Big data and imaging

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The future for radiologists is also interventional

Interventional radiology is a subspecialty providing minimally invasive image-guided diagnosis and treatment of disease. The number of procedures performed by interventional radiologists is extensive, ranging from the purely diagnostic such as angiography and cholangiography to the therapeutic, covering vascular and ablative applications. In recent years there has been a shift away from diagnostic angiography with the arrival on the market of high performance CT and MRI angiography systems which provide reliable and non-invasive alternatives.

Radiologists are by no means the only medical specialty performing interventional techniques as cardiologists and vascular surgeons have been quite successful in developing interventional skills, so much so that interventional cardiology has grown into a discipline of its own. In fields such as peripheral arterial disease treatment for example, it would seem that interventional radiologists have lost out to other specialties even though in some European countries like Germany they still have a significant share of this work. There is, however, a wide range of other areas, especially in interventional neuroradiology and oncology where interventional radiologists hold a quasi-monopoly.

In Europe, the Cardiovascular and Interventional Radiological Society of Europe (CIRSE) established in 2013 the first edition of the European Curriculum and Syllabus for Interventional Radiology which aimed at harmonizing training across European countries while supporting the European Board of Interventional Radiology (EBIR) examination in interventional radiology. CIRSE also works together with the European Society of Radiology (ESR) to attract more clinically-oriented medical students to interventional radiology. The steady growth of the ageing population in Europe and other industrialized countries and the resulting higher incidence of strokes and cancer cases combined with the multiplication and development of interventional techniques will boost the demand for interventional radiologists in the near future. Already now, there is a shortage of interventional radiologists in some countries, notably the UK where 25% of hospitals cannot provide minimally invasive procedures to their patients on a 24/7 basis because of a lack of recruitment of interventional radiologists in the National Health Service (NHS). This situation is having a clearly detrimental effect on patient care in some parts of the country. According to the Royal College of Radiologists (RCR), there are just 414 interventional radiologists in the NHS whereas 735 of them would be needed to provide 24/7 on-call service everywhere. In comparison, France has about 1,250 interventional radiologists while Germany totals over 1,000. In emerging countries, the shortages can be huge, such as in India where there are only 596 registered interventional radiologists, i.e. one per every 2.18 million population.

The challenge for radiologists is to recognize the value of being close to the patient and embrace clinical care.
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Big data and imaging - algorithms and analytics aid clinical decision making

A fluid, game-changing combination of mathematical tools and Big Data seems ready to disrupt the field of radiology. However, it also promises to pave the way for what may turn out to be potentially-dramatic advances in healthcare.

There is some irony here. Data was once seen as a liability, to maintain and pay for. It is now being considered a potentially major asset. The key to this turnaround in perspectives lies in increasingly sophisticated, deep learning algorithms, advanced analytics and artificial intelligence which interpret the Big Data and make it usable.

Explosion in image numbers and volume
There is no hyperbole in the use of the term Big Data, as far as radiology is concerned. In recent years, there has been a veritable explosion in the stock of medical images. Emergency room radiologists often examine up to 200 cases a day, and each patient’s imaging studies can be around 250 GB of data. At the upper end, a ‘pan scan’ CT of a trauma patient can render 4,000 images. Currently, about 450-500 petabytes of medical imaging data are generated per year, but this is accelerating. Decisions are made on the basis of small parts of imaging data, the proverbial tip of the iceberg. Much of the information in this data has still to be deciphered and used.

Medical imaging and disease
Medical imaging provides important information on anatomy and organ function as well as detecting diseases states. Its analysis covers a gamut of areas from image acquisition and compression, to transmission, enhancement, segmentation, de-noising and reconstruction. Technology has enabled often-dramatic leaps in image resolution, size and availability. Sophisticated picture archiving and communications systems (PACS) have allowed for the merger of patient images from different modalities and their integration with other patient data for analysis and use in a clinical setting.

Limits to vision - from digital to analogue
So far, radiology information to identify disease or other clinical conditions is presented in the form of images. Although scanners digitize data into pixels, this is reconstructed into shapes and shades or colours for display in a form that can be understood by the human brain. This is where the ‘tip of the iceberg’ statement above comes into play. Medical scanners encode an image pixel in 56 bits, equivalent to 72,000 trillion ‘shades’. However, the scanner reduces the data amount to 16 bits, just 65,536 shades, for the human eye. As a result, 40 bits of information is lost, in just one pixel. At some point in the future, it seems likely that radiologists use numbers rather than images to numerically define and detect patterns of diseases. The process may in fact have already begun.

Imaging analytics and deep learning
Such trends are being fuelled by rapid advances in imaging analytics. Smart, deep learning (DL) algorithms, which analyse pixels and other digital data bytes within an image, have the capacity to detect specific patterns associated with a pathology and provide conclusions in terms of a numerical metric.

One example of the use of numbers as a diagnostic definition concerns the use of algorithms in CT images to calculate bone density. The result is compared to a reference number, which auto-matically trigger alerts on low bone density. Avoiding the need for another dedicated examination, a physician can determine if a patient needs calcium supplements or another preventative measure.

Such algorithms also learn over time, and become better at what they do, resulting in even greater speed and more confidence in the future. Such a process has been driven by the steady acceleration, over the years, in computer processing speed. Indeed, while training an algorithm at the turn of the century took 2-3 months, the same results can now be achieved and iterated within minutes.

Neural systems and algorithms
Technically, deep learning produces a direct mapping from raw inputs to outputs such as image classes. Many DL algorithms are inspired by biologic neural systems. They are different from traditional machine learning, which requires manual feature extraction from inputs, and face limitations to use in the face of the large volumes of information associated with Big Data.
Big Data’s virtuous circle
Many DL algorithms directly seek to harness Big Data in radiology. Gigantic (and fast-growing) image libraries are being accessed for investigation to develop, test, validate and continuously refine algorithms, with the aim of covering a whole range of pathologies. For radiologists, analytic results from an examination can be comprehensively evaluated against similar data obtained over a long period of time and evaluated to suggest appropriate diagnosis in current scenarios.

Such a virtuous cycle of algorithms and Big Data have become the focus for a host of major medical technology vendors as well as start-ups. However, the key enabling players are radiology departments, who own the data repositories and are uniquely placed to curate the data, in other words, organize it from fragments and make it available for running analytical algorithms. The above process has, in some senses, been jump-started by previous efforts to data mine reports from radiology departments as they transitioned from PACS to enterprise imaging. The next step in this Big Data-driven opportunity will consist of linking information in radiology reports to the pixels of medical images.

The pixel goldmine
Few doubt any more that pixels are a goldmine, holding wholly new insights into a medical image and how best they could be utilized, not just by radiologists but other clinicians offering patient care. Alongside data mined from electronic medical records, quantitative pixel-based analysis algorithms are increasingly likely to be used to find patterns in images.

Big Data-based screening algorithms, for example, can be used to highlight subtle, multi-dimensional changes in a nodule or a lesion. This can be followed by applications such as curved planar or 3D multi-planar reconstructions, or dynamic contrast enhancement (DCE) texture analysis on highly targeted data subsets, instead of making the time-consuming effort of querying a complete imaging dataset.

Specific examples of such an approach might include diagnosis of lesions in the liver and identification of disease-free liver parenchyma. Another would be volume analysis of lung tumours and solitary pulmonary nodules to decide temporal evolution of lesion. Big data based pattern analysis modules can detect areas of opacities, honeycombing, reticular densities and fibrosis, and thereby provide a list of differentials, using computer aided diagnostic tools.

For tumours, in general, radiologists can run algorithms to check contrast enhancement characteristics, and such metrics can be compared to prior results as well as other pathology data to provide a specific differential list.

Decision support systems
One decision support system based on Big Data assists physicians in providing treatment planning for patients suffering from traumatic brain injury (TBI). The algorithm couples demographic data and medical records of the patient to specific features extracted from CT scans in order to predict intracranial pressure (ICP) levels. Google’s entry into this field seeks to address real world limitations – not just in terms of human capacities but also trained medical personnel. Its first deep learning imaging algorithm sought to recognize diabetic retinopathy, the fastest growing cause of blindness in poor countries, where a shortage of specialists meant many patients lost their sight before diagnosis.

The promise of AI
Google’s algorithm is based on artificial intelligence (AI), seen as an especially promising catalyst for advances in such areas. AI-based algorithms, for example, can calculate the volume of bleed on the basis of multiple brain CT slices in stroke patients, with the size of bleed volume indicating urgency as well as care pathway. Another recent algorithm assesses recent infarcts on CT, which can be missed if they are hyper-acute (less than 8-12 hours old), and is therefore relevant to all patients with sudden onset weakness. The University of California in San Francisco has been testing an algorithm to identify pneumothorax in chest radiographs of surgery patients, before they exit the OR (operating room). The aim is to not only avoid the huge costs of a collapsed lung but also ensure that the OR is freed from being used for an otherwise-avoidable procedure.

AI is also being considered for workflow management and triaging. In the near future, it is almost certain that images are screened as data is acquired by a scanner, to distinguish between ‘normal’ and ‘abnormal’ images, prioritize cases according to the likelihood of disease and alerting radiologists to conditions that require urgent attention. The results are tangible and impressive. One algorithm has helped physicians to shrink the time for cardiac diagnoses from 30 minutes to 15 seconds.

Certain vendors are leveraging AI to correlate findings on properties like morphology, cell density or physiological characteristics to expert radiologist’s reports, while taking additional clinical data such as biopsy results into account. Others use reasoning protocols as well as visual technologies such as virtual rendering to analyse medical images. This is then combined with data from a patient’s medical record to offer radiologists and clinicians decision-making support.

AI and the radiologist
So far, algorithms and emerging metrics are expected to be largely used as a complement to decisions made by radiologists. However, at some point in the future, it seems plausible that radiologists no longer need to look at images at all. Instead, they would simply analyse outcomes of the algorithms.

