Tele-ICUs and ambulance telemedicine

Also in this issue

4D imaging: cardiac ultrasound leads the way
Are we ready for the next pandemic?

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by Nova Biomedical  Page 32

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by Siemens Healthcare  Page 33

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by BBS Medical  Page 34
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Optimal management of the ICU: some problems and potential solutions

The costly critical care provided by highly qualified personnel using state-of-the-art equipment in today’s Intensive Care Units demands an increasing proportion of hospital budgets; in the EU this is currently estimated to be about 20% of total hospital expenditure. The number of ICU beds is thus necessarily limited, so optimal throughput of ICU patients is vital. And several recent studies report that a major concern of medical and nursing personnel dealing with critically ill patients is that non-medical factors so frequently impact on decisions concerning ICU patient admission and discharge.

As well as the inevitable frustration resulting from elective operations being cancelled because no ICU beds are available post surgery, there are several highly stressful situations with which medical personnel have to cope. Because of a shortage of ICU beds, emergency room patients may be admitted to a general ward when ICU care is indicated, and patients may remain in a general ward when a deteriorating condition calls for admission to the ICU. These patients may be stabilized prior to transport to another hospital’s ICU, or sometimes (against various national guidelines) patients currently in the ICU are transported to other hospitals so that patients perceived as higher risk can be admitted there.

Is there any way to alleviate bed shortages without augmenting the ICU budget still further? Patients in the ICU are frequently over-treated, aggressively and for longer than is prudent, when there is no hope of recovery; sometimes they have previously requested not to be resuscitated. Life-sustaining treatment is also given to some patients that may confer stability, but will never enable these patients to leave the ICU. And if it is decided that such treatment be finally withdrawn, patients may remain stable for some time before death without needing the intensive care offered by the unit. So there is clearly a need for early discussion between healthcare workers and their patients (or communication with patients’ families if patients are unable to express their wishes) in regard to treatment options.

Patients successfully treated in the ICU could also be discharged to a general ward more promptly if there were better rapport between ICU and general healthcare providers. Recent studies indicate that both the physical barriers separating ICUs from general wards and the perceived communication barriers, particularly between general ward and ICU nursing staff, adversely affected the optimal admission and discharge of ICU patients.
FEATURES

[6 - 11] ULTRASOUND IMAGING
[6 - 7] 4D imaging – Cardiac ultrasound leads the way
[8 - 9] Advanced ultrasound imaging: user experience makes the difference
[10 - 12] Ultrasound imaging news

[13 - 20] INTENSIVE CARE
[13] Are we really ready for the next pandemic?
[14 - 16] High-speed communications and healthcare – Tele-ICUs and ambulance telemedicine
[17 - 18] Intensive care news
[19 - 20] Blood conservation with a patient dedicated arterial blood gas analyser

[21 - 22] AIRWAYS MANAGEMENT
[21 - 22] Video laryngoscopy – ease of use and quick training drive acceptance

[23 - 26] HEALTHCARE REFORM IN LATIN AMERICA
Abstracts of papers published in the 2nd 2015 issue of World Hospitals and Health Services, the official journal of the International Hospital Federation

REGULARS

[3] Editor’s letter
[27-29] News in brief
[30] Industry news
[32-34] Product news

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4D imaging: cardiac ultrasound leads the way

The transformation of imaging from diagnosis to intervention has been among modern medicine’s major recent breakthroughs. Indeed, over the past two or three decades, the frontiers of interventional procedures have been extended dramatically by increasingly powerful imaging systems with ever-higher resolutions.

Today, the emerging field of 4D (four-dimensional) imaging promises clinicians a host of new possibilities.

Time and motion
4D imaging consists of the three spatial dimensions as well as the element of time. It projects a cinematographic, motion picture view of an organ or a specific part of an organ, and is emerging as the next generation in advanced imaging applications. Leading imaging vendors already offer 4D imaging products - across all modalities, PET/CT, MRI and ultrasound.

Real-Time 3D and 4D
Many users deploy the terms 3D and 4D in conjunction. These include technical initiatives such as DICOM (Digital Imaging and Communications in Medicine), which seeks to standardize the handling, storing, printing, distributing and viewing of medical imaging. DICOM's latest Strategy Paper (revised in August 2015) refers to “3D/4D” image exchange and “3D/4D data.”

Some, mainly in industry, refer to 4D as ‘real-time 3D’. Examples include a recent Japanese initiative to build the world's first ‘real-time 3D’ optical coherence tomography (OCT) system, or specialized imaging visualization and infrastructure vendors such as Emageon in the US.

Ultrasound and 4D imaging
In spite of efforts in fields like OCT, most 4D applications in use today involve ultrasound. A DICOM working group paper on whole-slide imaging provides a snapshot of state-of-the-art for supporting multi-frame modalities at the end of 2009. These were identified as “functional MRI, PET scans (and) 3D/4D ultrasound.” One year previously, DICOM approved Supplement 43 to address exchanging 3D/4D datasets between different vendors. These were specific to ultrasound. So too was the case with IHE (Integrating the Healthcare Enterprise), which published a White Paper on 3D/4D Workflow in August 2011.

In the near future, a fully defined DICOM standard for the file format of 4D ultrasound will be crucial to its takeup. So too would IHE efforts on workflow. Like other technologies, the fastest track to acceptance of 4D ultrasound would be its ability to streamline, modify and shorten workflow pathways.

