friend Wadsley." //

Brogan and Wadsley, an epilepsy seizure alert support dog partnership

From left to right: Mr. Pascal Dacher (Health Manager), Ms. Emilie Montfort, Ms. Virginie Boulanger, Mr. Cyril Dadier (Radiographers), GIE IRM Medical Imaging Center Beauvais (Centre d'Imagerie Médicale du Beauvaisis), France.

The MR Theatre Offers a Greater Sense of Escape and Improves Imaging Quality

Canon Medical's groundbreaking MR technology, offers greater ease and comfort to patients undergoing MRI examinations. Pascal Dacher discusses the benefits this technology has had on its patients at the GIE IRM Medical Imaging Center Beauvais (Centre d'Imagerie Médicale du Beauvaisis), France, where the equipment has recently been installed.

The Medical Imaging Center in Beauvais, northern France, treats all MR requests for all types of clinical applications except cardiology. "We perform osteopathy, neurology, oncology, women's imaging, and pediatrics examinations," Mr. Dacher said.

A main challenge in clinical practice is to secure imaging diagnosis, particularly in anxious, claustrophobic and pediatric patients, who are traditionally more difficult to scan.

To tackle this issue, the team has recently installed two Canon Medical Vantage Orian large aperture MR systems, one of which is equipped with the MR theatre.

A new MR experience

It has been shown that performing examinations in relaxed, cooperative patients improves image quality and diagnosis. Feeling at ease helps patients lie still during the examination.

Control room of the Vantage Orian at GIE IRM Medical Imaging Center Beauvais (Centre d'Imagerie Médicale du Beauvaisis), France.

The MR theatre, which projects peaceful, virtual and immersive reality inside the bore, helps distract patients from the ongoing examination – this reduces the stressful and claustrophobic effects of MR.

One of the main reasons that motivated Mr. Dacher and his team to purchase Canon Medical's technology, was the improved benefits it would bring to the patients: "Our goal, is to support all our patients as best as possible during imaging examinations. By offering them a new MR experience, we can now accommodate a higher number of claustrophobic and pediatric patients. We believe that the MR theatre can be a relaxing and distracting feature that will facilitate the better management of these patients,' he said.

The GIE IRM Medical Imaging Center is known for taking innovative approaches to improving patient comfort. The team notably installed France's first Titan system in March 2009 and was one of the first imaging centers to offer patients MR examinations using a wide-bore scanner.

"We have always paid attention to our patients' comfort. We aspire at setting ourselves apart from other imaging centers, by offering innovative and exclusive comfort technologies. Our best ambassadors are our patients. We are confident that the MR theatre will help us further improve our patients' comfort," he said.

"We were stunned by the immediate impact on our patients, their enthusiasm and spontaneous acceptance. The immersive film helps to distract them."

Mr. Pascal Dacher, Health Manager at the GIE IRM Medical Imaging Center Beauvais (Centre d'Imagerie Médicale du Beauvaisis), France.

Canon Medical's Vantage Orian with MR theatre at GIE IRM Medical Imaging Center Beauvais (Centre d'Imagerie Médicale du Beauvaisis), France.

High acceptance and better results

The team can perform all examinations on any patients with the MR theatre. However, the benefits have been more apparent for claustrophobic and paediatrics patients.

The patient reaction to the MR theatre has been overwhelmingly positive. Patients now feel less confined, comforted and at ease.

While Mr Dacher and his team have no doubts about the benefit of this technology, the instant response has exceeded their expectations.

"We were overwhelmed by the immediate impact this has had on our patients. The feedback from our patients is that they have had a more pleasant experience and there is a greater sense of escape. There is less sense of loneliness in the examination room and the film that is being projected offers an immersive and realistic distraction," he said.

Oncology patients undergo numerous MR scans as part of their treatment follow-up and have been particularly responsive to this technology.

Staff have also welcomed the positive effect this has had on their image quality, reducing stress and claustrophobia in their patients.

"Patients are more relaxed, more receptive and more cooperative, which greatly facilitates the performance and quality of examinations. The MR theatre helps achieve patient cooperation and reduces movement. This secures better image quality and avoids having to repeat sequences. The patient spends less time in the MR scanner and the examination is generally faster and better," Mr. Dacher concluded. //

Left: Mr. Pascal Dacher, Health Manager at the GIE IRM Medical Imaging Center Beauvais (Centre d'Imagerie Médicale du Beauvaisis), France. Right: Patrice Coudray, Product Manager MR, Canon Medical Systems France.