Once again, AI is at play here. Apart from deep learning algorithms, radiology can claim to be witness to the first successes with the emerging science of ‘swarm’ AI, which helps form a diagnostic consensus by turning groups of human experts into super experts. Swarm AI is directly based on nature, which sees species accomplishing more by participating in a flock, school or colony (a ‘swarm’) than they can individually. One report, published in ‘Public Library of Science (PLOS),’ stated that swarm intelligence could improve other types of medical decision-making, “including many areas of diagnostic imaging.”

In December 2015, a study in ‘IET Systems Biology’ reported about a swarm intelligence algorithm which assisted “in the identification of metastasis in bone scans and micro-calcifications on mammographs.” The authors, from universities in the UK and India, also reported about the use of the algorithm in assessing CT images of the aorta and in chest X-ray. They proposed a hybrid swarm intelligence approach to detect tumour regions in an abnormal MR brain image.

The future: human-machine symbiosis
AI is unlikely to become a replacement for radiologists, but a tool to help them. According to Curt Langlotz, MD, PhD, professor of radiology and biomedical informatics at Stanford, the “human-machine system always performs better than either alone.”
Gentle diagnostics make early-stage heart disease visible

By no means are only elderly people at risk from heart diseases. Physically active individuals can also be affected, for example if a seemingly harmless flu bug spreads to the heart muscle. Should this remain undetected and if, for example, a builder continues with his strenuous job or an athlete carries on training, this can lead to chronic inflammation and in the worst case to sudden death.

Professor Eike Nagel and his 12 co-workers at the Institute for Experimental and Translational Cardio Vascular Imaging of Goethe University Frankfurt are developing better ways to predict and diagnose heart diseases. In recent years, the researchers have taken the lead in the development of a procedure that is still very new in heart scans. Nagel explains the advantages: “With the help of magnetic resonance imaging, we can look right inside the heart muscle.” Blood flow to the heart muscle is visualized and shows whether there are any constrictions of the arteries supplying the heart. Experts can also spot whether the heart muscle is scarred, inflamed or displays any other anomalies. The comparatively fast method makes it possible to examine patients at an early stage and may prevent cardiac insufficiency or even a heart attack. “Diseases such as HIV, kidney damage, rheumatic diseases or tumours often affect the heart either directly or as a side effect of therapy,” says Nagel, describing groups potentially at risk. The cardiologist is convinced: “Nowadays we can treat or even cure so many diseases, but the heart suffers too and this should be carefully monitored as it mostly remains undetected.”

MRI is a non-invasive and gentle examination technique, which is less risky but just as efficient as an examination using a conventional heart catheter, where a thin tube is pushed in the direction of the heart through an artery. Nagel’s research group was recently able to demonstrate this in a large international multi-centre study that was met with international acclaim. The Institute for Experimental and Translational Cardio Vascular Imaging also has state-of-the-art computer tomography equipment at its disposal that can produce three-dimensional images of the heart. These especially reveal calcium deposits and plaques in the artery walls which could rupture and trigger a sudden heart attack. “This allows us to determine the risk of a heart attack and the need for therapy fast and at an early stage, which can then be non-invasive,” says Nagel. Which technique is best for which patient is one of the research topics Nagel’s group is evaluating. In some patients, both may be needed and the Institute is optimally equipped to answer most aspects of heart disease thanks to its deep insight into the heart.

Nagel finds these rapid advances in imaging over the last decades fascinating: “Nowadays we can spot the slightest changes and literally get a clear picture of the heart’s condition.”

Goethe Universität
https://tinyurl.com/yvjvvruf

Presurgical imaging may predict whether epilepsy surgery will work

Surgery to remove a part of the brain to give relief to patients with epilepsy doesn’t always result in complete seizure relief, but statisticians at Rice University have developed a method for integrating neuroimaging scans to identify patients at high risk of continued seizures before the surgery takes place. Rice statistician Marina Vannucci and lead author Sharon Chiang, an M.D./Ph.D. student at Rice and Baylor College of Medicine, worked with colleagues at Baylor, the University of California at Irvine and UCLA to develop a method for integrating functional magnetic resonance imaging (fMRI) and positron emission tomography (PET) scans to find visual biomarkers that distinguish patients with the greatest likelihood of benefit.

Their hope is that with recent alternatives to resective surgery, including responsive neurostimulation, vagus nerve stimulation and thalamic stimulation, patients with temporal lobe epilepsy (TLE) can avoid anterior temporal lobe resection surgery that may not help them, or can undergo other procedures that are more likely to benefit them.

Vannucci and Chiang built their model on data gathered from PET and resting-state fMRI scans for a total of 51 patients by the UCLA Seizure Disorder Center between 2007 and 2012. The centre worked with Rice and Baylor to investigate suspicions that failure to attain seizure freedom after resection of the anterior temporal lobe in some patients with TLE originates in tissue connected through networks to the lobe.

Standard resection of the anterior temporal lobe cures or dramatically reduces seizures for many who undergo the surgery, but approximately 30 to 50 percent of patients continue to experience seizures after surgery. Vannucci and Chiang previously used statistical techniques to analyse brain activity data from patients with epilepsy and control groups to gain new information about active networks in the brain. “We have been tackling this problem of trying to understand temporal lobe epilepsy from different angles,” said Vannucci, a professor and chair of Rice’s Department of Statistics.

This time, she said, they used the data to demonstrate that the recurrence of seizures after surgery, despite resection of the seizure-onset zone, may be due to either surgical disruption of fibres connected to previously normal brain tissue or incomplete resection of an epileptogenic network.

Their results identified a subgroup of patients with 5.8 times greater odds of experiencing postoperative seizures due to what the researchers suspect are differences in their underlying brain networks. They suggested the occurrence of postoperative seizures could be due to remaining epilepsy networks after surgery.

“This may lead us to better understand the brain networks that produce epilepsy and allow for the design of better treatments for those patients who do not have seizure freedom from the current operation,” said Dr. John Stern, a co-author and professor of clinical neurology, director of the epilepsy clinical programme and co-director of the Seizure Disorder Center at UCLA.

Rice University
https://tinyurl.com/y9j8d66

State-of-the-art MRI technology bypasses need for biopsy

The most common type of tumour found in the kidney is generally quite small (less than 1.5 in). These tumours are usually found by accident when CAT scans are performed for other reasons and the serendipitous finding poses a problem for doctors. Are
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these tumours malignant and do they need to be surgically removed because they may threaten the patient’s life? Or are they benign and can be left alone? The decision is often made with a biopsy. By sampling the tumour, doctors are able to determine whether the cancer is benign or malignant. However, biopsies are invasive procedures and not without risks.

Investigators with the Kidney Cancer Program at UT Southwestern Harold C. Simmons Comprehensive Cancer Center have developed a Magnetic Resonance Imaging (MRI) technology that can provide information about the nature and aggressiveness of the cancer without having to perform a biopsy. The team, led by Drs. Ivan Pedrosa and Jeffrey Cadeddu, co-authors of the study, have developed multiparametric MRI (mpMRI) protocols that tell physicians with high confidence whether the tumour is aggressive or not. These protocols allow investigators to evaluate the chemical composition of the tumour without a biopsy. This composition allows doctors to infer what type of cancer it is.

“Using mpMRI, multiple types of images can be obtained from the renal mass and each one tells us something about the tissue,” said Dr. Ivan Pedrosa, Professor of Radiology and Chief of Magnetic Resonance Imaging. The standardized diagnostic algorithm is largely based on the appearance of the renal mass on specific MRI images, namely T2-weighted images and those immediately after intravenous (IV) dye reaches the kidney. Other images are also used that indicate whether fat is present in the tumour. Based on the algorithm, physicians can recognize clear cell carcinoma (ccRCC), the most common and aggressive form of kidney cancer, with 80% confidence.

“Using mpMRI, doctors at UT Southwestern have a four-in-five chance of identifying clear cell cancer” said Dr. Pedrosa. The data collected from this study support the use of mpMRI to reduce the number of biopsies. “Biopsies are not entirely free of pain and discomfort,” said Dr. Cadeddu, Professor of Urology and Radiology at UT Southwestern. “Some patients, in fact, choose to observe the cancer simply to avoid the pain of the biopsy,” he says.

Investigators at UT Southwestern continue to push the technology and are hoping in the near future to be able to predict not only the type of cancer, but also to tell how aggressive it is. “If we can avoid the anxiety and the fear and the rare, but possible complication of a biopsy, I think we’re pushing medicine forward,” said Dr. Cadeddu.

MRI scans predict patients’ ability to fight the spread of cancer

A simple, non-invasive procedure that can indicate how long patients with cancer that has spread to the brain might survive and whether they are likely to respond to immunotherapy has been developed by researchers in Liverpool. The technique, which can be done using standard hospital-based Magnetic Resonance Imaging (MRI) scans, could one day remove the need for patients to undergo life-threatening surgery to obtain a biopsy, and provide an easier, quicker and safer way for doctors to prescribe the most appropriate cancer treatment.

The research is a collaboration between the University of Liverpool and The Walton Centre in Liverpool and is published in the journal Cancer Research. The major problem hindering the successful treatment of commonly-occurring cancers is not the primary tumour, which can usually be removed by surgery, but its spread or ‘metastasis’ to other organs in the body, forming secondary tumours. One of the most frequent sites of metastasis is the brain. Secondary brain tumours may also reflect the presence of further secondaries elsewhere in the body, any one of which can lead to the death of the patient.

As a general rule, cancer that has spread is treated with chemotherapy or with targeted therapies such as immunotherapy – a relatively new treatment that works by stimulating the body’s immune system to fight cancer. Immunotherapy is revolutionizing the way doctors treat cancer as it does not come with many of the debilitating side effects produced by chemotherapy. However, it does not work for everyone or for every type of cancer and although successful in some cases, there is currently no simple test to determine who is likely to benefit.