The close connection between 4D and ultrasound dates back to cutting edge efforts in the early 1980s, when a Duke University team determined that although MRI was faster, ultrasound was the closest to “achieving 3D real time acquisition.” The researchers, led by Dr. Olaf von Ramm, developed a single-transmit, multiple-receive ultrasound scanner called Explosocan to increase data bandwidth.

Other imaging modalities
Nevertheless, there is growing research interest on the use of 4D in other imaging modalities, especially when they make a difference in highly specific areas. These, however, still mainly concern diagnosis, above all for cancer.

For instance, the clinical impact of 4D PET has been studied in characterizing solitary pulmonary nodules, while 4D CT seems to offer significant promise in areas such as respiratory gating of tumours in lung cancer, and determining treatment margins for advanced pancreatic adenocarcinomas. 4D MRI, too, has been studied for tumour imaging, based on its superiority to CT in soft-tissue imaging and in terms of radiation.

4D and cardiology
While 4D PET/CT and MRI have shown their principal relevance so far to be in oncology, 4D ultrasound is highly relevant for cardiology. Indeed, cardiologists were early adopters of 3D ultrasound and the 2011 IHE White Paper on workflow mentioned above was authored by its Cardiology Technical Committee.

One expert notes that cardiology “is all about temporal resolution” and has prospered in the imaging world “because it provides immediate return on diagnostic information.” In this specialty, ultrasound also has some innate advantages over other modalities - above all, CT. Unlike the latter, ultrasound provides a real-time assessment of heart function and enables clinicians to see the entire heart - not “stitch it together or use some other type of post-processing technique in order to see what’s going on.” Compared to magnetic resonance, ultrasound is also relatively inexpensive and does not have gating problems. Last but not least, (mobile) ultrasound devices can be transported to the patient.

Efforts are however still being made to assess the role (and potential advantages) of MRI in certain cardiovascular applications - such as 4D flow MRI in hemodynamics. One US study in 2014 sought to evaluate cardiovascular blood flow in multiple organ systems and vascular territories, in order to “better understand altered hemodynamics in patients with cardiovascular diseases” and help to improve patient management and monitoring of ther-
apectic response. In Germany, Philips has sought to demonstrate 4D cardiac imaging with its Ingenia 3 Tesla MRI system.

4D remains novel
As mentioned earlier, many users refer in tandem to 3D and 4D imaging. This is both due to the newcomer status of 4D and the fact that, while 3D was developed as a means to provide superior imaging to 2D, 4D did this even better.

4D’s novelty is best indicated by an editorial in ‘The Journal of the American College of Cardiology’ which still observed the role of “2- and 3-dimensional coronary mapping” in high-resolution digital imaging to aid interventional procedures. The editorial was published as recently as 2009.

Technical challenges
Before 4D imaging attains its full potential, some technical challenges need to be addressed. The bulk of these concern the massive amounts of data required by 4D. It is likely that cardiologists of the future will use graphics processing units (GPU) with multiple processing cores for 4D cardiac MR and ultrasound images.

4D ultrasound and babyface imaging
Interestingly, the underlying technology for 4D ultrasound in interventional cardiology has the same heritage as those used by obstetricians now offering expectant parents superior ‘baby-facing’ - the chance to see “moving 3D images” of their baby, “with time being the fourth dimension.” Indeed, the only difference between cardiac 4D ultrasound and its obstetrics cousin consists of some algorithms.

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The future: hold the beating heart
In 2015, healthcare technology giant GE released new software for its ultrasound machines called cSound. cSound-equipped machines intelligently process data being returned by an ultrasound signal, analyzing a DVD’s worth of data (almost 5 gigabytes) every second, and filtering the data on a pixel-by-pixel basis using algorithms to produce real-time 4D views of organs.

cSound extends pioneering efforts by GE in the 4D ultrasound area. This is symbolized by Spatial Temporal Image Correlation (STIC), a GE-patented technique dating to the early 2000s which allowed for the quick capture of a full fetal heart cycle beating in real-time.

The impact of cSound is dramatic. One cardiologist using cCloud notes that the images are clear enough to allow him observe how blood swirls around clots in arteries. “I can use it to measure the severity of blood leakage around the valves and assess the damage,” he says. “What that allows us to do is to look at the heart as if you have lifted the heart outside of the chest and it is in your hand.”

New frontiers in cardiology
4D ultrasound is also reaching to other areas of interventional cardiology such as the percutaneous closure of large atrial septal defects, for alcohol septal ablation, for mitral balloon valvuloplasty and for percutaneous mitral valve repair.

One of the proponents of 4D ultrasound for structural heart disease is Ernesto Salcedo, MD, an associate professor of medicine and director of the Echocardiography Laboratory at the University of Colorado Hospital, Denver, which has been using 4D transesophageal echocardiography (TEE) for over eight years.

According to John Carroll, director of the Cardiac and Vascular Center at the the University of Colorado Hospital in Denver, the biggest constraint with 2D medical imaging consisted of the fact that interventional cardiologists had to “take two images and process them in your own brain to really understand that you are looking at a 3D object.”

Now, according to Dr. Carroll, 4D has become important “in all cardiac work because the heart is obviously very dynamic and many of our problems, both diagnostic and interventional, are related to motion.”

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The standardization project DICOM (Digital Imaging and Communications in Medicine) has several working groups making specific aspects of 4D imaging in general, and ultrasound in particular. Working Group (WG) 12 is wholly dedicated to maintaining/ extending the DICOM Standard to future needs of the ultrasound and echocardiography specialties - including 4D data exchange and workflow.

One specific area of activity is the “large size of 3D/4D data”, where it is seeking to develop enhanced volumetric compression standards.