CT: The Exceptional Past, the Phenomenal Present and the Exciting Future

By Mark Thomas, CT Modality Manager at Canon Medical Systems UK

Canon Medical UK recently welcomed the 100th Aquilion ONE CT scanner order of the latest generation, the Aquilion ONE / PRISM Edition.

Fifty years on and the demand for CT is still growing. The first ground-breaking clinical scan dates back to 1971, yet the longevity of CT as an important medical imaging tool is testimony to the ongoing investment and research into developing the systems to meet the greatest healthcare challenges in an ever-changing world.

Today, CT is a core imaging modality in all hospitals with nearly 268 million procedures performed worldwide in 2019, growing to an anticipated 320 million by 2022 . From CT Pulmonary Angiography (CTPA) in COVID-19 patients, to diagnosing heart or brain conditions and guiding tissue biopsies, it is an essential tool in the medical practitioner's arsenal. It helps to diagnose disease and conditions earlier and to improve life expectancy and outcomes for patients.

This frontline imaging role is set to stay with CT workforces to be expanded and capacity to be doubled over five years as part of the COVID-19 'Recovery and Renewal' reflections report. But there is so much more the future holds for CT. Artificial Intelligence will herald greater rewards with CT; new software applications will answer some of the biggest challenges facing clinical practice; and the sustainable development of CT will evolve in tune with supporting the health of our planet, as well as people.

The CT transformation

Recently we welcomed the 100th Aquilion ONE CT scanner order here in the UK, from the latest generation, the Aquilion ONE / PRISM Edition. This milestone is an opportunity to reflect on how far we have come with the system and convey our excitement of what the future holds.

It was just over a decade ago that CT scanning was defined by the number of 'slices', referring to the number of rows of detectors in the z-axis. However, the Aquilion ONE burst on to the stage at RSNA in 2007 taking everyone by surprise with its new technological CT innovation. This was the world's first dynamic volume system far exceeding the industry norms of 64-slice configurations. The competitive slice wars was eliminated forever. Today, to be CT cutting-edge is about the balance of low dose, high speed and clear image quality.

Dose reduction – a game changer for radiology

Since its birth, the Aquilion range of CT scanners has witnessed many changes to the healthcare market-place – several healthcare reforms; growing patient populations; diminishing radiology workforces; and, not to mention, a global infectious disease pandemic. But CTs' ability to stay in tune with the changing shape of global healthcare chimes with our

Advanced intelligent Clear-IQ Engine (AiCE), a Deep Learning Reconstruction AI algorithm on CT delivers low dose, extremely high-quality clinical images, and all in a rapid timeframe suitable for everyday clinical use.

philosophy of 'continuous improvement' and our commitment to serving the needs of our customers with vast R&D investment.

The introduction of AI-assisted CT has been a game changer for healthcare. Only a year ago the UK's first CT with Advanced intelligent Clear-IQ Engine (AiCE), a Deep Learning Reconstruction AI algorithm, was installed into a UK hospital, and many more orders have followed since. Our customers have referenced "phenomenal" patient dose reductions, up to 90% below the National Diagnostic Reference Levels, at the same time as benefitting from extremely high-quality clinical images, and all in a rapid timeframe suitable for everyday clinical use. The low doses have even been achieved when examining people that have traditionally been difficult to image, such as severely ill patients with their arms by their sides, those unable to hold their breath and bariatric patients.

AiCE is developed using a deep learning algorithm to differentiate 'noise' from true signal, reducing distortions, preserving edges and maintaining details in image outputs at the same time as achieving lower doses than ever before in routine CT imaging. This gives super clear images for radiologists to report on. The low dose is also much healthier for patients, many of which will have many scans over the course of their lives adding to their cumulative dose, given that CT is now a 'routine' diagnostic pathway. Recently, the Aquilion ONE / PRISM Edition earnt Frost & Sullivan's 2020 Best Practices Award for Global New Product Innovation Award in the CT market highlighting its potential in the future of healthcare.

CT in tune with the changing shape of patients

The ever-changing structure of patient populations also means that the design and development of medical equipment needs to adapt. Applications, the software that can be added to the CT hardware, is evolving in response. Take, for example, SEMAR, a Single Energy Metal Artifact Reduction reconstruction technique, mitigates artifacts, radiological distortions from metal objects such as orthopaedic plates or medically implanted coils and provides improved visualization of the soft tissue structures surrounding metal objects. This improves the visualisation of medical images for clinical interpretation with no increased patient dose. A timely innovation with growing numbers of people replacing hips or knee joints and using medical implants.