To investigate why some patients with secondary brain cancer do better than others, researchers at the University of Liverpool’s Department of Biochemistry and The Walton Centre Neurosurgery Department used an MRI technique called Diffusion Tensor Imaging (DTI) to analyse brain tumours from appropriate patients and then to sample the same areas for comparative biochemical tests. They found that the higher the level of immune reactive cells round these tumours the longer a patient survives, irrespective of the cancer type or other biological parameters and that this level matched that derived from the DTI technique.

The research draws upon material in the Walton Research Tissue Bank, which provides researchers with access to brain tumour tissue and blood samples to help facilitate the development and testing of new treatments. University of Liverpool

https://tinyurl.com/yyc77mvjl

Contrast-enhanced digital mammography comparable to breast MRI after therapy or chemo

Contrast-enhanced digital mammography is comparable to breast MRI in evaluating residual breast cancer after neoadjuvant endocrine therapy or chemotherapy, according to the results of a study presented by Mayo Clinic.

“Our study aimed to compare contrast-enhanced mammography with breast MRI in evaluating residual breast cancer in patients undergoing presurgical systemic treatment to shrink their tumour size,” says Bhavika Patel, M.D., a radiologist at Mayo Clinic’s Arizona campus.

“We identified patients who had both contrast-enhanced digital mammography and MRI after treatment to shrink their tumours and before additional therapy or a mastectomy,” Dr. Patel and her colleagues conducted a retrospective review of contrast-enhanced digital mammography cases at Mayo Clinic’s Arizona campus between September 2014 and June 2016. Forty female patients met inclusion criteria. The mean age of study participants was 52.3 years. Thirty-four patients received chemotherapy, and six patients received endocrine therapy.

Researchers interpreted radiographic images in a blinded fashion and compared residual size on imaging to pathology from surgical samples. Their results indicated that both imaging modalities demonstrate comparable accuracy in assessing residual cancer.

“These findings, if validated in larger studies,
Over the last 60 years, medicine has made major advances in diagnosis, treatment and surgery. Radiography and Fluoroscopy imaging are essential to medical science. As a result, Original Equipment Manufacturers (OEM’s) need to deliver ever more sophisticated turnkey platforms for their systems which are dedicated to end-users. Thales has designed a platform that meets all of these needs.

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Multiple advanced applications are embedded in this solution

ArtPix DRF is based on a user-friendly application that controls the generator and remote tables. For the physician, it also includes a patient vicinity controlled application to enhance treatment. The system offers increased value to OEM’s by featuring a vast choice of advanced clinical options such as: Tomosynthesis, stitching, radiation-less positioning, etc.

Integration and daily use are facilitated thanks to an intuitive setup, calibration and application

The setup, calibration, generator settings and stations can be easily configured by an X-ray technician guided by ArtPix DRF, allowing the system environment to be easily adjusted. Thanks to these options and the flexibility to change all of the configurations, time and money are saved by practitioners and therefore, a higher number of patients can be seen. The platform has been designed to tackle IT and patient information vulnerabilities. The system is compliant with the latest information security standards.

The people we rely on to keep us healthy rely on Thales to provide pioneering fluoroscopy solutions. Thales’ 60 years of experience in the domain, combined with its ability to remain at the forefront of innovation, has made the Group the leading choice for many radiological system manufacturers. With the launch of the world’s 1st 4343 panel dedicated to fluoroscopy in 2007, the company is perceived as a precursor in this domain. Nowadays, and thanks to its long term expertise, Thales is increasingly engaged in the development of image chain platforms in order to provide complete and efficient solutions for systems integrators and end-users. Discover ArtPix DRF at the ECR congress from 1-4 March 2018, Thales booth N°410 – Foyer D.
could potentially support the use of contrast-enhanced mammography as an alternative approach for evaluating residual cancer in the preoperative setting.”

Dr. Patel says contrast-enhanced mammography is a potentially easier, faster, more accessible and more cost-effective option than breast MRI. She says Mayo Clinic’s Arizona campus is one of the first sites in the U.S. to implement contrast-enhanced digital mammography. “Patients find contrast-enhanced digital mammography less anxiety-provoking than MRI, which can cause some patients to feel claustrophobic,” Dr. Patel says.

cancernews
https://tinyurl.com/y9lvcrhz

Faster, more accurate cancer detection using nanoparticles

Using light-emitting nanoparticles, Rutgers University-New Brunswick scientists have invented a highly effective method to detect tiny tumours and track their spread, potentially leading to earlier cancer detection and more precise treatment. The technology could improve patient cure rates and survival times.

“We’ve always had this dream that we can track the progression of cancer in real time, and that’s what we’ve done here,” said Prabhas V. Moghe, a corresponding author of the study and distinguished professor of biomedical engineering and chemical and biochemical engineering at Rutgers-New Brunswick. “We’ve tracked the disease in its very incipient stages.”

The study shows that the new method is better than magnetic resonance imaging (MRI) and other cancer surveillance technologies. The research team included Rutgers’ flagship research institution (Rutgers University-New Brunswick) and its academic health centre (Rutgers Biomedical and Health Sciences, or RBHS).

“The Achilles’ heel of surgical management for cancer is the presence of micro metastases. This is also a problem for proper staging or treatment planning. The nanoparticles described in this paper will go a long way to solving these problems,” said Steven K. Libutti, director of Rutgers Cancer Institute of New Jersey. He is senior vice president of oncology services for RWJBarnabas Health and vice chancellor for cancer programmes for Rutgers Biomedical and Health Sciences.

The ability to spot early tumours that are starting to spread remains a major challenge in cancer diagnosis and treatment, as most imaging methods fail to detect small cancerous lesions. But the Rutgers study shows that tiny tumours in mice can be detected with the injection of nanoparticles, which are microscopic optical devices, that emit short-wave infrared light as they travel through the bloodstream – even tracking tiny tumours in multiple organs.

The nanoparticles were significantly faster than MRIs at detecting the minute spread of tiny lesions and tumours in the adrenal glands and bones in mice. That would likely translate to detection months earlier in people, potentially resulting in saved lives, said Vidya Ganapathy, a corresponding author and assistant research professor in the Department of Biomedical Engineering.

“Cancer cells can lodge in different niches in the body, and the probe follows the spreading cells wherever they go,” she said.

“You can treat the tumours intelligently because now you know the address of the cancer.”

The technology could be used to detect and track the 100-plus types of cancer, and could be available within five years, Moghe said. Real-time surveillance of lesions in multiple organs should lead to more accurate pre- and post-therapy monitoring of cancer.

“You can potentially determine the stage of the cancer and then figure out what’s the right approach for a particular patient,” he said.

In the future, nanoparticles could be used in any surgeries to mark tissues that surgeons want to remove, the researchers said. The probes could also be used to track the effectiveness of immunotherapy, which includes stimulating the immune system to fight cancer cells.

Rutgers University
https://tinyurl.com/yblku22y

3D Mammography costs less than digital mammography

Although digital breast tomosynthesis (DBT), or 3-D mammography (DM) screening, it actually may help rein in cancer screening costs, according to preliminary findings (PD7-03) presented by researchers from the Perelman School of Medicine. The group analysed 46,483 screening episodes – a single screening mammogram and all subsequent breast diagnosis related costs for the following year – in two hospitals within the University of Pennsylvania Health System in 2012 and 2013.

“Early detection is critical to saving lives and lowering costs,” said senior author Emily F. Conant, MD, chief of Breast Imaging at Penn Medicine. “Fortunately, breast imaging is more precise than ever thanks to DBT. Despite its higher initial cost, DBT is increasingly being embraced by radiologists nationwide. If you look at expenses associated with breast diagnosis in the following year after initial screening, DBT is more cost effective in terms of health system or population level screening.”

Previous studies modelling outcomes have demonstrated that DBT can be cost effective. In this study, the authors analysed actual costs and patient outcomes within a single health system where both DM and DBT screening occurred.

They excluded any episodes in which the patient had a prior breast cancer diagnosis or reached 90 years of age before the end of the follow-up period. DM represented 53 percent of the episodes and DBT represented 47 percent. Fifty three percent of women studied received DM and 47 percent received DBT.

They tested DBT and DM according to four outcomes – true positive (TP), true negative (TN), false positive (FP), and false negative (FN) rates – by comparing the Breast Imaging Reporting and Data System (BI-RADS) score (assigned at screening with data about subsequent cancer diagnosis).

DBT was a more effective screening method. Compared to DM episodes, DBT episodes had lower FP (8.6% vs. 10.8%) and higher TN (90.9% vs. 88.7%, p<0.001 rates. (There were no statistically significant differences between DBT and DM episodes with respect to TP and FN rates.)

Although it screened more effectively, DBT did cost more than DM. Overall, average episode costs were higher for DBT compared to DM ($378.02 vs. $286.62). This difference was driven by higher average screening costs ($215.94 vs. $155.76), which approximated the additional charge for DBT, as well as follow-up costs ($23.67 vs. $12.11). There was no significant difference in costs between DBT and DM episodes within the diagnosis or cancer treatment windows.

DM and DBT episodes had roughly the same average episode costs per woman screened for FP ($67.75 vs. $65.71), FN ($4.63 vs. $5.60) and TP ($85.80 vs. $65.15) outcomes despite the higher cost per individual DBT study. The higher costs for TN ($219.84 vs. $150.16) outcomes approximated the higher CMS (Centers for Medicare and Medicaid Services) charge for DBT.

Penn Medicine
https://tinyurl.com/y7nemu7g
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Geriatric emergency medicine - growing patient numbers drive demand

Just like pediatric emergency units were developed to serve children, healthcare experts are recognizing that older adults require specialized forms of emergency care, which differ from the general population. Indeed, emergency rooms can be unforgiving for the elderly, many of who are often traumatized by the experience.