WG 12 highlights cardiology applications demanding specific attention.

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Advanced ultrasound imaging: user experience makes the difference

Low in cost and high in diagnostic value with applications that cover nearly every tissue in the human body, medical ultrasound has become one of the most popular imaging exams worldwide — and not just among healthcare professionals. Its popularity is likely to grow in coming years as practitioners look for ways to reduce costs while improving quality of care. The clinical and cost-saving potential of ultrasound might be better realized if the systems were more efficient and easier to use. Even though the clinical capability of ultrasound has increased remarkably over the last decade and a half, the operational aspects of ultrasound scanners have failed to keep pace with technological advances. Their computing architecture remains based on central processing units. Consoles are still relying on knobs, pods and trackballs. As a new entrant in the ultrasound arena, Carestream was free to seek higher value from leading edge technologies, building a computer architecture based on graphics processors, a touch screen and mechanical innovations that let the sonographer choose the best position for performing exams. International Hospital talked to Fabrizio Benigni about the CARESTREAM Touch Ultrasound System unveiled at RSNA 2014 and ECR this year.

Q. Why has Carestream entered the ultrasound business at this time?
Carestream investigated this market and found many unmet customer needs where we believe we have an opportunity to make things better. The radiology ultrasound market is growing as more imaging is shifting to the non-radiation modality of ultrasound. Carestream can innovate in this space and it represents an opportunity for growth and expansion of our business while utilizing our sales and service infrastructure that we currently have in place.

Q. What segments will Carestream be addressing?
Carestream will initially be entering the premium general imaging/radiology market. The product will be used in the Radiology department. Thus it was designed with a small footprint and advanced solutions from an ergonomic and workflow point of view so that it can easily be transported to image patients in other areas such as the ICU, NICU, Emergency Department, Operating Room, and Labour & Delivery. Last but not least, its imaging capabilities and wide range of probes will make the difference in a wider number of applications.

Q. What is the current product range and what are the intentions moving forward?
This is the first in a family of ultrasound products built with the same innovative architecture and differentiated by imaging performance and specific software features. The first product will compete in the premium tier and future releases will include mid and value tier offerings.

Q. What are the significant differentiating features of the Carestream products vs the offering of other vendors?
One of the unique product features is the All-Touch control panel. The panel provides familiarity to the user with etched-patterned primary controls that provide tactile feedback but also has the flexibility of configurable secondary controls. Its sealed, flat surface is easy to clean and the configurable controls allows for easy upgrading to the latest features and functionality.
There are a number of additional user features that set it apart from the competitors including:

- High-level computing power providing both speed and excellent image quality;
- Easy manoeuvrability and a small, lightweight footprint making the imaging process faster and easier;
- The “Swipe and go” badge log-on which saves time and promotes secure access;
- The “Smart connect” transducer technology that enables easy one-touch selection of the desired transducer;
- Cold boot time of an unprecedented 18 seconds to further enhance productivity, with no need for standby mode or battery backup; and
- Easy cart adjustments to allow sonographers to position the system where it is most comfortable to help reduce repetitive stress injuries.

Q. Can you tell us a bit about how the product was designed?

First of all by applying Voice of Customer to create a smarter solution; then the design process had the benefit of utilizing the best-in-class strategic suppliers. Because Carestream is new to the market and unhindered by legacy products, we chose to work with a combination of best-in-class suppliers, state-of-the-art technology and our own design innovation team to enable us to get to the market very quickly with a unique product that addresses the unmet needs of ultrasound professionals.

Q. What are Carestream’s mid term sales objectives for this new product line?

The initial primary markets will be the United States and Canada and Europe. We will expand to other regions soon.
Ultrasound pilot study shows positive results for treatment of pancreatic cancer

Tiny gas microbubbles can enhance the delivery and absorption of cancer drugs in patients with advanced pancreatic cancer, according to a new pilot study. The study was described at the International Contrast Ultrasound Society (ICUS) annual conference in Chicago.

One year after their last treatment cycle, two of 10 patients are still alive. 74 percent of pancreatic cancer patients die within the first year of diagnosis. The average life expectancy after diagnosis with metastatic pancreatic cancer is just three to six months.

“Our early findings suggested that commercially-available ultrasound microbubbles, combined with a standard chemotherapy drug, might prolong survival in pancreatic cancer patients,” according to Odd Helge Gilja, M.D., head of National Centre of Ultrasound in Gastroenterology at Haukeland University Hospital, in Bergen, Norway.

The pilot study included 10 patients with inoperable tumours, and preliminary results in 2014 showed that tumour size was reduced or growth was slowed in the patients, according to Gilja. “The patients treated with ultrasound sonoporation were able to undergo significantly more treatment cycles than those receiving standard chemotherapy. Additional studies are planned to confirm and potentially extend the results,” he said.

“The findings are extremely exciting because this study appears to represent the first time ultrasound microbubbles have been used in patients for drug delivery,” according to Steven Feinstein, M.D., co-president of ICUS and a professor of medicine at Rush University, Chicago. “If further studies confirm the Bergen findings, ultrasound microbubbles could prove to be an innovative platform option for delivery of drugs and genes to treat other cancers and a wide variety of medical abnormalities throughout the body,” he said.

Gilja reported that all 10 patients who participated in the pilot Phase I study received an infusion of a standard chemotherapy drug, gemcitabine, followed by an infusion of a microbubble contrast agent. A customized commercial ultrasound scanner was then used to confirm the presence of the microbubbles in the vicinity of the tumour and to induce “sonoporation,” a transient opening and resealing of cell membranes to allow for enhanced delivery and absorption of the cancer drug. Tumour sizes were confirmed by computed tomography (CT) imaging, according to Gilja.