The external design of CT has also stayed in tune with the changing shape of patients. Table capacity is now at higher weight tolerance adapting to the growing waistlines of UK populations, and the central bore hole of scanners has been getting wider over the last 10 years to accommodate larger patients more comfortably.

Alleviating pressure on clinical workforces

Recognising the growing pressures on radiology workforces is also a key consideration in the design of CT today. The latest Royal College of Radiologists Workforce Report highlighted growing concerns over a 33% shortfall in radiologists, to be 43% by 2024. Yet at the same time, the volume of CT imaging examinations across England has increased by 10% . Radiographer vacancy rates also remain high .

In response to workforce pressures, we continue to innovate CT workflow automation to help give some time savings that over the course of a full day or week, translate into more patient appointment slots. The advancement of AI, as mentioned above, is also a massive time saver to speed up procedures with none of the traditional compromises on image quality or dose.

A future with CT firmly at the heart

A look at the past and present of CT highlights its rise to become a key tool for frontline patient imaging. Its maturity across the wide spectrum of clinical disciplines now underpins many patient diagnosis and treatment pathways.

It is my belief the best of CT is yet to come. The early gains with AI-assisted technologies will develop further and the future of low dose, high speed and amazing image quality will power workflow efficiencies and throughput gains, lightening the load on overwhelmed clinicians and improving the care delivered to, and the life expectancy of, patients. //

Royal Infirmary of Edinburgh Impressed with CT Image Quality at High Speed and Low Dose

Deep intelligent CT scanners with AI inside transform breadth of clinical procedures

The Royal Infirmary of Edinburgh, a major acute teaching hospital in Scotland and part of NHS Lothian, has recently installed two new AI-assisted CT scanners from Canon Medical. Designed using Deep Learning Reconstruction, the systems are powered by an Advanced intelligent Clear-IQ Engine (AiCE) to deliver high quality medical imaging at speed to overcome the time vs patient demand challenge that most hospitals face today. A range of software applications also expands the procedures and possibilities for patient clinical practice and research.

In CT Pulmonary Angiography, iodine mapping is used as standard which provides the radiologists with extra information to aid diagnosis. A greater level of information delivered more quickly is better for clinical decision-making and is now achieved at lower dose. Similarly, Interventional Radiologists have found the subtraction package for CT Peripheral Angiograms extremely valuable. This provides excellent visualisation of the vessels, replacing the need to see vascular calcification via an MRI scan, which is not suitable for many patients, but still with reassurance of the dose being low. All of the processing is done automatically by the CT. Furthermore, using the CT fluoroscopy package, the time taken to undertake biopsies has halved, therefore reducing appointment times for patients experiencing uncomfortable procedures.

"As radiographers we can become blasé about the imaging equipment we use on a daily basis, but the arrival of the new AiCE CT and Aquilion Prime SP CT have reminded us of the amazing innovation going into medical imaging today. Our cardiologists have been blown away with how quick a cardiac CT is acquired using the wide detector, as well as the image quality achieved at such low doses." states Lynne Thomson, CT/MRI Superintendent at the Royal Infirmary of Edinburgh.

She continues, "It's not just the speed, low dose and image quality that have impressed us, but also the versatility of the new CT scanners. The 'Area Finder' functionality is useful for 4D joints and extremity imaging, which means we can seat patients at the end of the scanner. We have plans to adapt the way we book appointments for inpatients and outpatients since the arrival of the new CTs, which will lead to better workflow across a number of departments at the hospital."

Mark Thomas, CT Modality Manager at Canon Medical Systems UK states, "There is no trade off in welcoming AI into the imaging department today through modality CT. No apprehension or anxiety should be part of the decision about embracing the future of AI in medical imaging. Our scanners are built to be used in the same way that radiographers are used to but have intelligent technology inside powering the processing and steering the quality of image output. This illuminates enthusiasm and initiates a brighter future of CT scanning."

"Our cardiologists have been blown away with how quick a cardiac CT is acquired using the wide detector, as well as the image quality achieved at such low doses."

Lynne Thomson, CT/MRI Superintendent

"We have had trust in Canon Medical Systems for nearly two decades with a long-standing positive relationship in its medical imaging innovation, and for its after-sales and customer service. When our current 10-year-old CT scanners reached end of life, Canon Medical was again the natural choice. The new generation of Aquilion CT scanners is outstanding compared to what we were used to. Our radiologists have been amazed by the improved image quality and speed of procedures, and as radiographers, we are very pleased at the significantly reduced dose to patients," Lynne Thomson concludes. //

Responding to the Challenges of Today with a Vision for the Future

An update from Commercial Solutions

Our Community Hubs can provide patients with a coordinated set of diagnostic tests in their community, enabling an accurate and fast diagnosis, in as few visits as possible.