New geriatric emergency departments have recently begun to emerge, led by the US. They not only provide more appropriate care for older people, but can bring cost savings to a hospital, too.

A major and growing challenge
In the US, up to 25% of ED patients are aged 65 years or older. Indeed, geriatric ED patients represent 43 percent of all admissions, including 48 percent admitted to the intensive care unit (ICU). Geriatric patients in the ED also have an average length of stay that is 20 percent longer than younger populations.

There are no consolidated figures for Europe. However, there are both similarities and differences vis-a-vis the US. In the UK, a Nuffield Trust report in 2009 found nearly 40 percent of all ED admissions being for the over-65s and 10 percent for people aged 85 and above. However, it also observed that “at most, 40 percent of the increased number of emergency admissions” over a four-year period could be explained by the effects of population ageing.

The numbers of elderly are not insignificant. In the US, the 2010 Census found 13 percent of the population, corresponding to over 40 million people, were over 65 years in age. Their numbers too showed a sharper increase than other population groups, with people in the 85+ age group growing at almost three times the rate of the general population.

The situation in Europe is even more demanding, with 19.2 percent of the population in the 65+ age group in 2016, up from 16.8 percent a decade previously.

Benefits for both elderly and hospitals
There are several benefits which the elderly can derive from a geriatric ED. The most important is optimization of care. This is achieved by focusing resources, attention and capability to their most common risks and needs; the latter differ in several respects from other age groups.

Conversely, a geriatric ED can also provide benefits to a hospital. Improved standards of care for a large patient population are a useful marketing or public relations tool. In the US, hospitals have been marketing the geriatric ED to attract older patients who utilize higher reimbursing programmes. Finally, the case for special geriatric attention has become compelling due to the Affordable Care Act. This reduces reimbursement, should a patient return to the hospital due to iatrogenic complications such as infections and wounds.

Paradigm change for both emergency and geriatric care
Traditionally, ED teams were not provided with training for the care of older people. The ED environment was instead organized according to single organ management. For elderly ED admissions, a more holistic approach was considered as best practice, especially in terms of frailty and geriatric syndromes. Several such attitudes continue to this day.

In parallel, geriatric medicine (GM) has historically avoided paying attention to emergency care contexts, and competencies specifically associated with the elderly (e.g. management of falls, confusion, dementia, delirium, the risk of adverse drug-drug or drug-food interactions); these are as important in an acute care setting as in a geriatric ward. Indeed, various studies have pointed out that underlying vulnerabilities which led to an ER visit may go undetected and unaddressed by emergency room staff.

Compelling evidence
However, it has also become clear that dedicated geriatric EDs can make a major difference in delivering quality care to the elderly. One study used Medicare data from 2012 and 2013 to study falls by the elderly, a significant cause of morbidity – leading to hip fractures and nursing home admissions. The researchers found that less than 4 percent received a physical therapy (PT) consult. On the other hand, they also discovered that readmission rates for another fall within 60 and 180 days dropped significantly in patients who had a PT consult.

A brief history of the geriatric ED
The concept of a geriatric ED took root in the US in 2008. Since then, such facilities have become increasingly common in the country. Figures from the non-profit ECRI institute state there were 50 geriatric EDs
in operation in the US in early 2014, with another 150 in development. The first American hospital to develop a geriatric ED model was Holy Cross Hospital in Silver Spring, Maryland, part of the St. Joseph Mercy Health Systems. The geriatric practice was inspired by the fact that nearly one of five of its ED patients was 65 or older. Moreover, its CEO made a more prosaic observation - that the hospital's ED was not well suited to take care of his mother.

The Holy Cross Hospital was used to pilot the concept of a geriatric ED. Since then, other St. Joseph Mercy's hospitals have developed geriatric EDs, as have other hospital groups. In 2012, the Icahn School of Medicine at Mount Sinai received an award from the US government's Department of Health and Human Services to implement a geriatric ED model at three major urban hospitals, namely Mount Sinai Medical Center in New York City, Northwestern Memorial Hospital in Chicago and St. Joseph's Regional Medical Center at Paterson, New Jersey.

Common sense innovations

The practices prescribed by Holy Cross for its pioneering geriatric ED involved simple environmental standards such as natural glare-free lighting, soothing colours, beds rather than gurneys equipped with better mattresses and non-skid flooring. Posters and scales were equipped with larger print, and reading glasses made available. The designers also ensured that rooms/units were large enough to accommodate family members, whose role in care delivery of the elderly is now widely acknowledged.

Staff training

However, the most important developments at the Holy Cross ED concerned staff training and responsibilities. ED staff were given special training in geriatrics, while pharmacists were charged with reviewing medications of every elderly patient, to monitor and analyse them as causative factors for a medical emergency. Lessons from Holy Cross, including the maxim that geriatrics care is the 'ultimate team environment', have been transferred to other US healthcare facilities and to hospitals in Europe and elsewhere too.

The expertise a well-trained ED team bring to interactions with a geriatric patient directly impact the latter's condition. Studies have shown that trained ED staff also lead to the use of relatively less expensive outpatient treatments. The advantage of training nurses for an ED role was highlighted by the 'Journal of the American Geriatrics Society' in January 2018. The article, which studied 57,287 patients over 65, reported that an ED-based transitional care nurse (TCN) programme focused on geriatric care was able to reduce the number of unnecessary hospitalizations by 33 percent. Its co-author, Scott Dresden, MD, an Assistant Professor of Emergency Medicine at Northwestern University wrote that the programme “created an otherwise non-existent safety net for this vulnerable population.”

Holy Cross' first ED also ushered in a full-time, trained geriatric social worker, dedicated to emergency rooms. According to some estimates, geriatric ED patients are 400% more likely to require social services than the general population. Indeed, social workers play a key role in advising and assisting elderly patients to get post-ED care, after discharge. They also seek to know the patients and discover underlying reasons for their coming to the ED.

Reducing re-admissions and penalties

Overall, US hospitals are being compelled by the Affordable Care Act to reduce iatrogenic complications in the elderly. One study showed that 40 percent of emergency room patients older than 65, who had been denied admission, returned to EDs with conditions which had worsened. An article in 'Modern Physician' found that 27 percent of elderly patients either returned to the ED for admission or died, in the first three months after a hospital visit. The 'Modern Physician' article, however, observed that 30-day readmission rates for the elderly at Holy Cross Hospital halved after it set up a geriatric ED, from 10.9 percent to 5.2 percent. Results at another geriatric ED, at St. Joseph Regional Medical Center in Paterson, New Jersey, were even more dramatic: returns of elderly ED patients dropped from 20 percent to just over 1 percent.

Guidelines

Geriatric ED practices are the target of new guidelines in the US, developed by The American College of Emergency Physicians (ACEP), the American Geriatrics Society (AGS) and the Society for Academic Emergency Medicine (SAEM). These call for education and training of medical staff, making specific risk-assessments of senior patients and screening those considered to be vulnerable for co-morbidities such as cognitive problems, falls, etc., performing a comprehensive review of medication, and providing a comprehensive discharge plan. As part of their geriatric risk management, some hospitals are emphasizing the screening and triaging of elderly patients beyond their primary complaint. One popular tool here is the Identification of Seniors at Risk (ISAR), a simple patient checklist to be completed at the point of entry.

Another innovation is the use of telemedicine as part of ED discharge plans, with a typical 72 hours of coverage at home via video monitoring, and then transitioning care to a primary care physician.

Accreditation

On its part, ACEP has recently launched an accreditation programme for emergency rooms, with three levels of accreditation — basic, intermediate and advanced. All ACEP accredited facilities must provide elderly patients with walkers, canes and reading glasses. Intermediate accreditation requires provision of suitable lighting and non-slip floors, along with hearing aids, thicker mattresses and warm blankets. Advanced accreditation targets physician-supervised improvement initiatives, such as limiting the use of urinary catheters in older patients.

Europe launches GEM curriculum

In Europe, too, efforts are being made by professional societies to develop a validated curriculum on geriatric emergency medicine (GEM). The curriculum is thorough and covers a full spectrum of activity: pre-hospital care, primary clinical assessment and stabilization, secondary clinical assessment, medication, pain management, palliative care and transitional care, along with continuous attention to typical co-morbidities in the elderly and to differences in care paradigms and challenges vis-a-vis younger age groups.

Geriatric friendly – a new standard?

In the long run, we may well witness some major re-thinking about the impact of geriatric ED. Mark Rosenberg, who heads geriatric emergency medicine at St. Joseph’s – one of the three hospitals that received US government funding in 2012 for implementing a geriatric emergency practice – suggests that if an ED is designed for the most vulnerable patients, it will work for the strongest patients as well. In other words, he argues that all EDs should be designed to be geriatric-friendly, as a baseline standard.
Risk management approach to combat EMS fatigue

Extended shift work has historically been linked to interrupted sleep patterns and risk of injury, and is a persistent problem for emergency medical services (EMS) personnel who are tasked with delivering acute care under significant pressure.

New guidelines, written by a team led by University of Pittsburgh School of Medicine scientists and published aim to mitigate the effects of fatigue by addressing the impact of shift work and scheduling.

“The problem of fatigued EMS personnel is widespread and not isolated to one type of EMS operation or category of EMS clinician. Administrators of EMS organizations are not sufficiently equipped to address fatigue in the workplace, in part because of the absence of guidelines for fatigue risk management in the EMS setting,” said Daniel Patterson, Ph.D., lead author and assistant professor of emergency medicine at the Pitt School of Medicine. After review and analysis of more than 38,000 journal articles, conference presentations and other publications, Patterson and his colleagues gathered information on fatigue and shift work to develop the evidence-based guidelines for fatigue risk management and test the impact of the findings to create a biomathematical model for use by the EMS community to aid in shift-scheduling decisions.