Three ultrasound contrast agents — Definity (Lantheus Medical Imaging), Optison (GE Healthcare) and Lumason (Bracco Diagnostics) — are available in the United States but are approved by the U.S. Food and Drug Administration for cardiac imaging only.

http://tinyurl.com/oxtw5e9

Robotically steered flexible needles navigate tissue

Robotically steering flexible needles can reach their intended target in tissue with sub-millimetre level accuracy. This has been demonstrated by the doctoral research of Momen Abayazid, who is affiliated with the research institute MIRA of the University of Twente. A major advantage of steering flexible needles is that one can avoid obstacles or sensitive tissues and can re-orient the path of the needle in real time as you insert the needle.

During many diagnostic and therapeutic procedures a needle is inserted into soft tissue, such as during biopsies, or inserting radioactive seeds in order to combat prostate cancer. In many of these operations the accurate positioning of the needle is of the utmost importance. In general, rigid needles with a relatively large diameter are used in these procedures. However, the drawback of these needles is that they cannot be manoeuvred when inserted into tissue and hence cannot avoid any obstacles. In addition, the tissue and organs deform during needle insertion. As a result, the needle often misses its target.

The University of Twente is the only research involved the development of the robotic test-bed and the control that guides the needle as well as the 3D needle localization algorithm using ultrasound images. In order to promote the acceptance in clinical practice and to combine the robotic system's accuracy with clinical expertise, Mr. Abayazid also developed a system that allows the clinician to have control. In this version the clinician inserts the needle, while being given guidance and cues by the robotic system with the help of vibrations and visual feedback. Thanks to such a “shared-controlled” system it could be possible in the future for the needle to be guided by a clinician who is in a different location than the patient. For example, the researchers have successfully guided the needle located in Enschede, Netherlands from the city of Sienna, Italy.

Finally the developed system has been integrated with an ultrasound-based, automated breast volume scanner (ABVS). By combining the proposed system with a robotic, clinically approved ABVS system it is possible to bring robotic needle guidance from the research lab to the operating room.

MIRA Institute of Twente University
http://tinyurl.com/ogd4q8m

Ultrasound-based vasculitis diagnosis may save vision

The implementation of a “fast-track” clinic with rapid ultrasound assessment for patients with suspected giant cell arteritis led to a dramatic decrease in permanent visual impairment, a Norwegian study found.

Among 32 patients evaluated conventionally using biopsy of the temporal artery and 43 assessed with the fast-track ultrasound approach, 18 patients -- nine patients in each group -- experienced visual disturbances typical of giant cell arteritis, such as diplopia, blurred vision, and amaurosis fugax, according to Andreas P. Diamantopoulos, MD, PhD, of the Hospital of Southern Norway Trust in Kristiansand, and colleagues.
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Yet six patients in the conventional group (21.5%) experienced permanent visual loss compared with only one assessed with the fast track ultrasound approach (2.4%), with what was an 88% lower rate (RR 0.12, 95% CI 0.01 to 0.97, P=0.01), the researchers reported online in Rheumatology.

“Our data indicate that the fast-track clinic including a rapid assessment by ultrasonography may significantly reduce the risk of permanent visual impairment in giant cell arteritis patients,” they observed.

Giant cell arteritis is the most common of the primary vasculitides, most often affecting individuals older than 50. One in five patients are thought to experience irreversible vision loss, and high-dose steroids are the treatment of choice.

The gold standard for diagnosing the condition has been biopsy of the temporal artery, with confirmation being provided by a positive response to corticosteroid therapy. However, the inflammation of the artery typically is segmental and so can be missed if the biopsy needle is inserted in areas unaffected by the vasculitic process.

In addition, delay in obtaining the biopsy is common and clinicians may hesitate to prescribe corticosteroids in high doses to older patients, yet speed is of the utmost importance as vision loss can occur rapidly.

“The fast-track approach has been introduced in several fields in medicine with remarkable success in reducing mortality, morbidity, and inpatient days of care. Rapid initiation of treatment improves outcomes in rheumatoid arthritis through the utilization of the window of opportunity,” the researchers noted.

Medpage Today
http://tinyurl.com/p4p7zld

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**Study shows ultrasound to detect early signs of preterm labour**

Researchers from North Carolina State University, Institut Langevin and Paris-Descartes University have conducted a proof-of-concept study that raises the possibility of using ultrasound techniques to detect cervical stiffness changes that indicate an increased risk of preterm labour in pregnant women. While additional work needs to be done, it may ultimately give doctors a new tool for determining when to provide treatment that can prevent preterm birth.

Premature births can mean low birth-weights and other medical problems for newborns, but there are steps that doctors can take to reduce the chances of premature birth if early warning signs are detected. One of those early symptoms is a softening of the cervix. Traditionally, this stiffness is assessed by manually palpat ing the cervix.

“But that's a subjective measure, and we wanted to determine if ultrasound could be used to quantitatively assess how stiff the cervix is – and, by extension, whether a woman is at risk of going into labour prematurely,” says Marie Muller, an assistant professor of mechanical engineering at NC State and lead author of a paper describing the work.

Muller and her colleagues decided to try a technique called shear wave elastography (SWE), which was developed to assess tissue stiffness for cancer diagnosis. They reasoned that if SWE worked for detecting changes in other body tissues, it may also work for detecting changes in the cervix.