At Canon Medical Systems we work in tandem with our customers and partners to ensure we meet the diagnostic community's changing requirements. We share their ambition to improve patient outcomes and continually seek new, innovative ways in which we can support their valuable work.

In recent years, there has been a growing need to expand and reform the provision of diagnostic services in the UK, and this demand has intensified since the onset of the Covid-19 pandemic.

NHS England's 2020 report, Diagnostics: Recovery and Renewal completed by Professor Sir Mike Richards, highlights the important role that Community Diagnostic Hubs play in this transformation. These local settings not only allow for the separation of acute/emergency services from elective diagnostic procedures, but also offer bespoke, high-quality, adaptable surroundings that are tailored to individual site-specific requirements.

And this is where our expertise lies. The Richards Report has increasingly drawn attention to community-based services, and we have both the experience and resources to take your vision to the very heart of local communities; quickly, efficiently and within budget. Whether it be a small, basic design or a larger more complex project, we aim to not just fulfil your brief, but work alongside you – consulting and advising you every step of the way.

During 2020, when the need for offsite diagnostic provision grew exponentially, we were on hand to help the NHS deliver its vital services in the most challenging of circumstances. We provided 15 high-quality CT scan units to NHS Trusts across the UK, turning the project around within just eight weeks. Our team worked in partnership with the NHS throughout, ensuring the environments were compliant with infection control requirements but never compromising on quality.

We're proud to have played a part in such an important time for our healthcare professionals. But we want to do more.

Our complete service package is built to ensure that we deliver on our objectives with minimal disruption to your service. As well as offering everything from financial services to operational support, we can even build offsite, allowing us to deliver a complete solution that is operational from the moment it arrives.

We're excited to be a part of the changing landscape of diagnostic services in the UK and we're confident of the vital role we can play in assisting healthcare professionals to deliver safe, patient-centered care and pathways to diagnosis. //

Mobiles

Our mobile units can be deployed to wherever they are needed in the country, often with very little notice. With expandable sides, a patient staircase and a lift for access, they offer space and flexibility and can be delivered with ease.

Relocatables

Our relocatable units are designed to feel like a distinct building. The units sit at ground level, so no need for staircases. Installation is eased with the use of hydraulic legs so they do not require crane lifts. The units offer spacious settings and are built with the healthcare professional and patient experience in mind.

We offer

- Flexible financial options
- Spacious units
- Rapid solutions and access
- Applications support

Bespoke Modular Solutions

Our bespoke, modular facilities are based on your individual requirements and can be instantly deployed as a combination of multiple relocatables, or as a modular, fast-build imaging hub designed to fit your specific needs.

These bespoke centres are available for rental or purchase and are tailored to be as simple or as complex as your needs require.

We offer

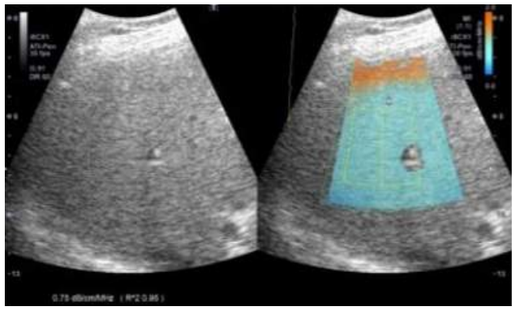
- Cutting edge imaging facilities
- Innovative solutions
- Rapid deployment
- Cost effective
- Scalable, adaptable size footprint
- Financed services

Improving the Clinical Pathways with Canon Medical's Liver Analysis Package

Jane Hanford, Ultrasound Clinical Product Specialist

What's the hype around the Canon Liver Analysis Package? During my many years (well decades!) as a radiographer I have seen the introduction of a myriad of technologies that improve patient diagnostic capabilities across all modalities. Canon's liver analysis package will make a real difference to the clinician's day while fundamentally improving the patient journey.