The guidelines consist of five recommendations:

- Use of fatigue/sleepiness surveys to measure and monitor EMS personnel fatigue.
- Limit EMS shifts to less than 24 hours in duration.
- Give EMS personnel access to caffeine to help stave off fatigue.
- Allow EMS personnel the opportunity to nap while on duty.
- Provide education and training in fatigue risk management to EMS personnel.

Patterson and his team expect the guidelines to have a wide impact on improving practice and policies to alleviate EMS personnel fatigue, whether when driving an ambulance or caring for patients.

Operating the ambulance is only one aspect of EMS care, said Patterson. “Most of the work EMS clinicians do is actually patient care. Fatigue affects decision-making abilities and overall performance, and with the pressure of delivering acute care, one wrong decision can be detrimental.”

Acupuncture relieves pain in emergency patients: study

The world’s largest randomized controlled trial of acupuncture in emergency departments has found the treatment is a safe and effective alternative to pain-relieving drugs for some patients. Led by RMIT University, the study found acupuncture was as effective as pain medicine in providing long-term relief for patients who came to emergency in considerable pain. But the trial, conducted in the emergency departments of four Melbourne hospitals, showed pain management remains a critical issue, with neither treatment providing adequate immediate relief.

Lead investigator Professor Marc Cohen, from RMIT’s School of Health and Biomedical Sciences, said pain was the most common reason people came to emergency, but was often inadequately managed.

“While acupuncture is widely used by practitioners in community settings for treating pain, it is rarely used in hospital emergency departments,” Cohen said.

“Emergency nurses and doctors need a variety of pain-relieving options when treating patients, given the concerns around opioids such as morphine, which carry the risk of addiction when used long-term.

“Our study has shown acupuncture is a viable alternative, and would be especially beneficial for patients who are unable to take standard pain-relieving drugs because of other medical conditions.

“But it’s clear we need more research overall to develop better medical approaches to pain management, as the study also showed patients initially remained in some pain, no matter what treatment they received.”

Patients who identified their level of pain as at least 4 on a 10-point scale randomly received one of three types of treatment: acupuncture alone, acupuncture plus pharmacotherapy or pharmacotherapy alone.

One hour after treatment, less than 40 per cent of patients across all three groups felt any significant pain reduction (2 or more pain points), while more than 80 per cent continued to have a pain rating of at least 4.

But 48 hours later, the vast majority found their treatment acceptable, with 82.8 per cent of acupuncture-only patients saying they would probably or definitely repeat their treatment, compared with 80.8 per cent in the combined group, and 78.2 per cent in the pharmacotherapy-only group.

RMIT University
https://tinyurl.com/yaclex5p
A growing number of individuals of all ages are surviving intensive care unit hospitalization, however their mental and physical health problems persist. A new study from Regenstrief Institute and Indiana University researchers reports that a care model they originally developed for older adults with dementia could benefit ICU survivors of all ages.

ICU survivors have high rates of persistent cognitive impairment similar to Alzheimer’s disease due to a combination of critical illness, medications administered during hospitalization, and physiological aspects of delirium that are not well understood.

The Critical Care Recovery Center (CCRC) care model developed by the Regenstrief Institute and IU Center for Aging Research scientists is the first collaborative care concept in the US focusing on the extensive cognitive, physical, and psychological recovery needs of intensive care unit survivors and decreasing the likelihood of serious illness after discharge from an ICU. The CCRC is an outpatient clinic with an interdisciplinary care team working closely with family caregivers as well as the ICU survivors themselves after hospital or rehabilitation facility discharge.

The 51 ICU survivors in the new study were the initial patients seen in the first CCRC — the Eskenazi Health Critical Care Recovery Center. They ranged in age from 40 to 70 with an average age of 55. Prior to the trauma or illness that had brought them to the ICU, nearly all were psychiatrically normal and functionally independent.

During their ICU stay more than three-quarters of the study participants had required mechanical ventilation and almost half were given antipsychotic medications for delirium. Following ICU discharge 88 percent had cognitive impairment and 60 percent experienced depression, recognized upon their subsequent follow-up as outpatients in the CCRC.

“The ICU survivor population is very heterogeneous which makes it a complicated population to understand and serve,” said Sophia Wang, MD, an implementation scientist at the Center for Health Innovation and Implementation Science and assistant professor of clinical psychiatry at the IU School of Medicine who led the study. “ICU survivors of all ages have high rates of persistent cognitive impairment similar to Alzheimer’s disease. Their complex needs match the traditional complexity of geriatric syndromes.”

According to Dr. Wang, the problems encountered after ICU discharge, known as Post Intensive Care Syndrome or PICS, should be viewed as a multifaceted disorder of cognitive, psychiatric, and physical impairment. Because the CCRC model is equipped to handle those complexities, it is a good fit for the ICU survivor population, regardless of the individual’s age.

“In this study we have demonstrated how novel concepts initially used to create a successful model of collaborative care for dementia were successfully applied to create the CCRC providing innovative collaborative care for ICU survivors,” she said. “We will be conducting future studies of how the CCRC meets the complex needs of ICU survivors and the healthcare systems they navigate.”

Regenstrief Institute
https://tinyurl.com/y7ld8kjv
The “Bismarck-Model” – Germany’s health insurance system in its historical context

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ABSTRACT:
The German system of statutory health insurance, worldwide referred to as the Bismarck model, has developed in its 135 years of existence from a compulsory workers’ insurance to a system that provides universal population coverage, a generous benefit basket and low cost-sharing arrangements. This article gives a short account of the German health insurance history on its way to universal health coverage along the country’s historical and political periods as well as an overview of its current functioning.

The National Health Service in England:
Achievements, Challenges and Prospects as it approaches its 70th Anniversary

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ABSTRACT:
The article examines the history, achievements, challenges and prospects of the NHS in England, as of early 2018. The article starts by examining health outcomes, distinguishing absolute and comparative. It then considers the impact of the Global Economic Slowdown and Brexit, before considering staffing, operational and financial pressures on the NHS. Next the article summarizes and comments on the House of Lords 2017 Select Committee Report The Long-term Sustainability of the NHS and Adult Social Care. The article concludes that the NHS in England is sustainable if ministers have the political stomach for the necessary fiscal and re-distributive prerequisites. The article ends by asking a bigger underlying question: to what extent current, or successor, UK Governments can, as a whole, acquire the skills and pace to adapt to “The Age of Accelerations.”
Universal health insurance coverage in Switzerland – yes, but ...

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ABSTRACT:
This article argues that in the case of Switzerland, financial incentives for signing up with social health insurance were so strong as to obviate the mandate imposed by a reform in 1996. That reform introduced premium subsidies paid to those whose health insurance premium exceeded some percentage (depending on the canton) of taxable income. The subsidies would have permitted to expose health insurers to full competition rather than maintaining and even tightening existing regulation. For, with sufficiently high premiums obtained from high risks (lowered by the subsidy), competing insurers would not have any incentive to prefer them to favourable ones. Therefore, regulation intended to prevent cream skimming, in particular a risk adjustment scheme and a premium surcharge on no-claims bonus options could have been avoided. In this sense, the reform 'missed the boat', i.e. an enhancement of efficiency in social health insurance.

Chile’s two-tiered health system: Past and present policy challenges

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ABSTRACT
Chile relies on social health insurance (SHI) to provide universal health coverage (UHC) to its 17 million people. Its two-tiered SHI system was designed under General Pinochet in 1981. Since the return of democracy in 1989 it has been criticized by many for having two segregated subsystems: a large public insurer (Fonasa) covering mostly public health services for the low- and middle-income population (80 percent of the country), and several for-profit private insurers (Isapres) covering private care for the better-off (20 percent). This paper reviews health reforms initiatives undertaken over the past 12 years in Chile; Chile’s case being relevant to developing countries with SHI which are debating the merits of alternative policies to achieve UHC. Two views compete: SHI with a single insurer, which also acts as a single purchaser of health services; and SHI with consumer choice among multiple insurers, each purchasing health services for its insured population.

UNICO: Demand Side Strategies for Universal Health Coverage (UHC)

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ABSTRACT
This article aims at better understanding the design and implementation of the demand-side programs developed in the middle-income countries documented by the World Bank through UNICO with a focus on the progress achieved in identifying beneficiary populations and separating financing from provision. The article concludes with the objectives of the demand-side programs and the reforms implemented in the countries to reach them. It also addresses the challenges met by countries in the development of these reforms to increase health coverage.

Access to the journal:
https://www.ihf-fih.org/home?document=resources&resource_type=41
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World Hospitals and Health Services Vol. 54 No. 1
Solving Universal Health Coverage Challenges through Joint Learning

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ABSTRACT
As universal health coverage (UHC) gains momentum in more countries, the need for practical information on how to strengthen health systems and expand coverage has emerged as a vital global priority. The Joint Learning Network for Universal Health Coverage (JLN) convenes practitioners and policymakers virtually and in-person for intensive learning exchanges on shared technical barriers to UHC. In the process, members co-produce practical tools on the how-to’s of designing and implementing efficient, equitable and sustainable health care systems. This article explores how Ghana and the Philippines, two JLN member countries, have leveraged practitioner-to-practitioner learning to address common challenges in their pursuit of UHC.

The French health care system

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ABSTRACT:
The French health care system is a model of national health insurance (NHI) that provides health care coverage to all legal residents. It is an example of public, social security and private health care financing, combined with a public-private mix in the provision of health care services. The French health care system reflects three underlying political values: liberalism, pluralism and solidarity. This article provides a brief overview of how French NHI evolved since World War II; its financing health care organization and coverage; and most importantly, its overall performance.