Working with a maternity hospital in Paris, the researchers did SWE measurements of 157 pregnant women who were already scheduled for ultrasounds. The researchers then followed each patient's pregnancy.

The researchers found that patients between 24 and 35 weeks pregnant who had below average cervical stiffness were at higher risk of going into preterm labour.

In SWE, stiffness is measured based on how fast a mechanical shear wave propagates through the tissue. What the researchers found was that if the wave was more than one meter per second below the baseline for a woman's gestational age, or how far along she is in her pregnancy, the woman was more likely to have a preterm birth.

“This work is only a first step,” Muller says. “We know the technique is reproducible. We know we can measure these changes in cervical stiffness. However, we need to do a longitudinal study that follows patients throughout pregnancy. That would give us a better understanding of how cervical stiffness changes over the course of pregnancy — and that would help us determine which changes are likely indicative of early onset labour.” Muller also notes that, while the SWE technique uses high-end ultrasound equipment, the equipment can be used for normal prenatal examinations as well as SWE assessments of cervical stiffness, which would hopefully mitigate any additional cost.

North Carolina State University
http://tinyurl.com/neusxvj
Are we really ready for the next pandemic?

Pandemics - derived from the Greek pandemos (affecting all people) - are not new events, but have occurred sporadically throughout history. These large, infectious epidemics threaten not only global health but can also have catastrophic social, economic and financial effects. Given the periodic nature of pandemics, we know there will be another one sometime, we just don’t know exactly when…. Perhaps already next winter? Perhaps not for several years? The serious potential consequences of pandemics and the fact that we don’t know the precise date means that it is essential that we are ready now - logistically, clinically, and at a research level - in anticipation. During the recent World Federation of Societies of Intensive and Critical Care Medicine (WFSICCM) meeting in Seoul, we had detailed discussions on pandemic preparedness and have had good interactions with the World Health Organization (WHO). If we are all prepared, the problem can be identified rapidly and the WHO can quickly involve the relevant governmental organizations, which can then react appropriately. The WFSICCM is well-equipped to provide management guidelines, to be able to quickly launch a clinical trial on a new treatment, and to provide help to doctors on the ground.

by Prof Jean-Louis Vincent

Ebola disease was catastrophic in a number of aspects, and yet it was responsible for “only” around 12,000 deaths, a death toll probably comparable to the H1N1 epidemic in 2009 (the number of deaths from influenza is difficult to estimate for a number of reasons), less than in most other flu pandemics, and nothing compared to the millions of deaths from the so-called Spanish flu in 1918. For the intensivist, the Ebola disease outbreak has had limited implications, not only because intensive care units (ICUs) are poorly developed in central-western Africa, but because few patients could actually benefit from ICU management. What about viruses that lead to severe respiratory failure, like the Middle East respiratory syndrome coronavirus (MERS-CoV), severe acute respiratory syndrome coronavirus (SARS-CoV), or another Influenza virus? The major difference from the previous large Influenza pandemics in 1957 (“Asian influenza”) and 1968 (“Hong Kong influenza”) is in the progress of intensive care medicine. Advances in our ventilators and the way we use them and development of extracorporeal membrane oxygenation (ECMO) have definitively changed the way we treat the most severe forms of respiratory failure, and provided us with means of improving survival rates for many patients.

Although our ICUs are already almost full without additional strains imposed by an epidemic, we can expand and transform high-dependency units and other recovery rooms, and even general wards, into ICUs. Triage will also play an important role so that access to sophisticated care is restricted to patients with limited reserves or serious co-morbidities who will really benefit. The most serious problem, though, will arise when all the available ventilators in the hospital are in use; and for the most severe cases, our limited number of ECMO machines will rapidly be saturated. What are our options then? The industry may be able to rapidly produce more material for hospitals to purchase and install? But this will be a limited solution? Ultimately, we may have to discontinue ventilatory support in patients who do not seem to be improving over time or in those with a degree of frailness or co-morbidities? Ethically, the principle of “first-come, first-served” is not acceptable – neither is a lottery-based selection process but discontinuation of life-support in some patients also raises difficult ethical and moral dilemmas. Such decisions will be influenced by cultural and religious background and will be more difficult in some countries/communities than in others. Of course every patient should be considered identically, according to the principle of justice. But, what if the medical director asks us to try to provide the equipment for his/her partner or best friend? What if it’s the minister of health who is asking, or our colleague, the wealthiest or most famous person in our country, or simply our own loved one? And if a decision is made to forgo life-support so that someone else can benefit, how do you explain the reasons to that patient's relatives? These scenarios raise terrible ethical questions, but, although we may hope that we never have to face them, they need to be discussed openly now, so that if the situation arises, we are prepared. The timing, origin and magnitude of the next pandemic are uncertain. What is certain is that we all need to be prepared at the local, national and global level. Importantly, as we develop or adjust existing action plans, the difficult ethical issues that are likely to arise must also be discussed.

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High-speed communications and healthcare - Tele-ICUs and ambulance telemedicine

The communications revolution has opened up dramatic possibilities for healthcare delivery across physical/geographical boundaries. Telemedicine, once held up as a miracle, and then seemingly forgotten, has been making a comeback in one of the most challenging frontiers of modern medicine - the ICU.

High-speed communications have also paved the way for ambulance-based telemedicine.

**ICU Telemedicine**

*Video observation and advanced algorithms*

The greatest benefit of ICU telemedicine or Tele-ICU care involves continuous surveillance and interactive care by off site clinicians. This is achieved by direct video observation of the patient and interrogation of ICU equipment. Advanced computer algorithms, based on clinical data available in a patient’s electronic medical record, issue alerts to evaluate critically ill patients. They include multi-variable vital signs algorithms to identify clinical patterns, as well as algorithms to monitor when the care process deviates from accepted standards.