Current tools for assessing liver disease include the liver biopsy which has limitations i.e. it's invasive and has no follow-up. MRI proton-density-fat-fraction is the gold standard of quantifying steatosis and of course we have histopathology. So, wouldn't it be beneficial if ultrasound was able to assess and quantify steatosis, inflammation and fibrosis? The ongoing development and subsequent advancement of ultrasound, which is fully utilised within the Canon i and a series, provides not only exceptional 2D image quality, but also the essential liver analysis tools to assess and quantify liver disease.



The Canon Medical Liver Analysis Package consists of:

- Shearwave Elastography (quantifies the stiffness of the liver associated with Fibrosis – cirrhosis, alcoholic liver disease)
- Attenuation Imaging (ATI) (quantifies the degree of fatty infiltration)
- Dispersion Imaging (early stage of launch – quantifies the frequency dispersion, the liver viscosity).

"ATI… is as easy as placing a colour Doppler region of interest box over the liver in your normal abdominal examination and allows you to put a value to that fatty liver, something we have not been able to do until now."

Jane Hanford
Ultrasound Clinical Product Specialist

Shearwave and attenuation imaging may be used in stand-alone mode, but more importantly, when all three are used together they provide both the radiologist, sonographer and the referring clinician, a deeper and better understanding of liver disease within minutes!

For this article, I am going to highlight Attenuation Imaging (ATI)

The success of implementing new technologies often goes hand in hand with questions like –

"What is it?"
"How easy is it to use?"
"Is this easily reproducible?"
"Will it add to my scanning time?"

"What is it?"

- Canon Medical's Attenuation Imaging (ATI) was the first ultrasound imaging technique for steatosis quantification.
- It consists of Real Time colour mapping and incorporates 4 quality factors
- Takes less than 2 minutes for a full assessment
- Strong and robust clinical evidences (vs biopsy and MRI Proton Density Fat Fraction)
- Better results than controlled attenuation parameter CAP

ATI is a non-invasive ultrasound technique that allows you to measure the change in the attenuation coefficient, by calculating the local slope of declining intensity.

The Attenuation coefficient should correlate with the degree of liver steatosis, as the higher the fat content, the higher the attenuation. As sonographers, we see the fatty liver quite frequently, as it occurs in approximately 30% of the population. There are varying degrees of steatosis such as non-alcoholic fatty liver disease (NAFLD), and non-alcoholic steatohepatitis (NASH), and if we could quantify this level of steatosis then maybe this would help influence clinical management resulting in less patients reaching the fibrosis stage – so let's identify it earlier.

The way we currently evaluate a fatty liver in a routine abdominal ultrasound examination, is by comparing the echogenicity of liver to kidney, however as we know this is a subjective assessment, that is where it ends… identifying the fatty infiltration with no quantification. ATI is probably the tool sonographers would want to use more often out of the Canon toolbox, is as easy as placing a colour Doppler region of interest box over the liver in your normal abdominal examination and allows you to put a value to that fatty liver, something we have not been able to do until now.

"How easy is it to use?"

In brief – to perform attenuation imaging, you simply

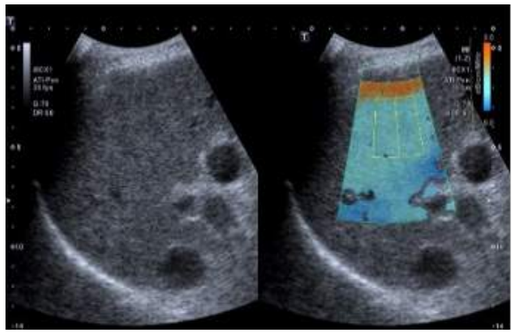
- Press the ATI subpreset button that is assigned on your system – the Attenuation Coefficient is then colour mapped onto the 2D B-mode image.
- Press Freeze, not only does the image freeze, but a predefined measurement region of interest is displayed, in which the attenuation coefficient is measured in dB/cm/MHz
- Move the measurement box into the light blue area and SET
- Press your Report button and a colour coded report identifies if the measurement is in the normal, mild, moderate or significant level of steatosis. I think that answers the question.

"Is this easily reproducible?"

Yes, it is, so let's delve deeper. ATI can easily be incorporated into your normal abdominal examination procedure. Patient preparation is the same, as is patient positioning.

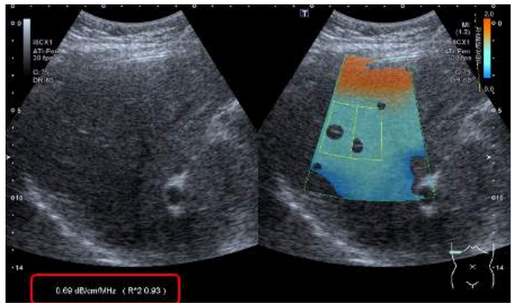
The ultrasound probe is placed perpendicular to the patient's skin in an intercostal space over the right liver lobe. The box for the colour mapping of the attenuation coefficient is then placed over the liver parenchyma trying to avoid any large vessels, ducts and avoiding the artefacts from the capsule when measuring.