Also in this issue

An Anatomy of Progressive Universal Health Coverage Reforms in Low- and Middle-Income Countries, by Daniel Cotlear

Faster, higher, leaner, but not further: Sri Lanka and Malaysia’s expansion of Universal Health Coverage (UHC) using an integrated NHS, by Wei Aun Yap, Daniel Cotlear and Owen Smith

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21st Century hospitals - pressures for transformation

New service and business models are challenging the traditional role of a hospital – as a place where sick people are taken to get better. Instead, a growing body of evidence suggests that the key mission of future hospitals will be to help people to avoid falling ill, and to manage those that do in fundamentally different ways than at present. Such processes are principally driven by economic pressures and the promise of new technologies. However, patients are also playing a major role.

Patients more proactive

It has indeed been apparent for some time that patients are far less passive than they were in the past. In Britain, a study by the King’s Fund think-tank found patients wished to be far more involved in healthcare decisions. In addition, the study reported that patient satisfaction depended not just on medical outcomes, but also on being treated with dignity and respect.

Emerging technologies are seen as one way to enhance the patient experience, and several popular apps show how rapidly patients have moved to centre-stage. In the US, Heal, a smartphone app, lets patients search for physicians in a manner similar to Uber's connecting passengers to drivers. Zocdoc, another tool for finding doctors, has added an artificial intelligence-powered Insurance Checker feature which lets patients select and verify insurance information as they are booking appointments. An app called Welloh goes beyond doctors to give users information about hospitals, pharmacies, care centres and other facilities. Clinical trials are also opening up to volunteers, thanks to an app called TrialReach, which helps patients find open clinical trials for specific medical conditions. These new health access paradigms resonate strongly with younger patients. According to a report from Salesforce, over 70 percent want their physicians to adopt mobile health applications.

Big Data

One of the most promising and best known tools in the emerging technology arsenal is computing giant IBM’s Watson, which deploys artificial intelligence (AI) to collect and interpret vast amounts of data from medical literature in order to advise on best treatment options. Scores of other tools provide personalized treatment plans for cancer patients using the genetic background of their tumours, accompanied by analysis from tens of thousands of other, similar cases. These kinds of innovations count on assimilating and interpreting what has come to be known as Big Data. The sources for this data, whose volume continues to grow by leaps and bounds, are many. They include clinical studies, prescriptions, radiological images and a host of other healthcare information.

The Internet of Things

One new source of data is from the Internet of Things. Connected medical devices such as insulin pumps and pacemakers pick up signals and automatically transmit information to networked computers, which allow physicians (and patients) to perform real-time monitoring. An array of wearable devices to track vital signs are another fast-growing source of medical data. On an individual basis, this may not amount to much. However, when the data is provided by millions of users, its size becomes staggering, as does its potential for providing insights.

Cloud computing

Such a burgeoning mass of data is being generated asynchronously, processed and stored by different machines on multiple platforms. Making it usable is hardly simple.

One promising answer to such a challenge lies in cloud computing technology, which has dramatically reduced the cost of data storage, as well as the time required to process and transfer the data to multiple users at different locations. For patients needing to visit a lot of specialists, the accessibility of their data from a variety of locations can be indispensable.

The Electronic Health Record

One of cloud computing’s biggest areas of impact may be the electronic health record...
(EHR), one of whose goals was in fact to address the above challenge – patient data access in real time by different specialists. The EHR has generally failed to meet expectations (and over-expectations). In both Europe and the US, the EHR’s key technical/operational limitation was that clinical and financial data could not be easily shared and exchanged among providers – as many had assumed or otherwise hoped for.

In the US, EHRs have generally also failed to meet levels of reporting that support the ‘meaningful use’ requirements of pay-for-performance programmes.

Cloud computing seems likely to give a new lease of life to the EHR. Server-based EHRs always run the risk of system failure, which would prevent access to critical patient data until the server has been restored. Such a scenario does not concern cloud-based EHRs. In addition, cloud services are encrypted and provide security. Cloud-based EHRs also reduce entry barriers to adoption by transferring responsibility for confidential patient information to specialized vendors.

**Design and hospital re-purposing**

The impact of such developments are reaching into the very design of a hospital. Christopher Shaw, Chair of a professional organization called Architects for Health and founder of the design firm Medical Architecture, believes there is a growing mismatch between the physical infrastructure of a hospital and the nature of activities expected to be required over the coming decades.

One key question here is the future of hospital buildings – whether to renovate and incrementally redesign structures or start afresh. Indeed, even as popular imagination associates future hospitals with robotic doctors, another equally beguiling scenario consists of individualized medicine, extending to some forms of surgery, carried out at home.

**Hub-and-spoke models**

The reality may lie in between, at least in the foreseeable future. One of the most likely scenarios might be a hub-and-spoke hospital model. Its inside tier would consist of academic medical centres serving larger populations and focused on acute care. The middle tier would be an intermediate-care hospital, located in smaller cities or larger towns and providing longer-term rehabilitation and nursing support. The outer tier would be comprised of polyclinics for outpatient diagnostics and elective care, referred from primary care physicians. At the periphery would be the patient’s home, with telemedicine treatment, and possibly some form of tele-surgery assisted by paramedical professionals on the scene. Some of the latter may well be robots.

**Telehealth**

After many false starts, telehealth technology is now on the edge of take-off – helping allocate care to patients more efficiently, by eliminating the need to visit hospitals, when they do not have a need to access concentrated multi-disciplinary expertise. Telehealth is also seen as a means to bring patients back more quickly to their homes. Indeed, there is a considerable body of evidence which suggests that the sooner patients begin recovery at home, the more quickly they heal.

Telehealth is not only being pushed by technology but also pulled by economics. In the US, for example, healthcare providers of diabetic patient care have to contend with value-based measures. As a result, they are becoming increasingly dependent on real-time data from remote glucose monitors. Telehealth allows patients to be more engaged, and participate with physicians in ensuring better outcomes, by adhering to insulin or other medications.

**Emerging models - examples**

The challenge facing the emerging healthcare model lies in the best way to integrate resources, delivery and support mechanisms, and the need to avoid duplication. However, there are encouraging signs from several parts of the world.

In the US, Westchester Medical Center Health Network (WMC Health), is an example of the emerging hub-and-spoke hospital model. The core of the system consists of a 1,500-bed facility headquartered in Valhalla, New York, which is the only facility for complex interventions and procedures. Buttressing this are six (intermediate) hospitals, as well as several polyclinics and medical campuses. The system covers a population of more than 3 million people spread over 15,000 square kilometres.

In Europe, there are several efforts to redefine hospital design. In a variation of hub and spoke, Guy’s Hospital at London has developed its cancer centre as a stack of ‘villages’, one atop another, with each providing a different service (radiotherapy, chemotherapy, etc.). Certain hospitals have sought to move in the opposite direction, bringing a full range of services to patients in one room or area. In Veldhoven, the Netherlands, a new Woman-Mother-Child Center at Maxima Hospital provides prenatal, delivery, postnatal and breastfeeding support services from one room.

**UMC+ in Maastricht, NL**

Some of the most radical efforts to address the redefinition of the hospital are being explored in the Netherlands, at Medical University Centre+ (UMC+) in Maastricht. In late 2009, the departments of Dermatology and Orthopedics at UMC+ started out on separate tracks of what is called ‘design thinking’. Each department independently developed and implemented new care and financing systems, closely adapted to what they saw as the real needs of their patients, and combining specialties, which had been traditionally separated.

The key mission at UMC+ is to avoid pushing strategy down individual departments, which have highly specific patient groups, processes and technologies, and instead build strategy bottom up, involving inputs from across the staffing chain. Nevertheless, the aim of design thinking is to also generate organizational change.

Over time, several other departments began applying the methodologies pioneered by Dermatology and Orthopedics, creating a new hospital healthcare model.

Over time, the UMC+ model is transforming healthcare focused on rehabilitation, to preventive public health and development. The shift has also changed the role of the Board. Directors no longer set out strategies, but make communication possible between different departments. The Board aims to ensure that different departments do not seek to reinvent the wheel, and instead continuously develop and implement internal best practices.

**The challenge of demographics**

Nevertheless, many challenges still lie ahead. While Internet- and smartphone-friendly millennials are clearly going to benefit from new hospital care models, the bulk of hospital and healthcare needs for the next decade or two lie in the elderly. According to a Partners HealthCare study in 2016, few seniors obtain information or accomplish healthcare-related tasks online. Only 16 percent of seniors said they used the Internet to obtain health information, while just 7 percent contacted physicians online.
New AI technology significantly improves human kidney analysis

The ability to quantify the extent of kidney damage and predict the life remaining in the kidney, using an image obtained at the time when a patient visits the hospital for a kidney biopsy, now is possible using a computer model based on artificial intelligence (AI). The findings can help make predictions at the point-of-care and assist clinical decision-making.

Nephropathology is a specialization that analyses kidney biopsy images. While large clinical centres in the U.S. might greatly benefit from having ‘in-house’ nephropathologists, this is not the case in most parts of the country or around the world. According to the researchers, the application of machine learning frameworks, such as convolutional neural networks (CNN) for object recognition tasks, is proving to be valuable for classification of diseases as well as reliable for the analysis of radiology images including malignancies.

To test the feasibility of applying this technology to the analysis of routinely-obtained kidney biopsies, the researchers performed a proof of principle study on kidney biopsy sections with various amounts of kidney fibrosis (also commonly known as scarring of tissue). The machine learning framework based on CNN relied on pixel density of digitized images, while the severity of disease was determined by several clinical laboratory measures and renal survival. CNN model performance then was compared with that of the models generated using the amount of fibrosis reported by a nephropathologist as the sole input and corresponding lab measures and renal survival as the outputs. For all scenarios, CNN models outperformed the other models.