**Centralized and decentralized models of Tele-ICUs**

According to a recent publication, Tele-ICUs can be organized either centrally, or in a decentralized manner. In the centralized model, the telemedicine centre is a specific location from where physicians and nurses provide different hospitals with 24x7 care. The decentralised model is organized with the ICU at the centre, and telemedicine expertise is provided from multiple locations.

**The US leads the way**

Tele-ICU has taken off sharply in the US, compared to negligible development, until very recently, in Europe. The growth of ICU telemedicine in the US is mainly due to the fact that “access to on-site intensive care specialists is limited for the volume of intensive care being undertaken.” The US has 5,500 intensivists - “not enough for each hospital to have one, and many hospitals could use more than one,” notes Teresa Rincon, chair of the Tele-ICU Committee of the Society of Critical Care Medicine (SCCM).

A recent article in ‘Critical Care Medicine’ estimates that the number of US sites using remote monitoring has risen exponentially - from 16 (0.4% of total) in 2003 to 213 (4.6% of total) in 2010. The number of ICU beds covered by telemedicine during the period rose from 598 (0.9% of total) to 5,799 (7.9% of total). Overall, Tele-ICU is now a key component of healthcare delivery for 11% of critically ill US adults.

The ‘Critical Care Medicine’ article also found that hospitals adopting ICU telemedicine were more likely to be large, teaching and located in metropolitan areas. Although more studies are needed, there is evidence of an association of the Tele-ICU with lower mortality and shorter length of stay in both the ICU as well as the hospital. Another benefit is that a Tele-ICU enables stricter adherence to guidelines.

**Telephone consultation is not telemedicine**

Formally, the umbrella Critical Care Societies Collaborative in the US does not consider more general remote interventions such as telephone consultation or medical education to constitute ICU telemedicine.

In Europe, on the other hand, ICU telemedicine consists almost wholly of teleconsultation, by virtue of which a remote intensivist has access to a patient’s electronic medical record and radiology system and provides guidance to staff at the ICU. Given differences between Europe and the US in the delivery of critical care, in intensivist staffing and in population distribution /access times for reaching ICUs, the potential for Tele-ICU in Europe is generally limited only to those ICUs lacking 24/7 intensivist coverage. One study in the Netherlands sees hospitals as already having high standards of quality and unlikely to see the “enormous” investment entailed by a tele-ICU as being cost-effective.

Europe taking Tele-ICU lessons from US

Nevertheless, Europe is closely watching the US experience with Tele-ICUs. For example, the Netherlands study mentioned above provides a detailed analysis of the US experience to make an assessment of Tele-ICUs. Britain’s NHS too refers wholly to
US studies on ICU telemedicine in its own Technology Enabled Care Services (TECS) Evidence Database, while the University of Pittsburgh Medical Center has opened a Tele-ICU centre in Italy, which allows US physicians to perform remote consults for Italian ICU patients.

Guy’s and St Thomas establishes first European Tele-ICU

Guy’s and St Thomas’ NHS Foundation Trust in the UK recently became Europe’s first to commit to Tele-ICU, in the sense that the term is used in the US. The Trust first aims to determine the impact of ICU telemedicine “on staff, patients and families, and of relationships between its development, implementation and routine use.

The system targets a minimum of 65 ICU beds with the aim of expanding if required to 120 ICU beds, with patients monitored remotely and round-the-clock by intensivists using proprietary clinical software and tools, such as two-way audio and high definition video.

EU efforts in ICU telemedicine

The European Commission, on its part, has sought to catalyse the development of Tele-ICUs. It is financing a programme to develop software to create a “technologically advanced cockpit in which a team of doctors can remotely support and advise various intensive care units.”

The EU project is called THALEA (Telemedicine system to meet the demands of Hospitals concerning early warning Assisted by innovative ICT for Life saving co-morbid patients in Europe As part of a patient personalized care program). It involves eight partners from academic hospitals and government bodies in Germany, the Netherlands, Spain, Belgium and Finland.

Doing the numbers for Tele-ICU

In the longer run, the success of Tele-ICUs will depend on economic considerations. Indeed, one of the first goals of Guy’s and St Thomas’ NHS Foundation Trust is to conduct a trial to assess the economic impact of ICU telemedicine.

Some hospitals in the US have collided harshly with reality, “removing tele-ICUs after outcomes failed to justify the costs.” Concerns have also been echoed in Canada, where critical care clinicians express significant scepticism regarding the ability of a Tele-ICU to address challenges of human resource limitation and deliver quality care. In Australia, a study found that the benefits of ICU-telemedicine systems remain unclear “but at least the systems appear safe.”

The numbers are still inconclusive, and are likely to remain so for some time. In 2012, a study published in the journal ‘Chest’ found that Tele-ICUs cost hospitals anywhere from 50,000-100,000 dollars (45,000 to 90,000€) per bed in the first year of operation. According to Dr. Gaurav Kumar, a fellow at the University of Iowa and lead author of the study: Whether this invest-

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ment pays off in the long run by improving ICU patients’ care and saving money, “we don’t know.” However, for Tele-ICU programmes to be sustainable, “hospital administrators will demand rigorous financial analyses of budgetary impact.”