The colour mapped box consists of three colours:



Orange	*Depicts the Liver Capsule Artifact*
Light Blue	*Depicts the best measurement area*
Dark Blue	*Avoid this deep area for measurement*

Once the Colour mapped box has been placed correctly, making sure the box includes the orange capsular artefact, and deeper darker blue highly attenuating areas, press Freeze.
The measurement region of interest (ROI) populates immediately within the colour-mapped area – however, only measure in the light blue area of the colour map. The dark blue area indicates an area where the ultrasound beam has had a high degree of attenuation and the reading will be too weak to be accurate.



As a further quality indicator, and to ensure you only use accurate measurements, there is a profile uniformity index – R2, which has to be greater than 0.85 for each measurement to be statistically significant. If the measurement falls below the R2 value the measurement has to be disregarded. This is simplified further, as the figures appear in white indicating a good reading, yellow indicating the reading could be better, and red indicating that the reading is inaccurate. You can see in this image, that some vessels could not be avoided. In this instance, the system used an algorithm to suppress the vessel walls, as these behave differently with the fat cells, with fat infiltrating the liver tissue first.

So we have acquired an image, activated ATI, positioned the colour map away from vessels , performed the measurement in the light blue area, stayed away from the orange and dark blue areas, checked that the R2 number is above 0.85, and obtained a value. How do we assess the results?

Cut off values have been derived from research programmes, pilot studies, clinical evaluations and other assessments, that compare ATI with MRI PDFF, CAP and liver biopsies.

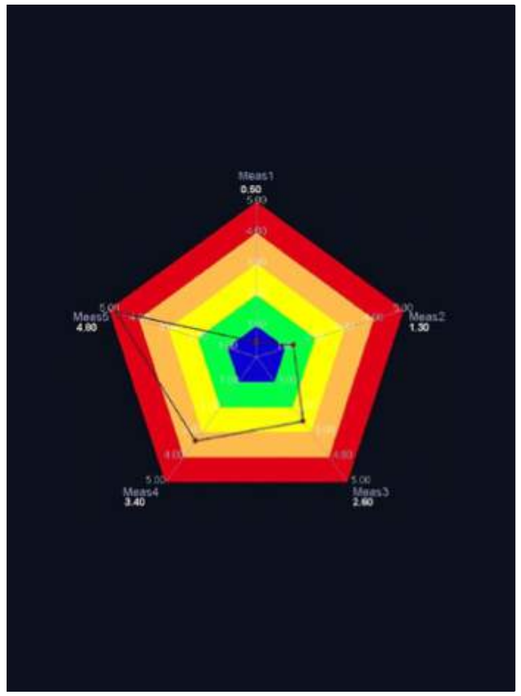
Normal range <0.63cm/Db/MHz
which will lie in the green range
Mild Steatosis >0.63 cm/Db/MHz and <0.72 cm/Db/MHz *which will lie in the amber range*
Significant Steaosis >0.72 cm/Db/MHz and <0.82 cm/Db/MHz *which will lie in the yellow range*
Severe Steatosis >0.82 cm/Db/MHz
which will lie in the red range

When your result is plotted on your report page, it is clearly depicted in a colour coded bar graph as seen below.

Normal Liver Parenchyma

Severe Steatosis

The multiparametric reporting functionality allows simultaneous comparison of all the available metrics from shearwave, dispersion imaging and attenuation imaging.



The multiparametric reporting functionality allows simultaneous comparison of all the available metrics from shearwave, dispersion imaging and attenuation imaging. It even allows the user to input ALT (alanine aminotransferase), AST (aspartate aminotransferase) blood results making it a very comprehensive report. All these results can be viewed in a bar graph, spider graph or tabular format.

"Will it add to my scanning time?"

The whole process is very efficient – no further preparation is needed for the patient, and ATI can be acquired very easily. By reading the above, you can see that this can be performed with just a few minutes more and as part of a routine ultrasound abdominal examination. So that's the reading complete – now is the time to contact your application specialist or sales specialist to see if can be trialled on your current Canon i series, or possibly demo on a new system. //

References
Recent clinical evidence is included for reference within this article.

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