“While the trained eyes of expert pathologists are able to gauge the severity of disease and detect nuances of kidney damage with remarkable accuracy, such expertise is not available in all locations, especially at a global level. Moreover, there is an urgent need to standardize the quantification of kidney disease severity such that the efficacy of therapies established in clinical trials can be applied to treat patients with equally severe disease in routine practice,” explained corresponding author Vijaya B. Kolachalama, PhD, assistant professor of medicine at Boston University School of Medicine. “When implemented in the clinical setting, our work will allow pathologists to see things early and obtain insights that were not previously available,” said Kolachalama.

The researchers believe their model has both diagnostic and prognostic applications and may lead to the development of a software application for diagnosing kidney disease and predicting kidney survival. “If healthcare providers around the world can have the ability to classify kidney biopsy images with the accuracy of a nephropathologist right at the point-of-care, then this can significantly impact renal practice. In essence, our model has the potential to act as a surrogate nephropathologist, especially in resource-limited settings,” said Kolachalama.

Boston University School of Medicine
https://tinyurl.com/y7p83anb

Scientists unleash power of genetic data to identify disease risk

Massive banks of genetic information are being harnessed to shed new light on modifiable health risks that underlie common diseases.

University of Queensland researchers have pioneered a method to integrate data from multiple large-scale studies to assess risk factors such as body mass index (BMI) and cholesterol levels, and their association with diseases including type two diabetes and heart disease.

Professor Jian Yang, from UQ’s Institute for Molecular Bioscience and Queensland Brain Institute, said the new method was more powerful than earlier techniques and enabled scientists to identify risk associations that were difficult to detect in smaller samples.

“Identifying new risk factors provides an avenue to look at diseases from a different angle,” Professor Yang said.

“For example, LDL-cholesterol is known to be a risk factor for cardiovascular disease, but we were surprised to see that it actually lowers your risk of type two diabetes.

“Discoveries like this could have significant implications for medical research, the pharmaceutical industry and public health policy.”

The study looked at seven known health risk factors and more than 30 common diseases, in genetic data from more than 400,000 people. Professor Yang said the method identified 45 potentially causal associations between health risk factors and diseases.

“Some of these associations – such as the link between BMI and type 2 diabetes and cardiovascular disease - have already been confirmed in randomized controlled trials, which validates our methods,” Professor Yang said.

“Others identified in this study provide candidates for prioritization in future trials, and fundamental knowledge to understand the biology of the diseases.

“For example, we identified a highly significant risk effect of HDL-cholesterol on age-related macular degeneration.”

Professor Yang said the method was particularly valuable where clinical trials to investigate associations would be impractical or even unethical.

“Years of education is one trait we looked at in the study, and it had a protective effect against most diseases, particularly for Alzheimer’s and coronary artery disease – but it is something that needs to be carefully investigated in the future,” Professor Yang said.

University of Queensland
https://tinyurl.com/y9lf6963

Computer-aided facial analysis helps diagnosis

In rare diseases, the computer-aided image analysis of patient portraits can facilitate and significantly improve diagnosis. This is demonstrated by an international team of scientists under the leadership of the University Hospital Bonn and the Charité – Universitätsmedizin Berlin on the basis of so-called GPI anchor deficiencies. Using data on genetic material, cell surface texture and typical facial features, researchers utilized artificial intelligence methods to simulate disease models. The results may also be ground-breaking for other diseases.

Mabry syndrome is a rare disease that causes mental retardation. It is triggered by a change to a gene mutation, signal transmission and further steps in the cell-cell communication are impaired.
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The spectrum of the external appearance of GPI anchor deficiencies is very broad: The clinical impact of a mutation in a particular gene can range from mild to profound. This also applies to distinctive facial features. In Mabry syndrome for example, a narrow, sometimes tent-shaped upper lip, broad bridge of the nose and wide-set eyes with long palpebral fissures are among the classic features, but these may be more or less pronounced. This often complicates the diagnosis of this rare disease. The elevated alkaline phosphatase (AP) levels in the blood which are also considered characteristic for the syndrome cannot be detected in every patient. “The result is that many patients and their relatives often suffer many years of uncertainty until the correct diagnosis is made”, says Krawitz.

An international research team led by Dr. Alexej Knaus and Prof. Krawitz from the Institute for Genome Statistics and Bioinformatics of the University Hospital Bonn and Prof. Dr. Denise Horn from the Institute of Medical Genetics and Human Genetics of the Charité investigated how the diagnosis of GPI anchor deficiencies can be improved with the help of modern, particularly fast DNA sequencing methods, cell surface analysis and computer-aided image recognition (next-generation phenotyping).

The researchers applied artificial intelligence in image analysis

In the large-scale overview study, the scientists used photographs of the faces of a total of 91 patients. Cell surface changes characteristic for GPI anchor deficiencies were detected in some of the participants. Genetic analysis also revealed gene mutations that are typical for this rare group of diseases. “The artificial modelling of gene-typical faces that we achieved with these datasets clearly shows that the computer-aided evaluation of patients’ portraits can facilitate and improve the diagnosis of GPI anchor deficiencies, which is significant progress”, says lead author Dr. Knaus.

With the assistance of combined data from the laboratory and the computer, the authors hope to gain better understanding of the molecular processes involved in such diseases. For example, it was shown that increased blood alkaline phosphatase levels and conspicuous image analysis results provide a reliable indication of a new mutation in a GPI anchor deficiency. Because of the shared molecular causes shown during the research and the similarity of the patients that has now been quantified, Krawitz also advocates using the term “GPI anchor deficiency” for this group of diseases.

Bonn University
https://tinyurl.com/ycq27csx

An eNose is able to sniff out bacteria that cause soft-tissue infections

A recent study conducted at the University of Tampere, Tampere University of Technology, Pirkanmaa Hospital District and Fimlab in Finland has concluded that an electronic nose (eNose) can be used to identify the most common bacteria causing soft-tissue infections.

The eNose can be used to detect the bacteria without the prior preparation of samples, and the system was capable of differentiating methicillin-resistant Staphylococcus aureus (MRSA) from methicillin-sensitive Staphylococcus aureus (MSSA).

Skin and soft-tissue infections are common diseases that need medical treatment. Their diagnosis is usually based on bacterial cultures, but in uncomplicated cases the diagnosis may be made directly based on the clinical presentation of the disease. However, this may lead to empirical antibiotic treatments, i.e. treatments without a specific diagnosis, which may result in longer treatment times, adverse effects and increased costs.

“Our aim was to create a method for the rapid diagnosis of soft tissue infections. If we had such a method, treatment could be started in a timely manner and targeted to the relevant pathogen directly. This would reduce the need for empirical treatments and shorten diagnostic delays,” says doctoral researcher Taavi Saviauk from the faculty of medicine and life sciences at the University of Tampere.

“The portable eNose device we used does not require laboratory conditions or special training, so it is well suited for outpatient use. The results of this study are a significant step towards our goal,” Saviauk continues.

An electronic nose is a device that produces “an olfactory profile” for each molecular compound in the air. The results are analysed by a computer and the system is programmed to differentiate between different compounds. The research group conducting the study has previously shown how an eNose can be successfully used to differentiate prostate cancer from benign prostatic hyperplasia using a urine sample and distinguish between the various bacteria that cause urinary tract infections.

Infection Control
https://tinyurl.com/y8bwvxml

Improving stroke treatment through machine learning

Methods from optogenetics and machine learning should help improve treatment options for stroke patients. Researchers from Heidelberg University have developed a computer vision technique to analyse the changes in motor skills that result from targeted stimulation of healthy areas of the brain. Movements recorded with a video camera are automatically analysed to monitor the rehabilitation process and evaluate and adjust the optogenetic stimulation.

Researchers from the Interdisciplinary Center for Scientific Computing (IWR) in Heidelberg worked with neurobiologists from Switzerland to develop the method.

Along with speech and vision problems, motor paralyses are the most common symptoms post-stroke. According to lead author Dr. Anna-Sophia Wahl, a neuroscientist at the Swiss Federal Institute of Technology (ETH) in Zurich, neurorehabilitation is the only treatment option for the majority of stroke victims. “Many approaches in basic science and in the clinic aim to trigger regeneration processes post-stroke by stimulating healthy brain regions of indeterminate size. However, we use optogenetics to systematically stimulate certain unaffected areas of the brain so that they sprout connections into the damaged hemisphere in order to assume its functions.” So-called corticospinal circuits from the cerebral cortex to the spinal cord are specifically activated.

In optogenetics, light is used to control genetically modified cells. The cooperation partners in Switzerland – researchers from the ETH and the University of Zurich – used optogenetic stimulation in combination with intensive rehabilitation training to restore the paralysed paw function in rats. “Using our automatic evaluation of the movement processes, we were able to demonstrate a full recovery,” explains Prof. Dr. Björn Ommer, IWR researcher and head of the Heidelberg team. The new computer vision technique is able to quantify even the slightest changes in motor functions. “By recording and analysing the movements, we can objectively assess whether there was true restoration of the original function or merely compensation.”

University of Heidelberg
https://tinyurl.com/y778zzk9
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Good hand hygiene – the only way to tackle HAIs

Increasingly, hospitals have been struggling to tackle mutating healthcare acquired infections (HAIs) which continue to affect 1 in 15 hospital patients. The rise in use of antibiotics over the last six decades has meant infections are mutating into new and often untreatable forms.

The new Hygienius MediWash™, an innovative portable hand washing device, has been developed by TEAL Patents – the world’s leading manufacturer of portable hand washing units – to directly resolve this ever-growing problem. TEAL is currently looking to expand its highly-trained network and establish new relationships with international medical equipment distributors to spread the word that the only way to tackle HAIs is through good hand hygiene practice – washing hands with soap under warm running water.

Manty Stanley, managing director of TEAL Patents, says: “Antibiotics have played a front and central role in the fight against HAIs but superbugs are now mutating into more lethal infections.

“It’s widely acknowledged and encouraged by healthcare professionals that, to keep hands clean and infection-free, they must be washed using soap under warm running water. This gold standard of hand hygiene is recognized as the most effective treatment to kill deadly bacteria and infections, 80% of which are spread simply by touch.