Dr. Richard Lofgren, senior vice president and chief clinical officer of the University HealthSystem Consortium, an association of non-profit hospitals, was more optimistic. If a hospital spends 70,000 dollars (62,000€) a year on telemedicine, that works out to little less than 200 dollars (175€) per day, per bed, he noted. “It doesn’t take much of a reduction in length of stay...or a reduction in complications” to offset this in an environment that is as expensive as an ICU.”

Ambulance-based telemedicine

The communications revolution has also made ambulance-based telemedicine a reality. Here, Europe is on par with, if not ahead of the rest of the world. In the US, Tucson (Arizona), the first citywide ambulance telemedicine network, was shut down in 2011 due to budgetary problems. The network covered all city-owned ambulances, and allowed emergency and trauma physicians to triage cases remotely. The system did have limitations, notably the range and reliability of WiFi, with consultations taking place in 20-30 second transmissions when ambulances were not in motion.

More recently, other ambulance-based telemedicine systems have been launched in other parts of the US. However, as in Tucson, the weakest link in the chain is the ability of a pre-hospital vehicle to maintain reliable wireless data connectivity.

Ambulance-based telemedicine initiatives in Europe

In Europe, the LiveCity project seeks to assess telemedicine in the pre-hospital environment. One study by LiveCity investigated the role of ambulance-based telemedicine in stroke management, trauma and myocardial infarction, and concluded that overall, telemedicine had a positive impact on emergency medical care. “It improved the pre-hospital diagnosis of stroke and myocardial infarction and enhanced the supervision of delivery of tissue thromboplasminogen activator in acute ischemic stroke.” The study noted that wearable technology such as head-mounted displays may improve early pre-hospital diagnosis and that consideration should also be given to incorporating smartphone technology into emergency systems to facilitate patient or bystander incident reporting.

In 2012, a Danish study showed that calling emergency services allows pre-hospital triage and transport to the most appropriate hospital for cardiac patients. The key lay in digital transmission of an ambulance electrocardiogram (ECG) to the attending cardiologist at the hospital with the balloon capacity “who can decide if the patient needs balloon treatment.”

More recently, researchers in Belgium equipped an ambulance with real-time bidirectional audio-video communication, automated transmission of blood pressure, heart rate, blood oxygen saturation, glycemia and electronic patient identification. Their findings, published late last year, were encouraging: pre-hospital teleconsultation was obtained in 95% of cases. Preliminary pre-hospital diagnosis were formulated in 90% cases, with satisfactory agreement on final in-hospital diagnoses. However, as in the US, failures resulted from limited mobile connectivity and the authors of the study recommended further research, especially with regard to high speed broadband access, before implementing ambulance-based telemedicine in daily practice.

In Italy, a telemedicine platform called FacileCare has been developed for air ambulances to enable collection of patient clinical data and dispatch this to a ground station in order to improve the quality and timeliness of emergency care. Structured data collection sheets (dataset) allow for inclusion of information about the patient (vital signs, administered drugs etc.) and the type of intervention performed (e.g. in case of cardiopulmonary arrest, stroke, chest pain, etc.). This is transmitted by a UMTS network to the medical staff receiving the patient, enabling them to be prepared in advance.

The opportunities in ambulance-based telemedicine are squarely in the sight of some telecoms companies. Vodafone, for example, has equipped ambulances in different European countries with a telemedicine solution. This enables paramedics to transmit medical parameters and video images to hospital A&E departments ahead of arrival, enabling more timely and case-effective care. The solution was installed recently in 73 cities and 26 counties in Romania.
Algorithm interprets breathing difficulties

Researchers from North Carolina State University have developed an efficient algorithm that can interpret the wheezing of patients with breathing difficulties to give medical providers information about what’s happening in the lungs. The research is part of a larger, ongoing project to develop wearable smart medical sensors for monitoring, collecting and interpreting personal health data. The work was done by Saba Emrani and Hamid Krim, researchers in the National Science Foundation Nanosystems Engineering Research Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies.

“Researchers at ASSIST have developed wearable sensors that are powered by a patient’s body heat and can monitor the sound of a patient’s breathing,” says Krim, a professor of electrical and computer engineering at NC State and senior author of a paper on the work. “Now we’ve developed an algorithm that can assess the onset time, pitch and magnitude (or volume) of wheezing sounds to give healthcare professionals information about the condition of the lungs. This information, in turn, can be used to help doctors make more informed decisions about diagnosis and treatment.”

Wheezing sounds vary depending on where the problem is in the lungs and on the severity of the problem, Krim explains. The algorithm accounts for these differences to tell doctors exactly what is going on. “The algorithm is effective regardless of the physical size of the patient,” Krim says, “and is able to handle the variability and complexity associated with breathing patterns.”

Because the algorithm was developed to work in concert with wearable technology, the goal is for it to ultimately be used to continuously assess the sound of a patient’s breathing over time. This would make it possible for doctors to monitor breathing under a patient’s real-world, day-to-day conditions.

Here’s how the system is eventually supposed to work: sensors that monitor breathing transmit information to a smart device, such as a smartphone. That data is then run through the algorithm. If the algorithm finds that there is a breathing problem, the smart device could then notify the patient and his or her medical provider. Moreover, due to the low computational cost of the algorithm, the long-term goal is for it to be implemented on the sensor device itself. The sensor would then transmit an alert to the smart device only if it detects a problem. But while researchers have come a long way, they still have challenges to address. “We have the sensors and we have the algorithm – and we know that they work – but we haven’t yet integrated them into a smart device. That’s next,” Krim says. “We’re currently weighing whether to modify the sensors so that they can run the algorithm and transmit only if there is a problem, or to maintain the current approach of having the sensor transmit all of the data so that the smart device runs the algorithm. ASSIST is also working to develop sensors that can operate wirelessly, so that the sensors don’t need to be physically connected to the smart device.”