“TEAL’s Hygienius MediWash™ includes a built-in video, synchronized with the unit’s delivery of warm water. This enables the user, in just over 37 seconds, to follow the necessary ‘seven hand rubbing routines’ needed to achieve hygienically-clean hands as specified by the World Health Organization.

“We firmly believe that medical professionals, patients and visitors alike, in all hospitals and clinics across the world should have easy access to clean, warm water to effectively wash their hands and ensure hand hygiene takes appropriate importance. Therefore, TEAL is now looking to expand its worldwide offering by partnering with international distributors to provide the necessary care for all.”

Designed to be as accessible as possible, the MediWash™ requires no access to mains plumbing or drainage. Instead, it is an entirely self-contained unit, filled with 20 litres of water and capable of delivering up to 80 hot washes.

Mounted on medical-style castors, TEAL has specifically engineered the MediWash™ unit to ensure it can be taken to the point of need – wherever and whenever a hot water hand wash is needed, limiting the risk of infections spreading.

For more information, or if you’re interested in partnering with TEAL Patents as an international distributor, please visit www.tealwash.com

www.interhospi.com & search 47305
**Depth of anesthesia monitor**

Fresenius Kabi, a healthcare company that specializes in medicines and technologies for infusion, transfusion and clinical nutrition, has received the CE mark for the Conox anesthesia monitor. Conox is a non-invasive depth of anesthesia monitor designed to help anesthesiologists monitor patient brain activity and to rapidly detect how anesthetics are affecting the patient. The Conox anesthesia monitor comprises cutting edge hardware and digital signal processing technology to measure the two main components of anesthesia: the depth of anesthesia and the patient’s reaction to external stimuli. The qCON index of hypnotic effect and the qNOX index for responsiveness are derived from one single forehead sensor recording the EEG. The Conox monitor features an innovative design with easy to use graphical interface, touch screen display and easy to apply sensors. Conox was developed by Barcelona-based Quantum Medical S.L.U., which was acquired by Fresenius Kabi last year. Quantum Medical is focused on the development of non-invasive physiological monitoring and biosignal data processing. Quantum Medical’s non-invasive monitoring competence is an excellent fit for Fresenius Kabi with its anesthetics I.V. drugs and infusion technology. The new Conox device will provide high-quality anesthesia monitoring and enhance the company’s offering in the operating room and intensive care units.

**Mini C-arm extremities imaging system**

The launch of the next generation in mini C-arm imaging, the Fluoroscan InSight FD Mini C-Arm, addresses the continuum of skeletal healthcare. The enhanced system offers a variety of improved features designed to arm orthopedists, podiatrists and clinicians with diversified imaging options, more flexible storage and transport, and an enhanced interface. The Fluoroscan InSight FD Mini C-arm provides high-resolution and low-dose rate modes, which deliver the largest image size and highest image resolution available, on an intuitive 24-inch HD touchscreen. The low-dose rate mode allows physicians to reduce dose rates by up to 50 percent compared to Auto Mode, while continuing to deliver clinically equivalent images. The high-resolution mode enables clinicians to use full detector resolution. The new system also offers MegaView Image in Review Mode, providing clinicians the option to display and view 50 percent larger images. In addition to these imaging upgrades, the system also features hardware updates. These include a streamlined monitor arm with integrated keyboard and reduced top casting that equip clinicians with increased range of motion and positioning options in the operating room. The method for locking the C-arm has also been simplified, reducing the total width of the system in the locked position. Beyond updates to the system’s imaging options and hardware, enhancements also have been made to its interface. These features include a pinch-to-zoom feature, save notifications that allow a way to identify saved images, a save filter to let the clinician filter for saved images, and an auto-save option to save all images acquired during a session. The Fluoroscan InSight FD Mini C-Arm is now available, and options for new software are available for current Fluoroscan InSight FD Mini C-Arm customers.

**Disposable masks for non-invasive ventilation and administration of oxygen**

Now available is a new low cost, disposable short term non-invasive ventilation (NIV) mask that meets high product standards. The new Eagle is a true hybrid mask in the market of short term non-invasive ventilation manufactured with proprietary methods to deliver a low cost NIV mask needed in the emergency medical services market. The mask is made out of an extremely soft material that is specifically made to ensure a comfortable fit and seal. The Eagle mask offers extremely low dead space which translates into less work of breath and comes with four optional swivels: AAV with CO₂ Vented Elbow, AAV only Elbow, Non Vented Elbow and Non Vented Straight. This multi-purpose mask can be used at crash site, pre-hospital transportation, from acute to sub-acute hospital care.
**X-ray detector**

VIVIX-S 1417N is Vieworks’ latest model for addressing busy workflow in medical facilities. A key feature is Vieworks’ automatic exposure detection (AED) function, Anytime, which takes away the need for a cabled connection between the detector and a generator and helps differentiate the detector from competitors. It is well recognized for superior performance in the industry, offering high reliability and high sensitivity without compromising the image quality compared to a DR line trigger. VIVIX-S 1417N is the first Vieworks’ detector to use Near Field Communication (NFC), which allows for quick and easy configuration, so clinicians don’t have to go through complicated settings. Clinicians can also swap batteries without turning off the detector, and dual batteries can cover up to 8 hours. The LED display on the back of the detector indicates whether the panel is in AP mode, and the status of battery and signal strength. The ergonomic and lightweight design gives full mobility as well. VIVIX-S 1417N is also dust- and water-resistant, has enhanced durability with low maintenance costs and offers faster wireless communication, allowing for quicker throughput for mid- and high-tier hospitals. It can also be used as a CR to DR retrofit.

**VIEWORKS**

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**Spectral CT scanner**

Representing an evolution of the original detector-based IQon Spectral CT scanner, the IQon Elite advances the capabilities of its predecessor through a series of key benefits that support emergency/trauma department care and oncology care. This new configuration provides a number of enhanced features, including faster reconstruction speeds and better visualization of bone marrow pathology which increases diagnostic confidence within emergency and trauma departments, providing the opportunity to reduce the need for subsequent scans. The system’s ability to estimate electron density provides enhanced tissue characterization. IQon Elite’s faster
CT platform with expanded range of clinical applications

The two new scanners in the Somatom go. platform – Somatom go.All and Somatom go.Top – now make the mobile workflow available for advanced clinical fields such as cardiology and CT-guided intervention. This mobile workflow operated via tablet enables the user to interact with the patient being closer to him/her. With a rotation time of 0.33 seconds and the Stellar detector technology, the 64-slice Somatom go. All can cover scan ranges of up to 100 millimeters in one second. The 128-slice Somatom go.Top can perform whole-body scans of up to 200 centimeters with a scan speed of up to 175 millimeters per second. Users can deploy the Somatom go. platform’s mobile workflow in advanced clinical fields such as emergency medicine, interventional radiology (steered by Guide&GO, the first tablet-based solution for CT-guided interventions), and even cardiology. The new X-ray tube allows users to adjust the tube voltage in steps of 10 kilovolts while keeping the tube current high – and thus to adapt the settings to each patient’s individual anatomy. Examinations performed at just 70 kilovolts with a current of up to 825 milliamps, for instance, can significantly reduce X-ray dose and the amount of contrast medium required.

Somatom go.Top also offers TwinBeam Dual Energy imaging, which means users can examine the same body region at two different energy levels simultaneously. The technology splits the X-ray beam into two energy spectra before it reaches the patient. With a scan mode that is not different to a routine CT examination, TwinBeam Dual Energy can therefore acquire two image datasets that provide additional information about the tissue. This is particularly beneficial in soft tissue differentiation and for oncology. All scanners belonging to the Somatom go. platform (including the two new additions) are handled via a tablet that can be used to control all routine and advanced examinations. Radiology technologists can thus stay close to their patients during the entire scan preparation process, which makes the experience much more pleasant for the patients, especially if they are children. Further innovative hardware designs are introduced with the Somatom go. platform. After the integration of all computer hardware into the gantry, a new injector arm is now available. This ergonomic solution allows the user to swivel the tablet and the injector around the gantry, flexibly placing them wherever needed.

SIEMENS HEALTHINEERS
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Optional metal artifact reduction software for OnSight 3D extremity system

Carestream Health has introduced a new optional advanced metal artifact reduction software for its OnSight 3D Extremity System which captures high-quality, low-dose 3D extremity exams. This second generation of software provides enhanced flexibility depending on the metal content present and reduces the visual distortion caused by screws, implants, rods and other metal objects to create improved visibility. Image processing can be adjusted and optimized according to the amount of metal present. The software uses information from the original scan to eliminate the need for additional imaging studies, which reduces costs and lowers radiation exposure for patients. An intuitive touch screen interface allows technologists to adjust for either moderate or complex metal content. The metal artifact reduction software can be activated prior to the scan or it can be applied after the original reconstruction is complete. Both the original and corrected images are always available to view and compare. The OnSight 3D Extremity System also assists surgeons in detecting occult and non-union bone fractures. Unlike traditional CT systems, this cone beam CT system has a large-area detector that captures a 3D image of the extremity in a single rotation, which takes only 25 seconds. A patient simply places the injured extremity into a donut-shaped opening in the system. Since the patient’s head and body are not confined, patients do not experience the claustrophobia that often occurs with traditional CT systems. Dose is significantly reduced because only the affected body part is imaged. The compact extremity system can be installed in an exam room and plugs into a standard wall outlet.

CARESTREAM HEALTH
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reconstruction speeds have been shown to enable up to 200 CT patients per day. This is an important benchmark for healthcare facilities experiencing a high volume of patients, especially in the emergency department where CT can be a commonly-used imaging modality. The system’s new radiation therapy planning couch and bariatric table top allow larger patients to be scanned with increased positioning controls.

PHILIPS
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