North Carolina State University
http://tinyurl.com/p7xeu8

New drug against death by sepsis and ARDS

Scientists at Queen’s are developing a potential revolutionary new treatment for Sepsis and Acute Respiratory Distress Syndrome (ARDS), which are among the leading causes of death in hospitalized patients in the UK. Currently, there are no effective treatments available for these life threatening syndromes.

The novel anti-inflammatory drug, SAN101, is being developed by a team of scientists and clinicians at the School of Pharmacy and the Centre for Infection and Immunity at Queen’s, alongside colleagues at Trinity College Dublin (TCD). It is the result of an initial discovery made over 6 years ago at Queen’s. Pre-clinical results have been recently published.

Sepsis is one of the most frequent cause of death in hospitalized patients, with an estimated 19 million cases worldwide every year and around 8 million deaths. The team at Queen’s have developed a nanoparticle that binds to immune cells in the body and inhibits the excessive cycle of inflammation which drives the development of sepsis and ARDS. This new approach has the potential to reduce the impact of sepsis and ARDS in acutely ill patients.

Professor Chris Scott from Queen’s School of Pharmacy said: “Through this research we are well on the road to developing a medical treatment for sepsis and ARDS. “Sepsis arises when the body’s immune system goes into overdrive, setting off a series of reactions including widespread inflammation. This inflammation can lead to a significant decrease in blood pressure, which inhibits blood supply to vital organs and can lead to multiple organ failure.

“A frequent complication of sepsis is ARDS – where the lungs can’t provide enough oxygen for the rest of the body. Up to 25 per cent of patients with severe sepsis will develop ARDS and up to half of these patients will die.”

“What we have developed is an anti-inflammatory nanoparticle – a microscopic particle that binds itself to cells called ‘macrophages’, which are often found at the site of an infection. We have found that this nanoparticle essentially blocks inflammation and interrupts the chain of reactions that lead to severe sepsis and ARDS.”

Queens University Belfast
http://tinyurl.com/qoyndnw

In very ill, probiotics don’t prevent ‘superbugs’ from colonizing intestinal tract

The probiotic Lactobacillus rhamnosus GG was no more effective than regular medical care in preventing the colonization of superbugs in the gastrointestinal tracts of critically ill patients, according to a pilot study by Washington University researchers. Compared with routine medical care, probiotics administered to critically ill patients in intensive care units showed no benefit in preventing the colonization of drug-resistant microbes in the intestinal tract, according to new research at Washington University School of Medicine in St. Louis.

Probiotics — live microorganisms believed to help restore the balance of intestinal bacteria and increase resistance to harmful germs — were given to patients twice daily for up to two weeks. But they were no more effective than not giving probiotics.

“Probiotic use is an intriguing topic,” said
Jennie H. Kwon, DO, lead author of the study and a clinical researcher in the Division of Infectious Diseases. “With fewer therapies available to treat multidrug-resistant organisms, innovative methods to prevent or eliminate gastrointestinal colonization are necessary.”

Drug-resistant “superbugs” pose a serious risk to hospitalized patients — particularly those in ICUs — because the microbes increase the risk of hard-to-treat infections that can spread easily.

Washington University School of Medicine
http://tinyurl.com/q9hwroa

Computer algorithm could aid in early detection of life-threatening sepsis

For a patient with sepsis—which kills more Americans every year than AIDS and breast and prostate cancer combined—hours can make the difference between life and death.

The quest for early diagnosis of this life-threatening condition now takes a step forward, as Johns Hopkins University researchers report on a more effective way to spot hospital patients at risk of septic shock.

The new computer-based method correctly predicts septic shock in 85 percent of cases, without increasing the false positive rate from screening methods that are common now.

“But the critical advance our study makes is to detect these patients early enough that clinicians have time to intervene,” says Suchi Saria, an assistant professor of computer science in Johns Hopkins’ Whiting School of Engineering and of health policy in the Bloomberg School of Public Health.

More than two-thirds of the time, the method was able to predict septic shock before any organ dysfunction. That is a 60 percent improvement over existing screening protocols.

Peter J. Pronovost, a study co-author and senior vice president for patient safety and quality at Johns Hopkins Medicine, said the research promises significant progress in treating a condition that is estimated to hit about a million Americans and kill about 200,000 every year—many of them in hospitals and nursing homes.

“We know a lot of those deaths would likely be preventable” if sepsis were diagnosed well before it develops into septic shock and organ failure, said Pronovost, who directs the Armstrong Institute for Patient Safety and Quality at Johns Hopkins Medicine. “Right now, much of sepsis is invisible until someone is on death’s door.” Every passing hour before sepsis patients receive antibiotics, he said, “correlates strongly with risk of death.”

The study drew on electronic health records of 16,234 patients admitted to intensive care units—including medical, surgical, and cardiac units—at Boston’s Beth Israel Deaconess Medical Center from 2001 to 2007. Researchers created an algorithm that combines 27 factors into a Targeted Real-time Early Warning Score, or TREWScore, measuring the risk of septic shock.

“One strength of this approach,” notes Katharine Henry, a PhD student in Saria’s lab and first author of the study, “is that all of our inputs are routinely collected. You don’t need specialized new measurements.”

The method differs in several respects from previous attempts to predict septic shock. It’s based on a larger data pool, takes account of more health indicators, and factors in several elements that could have confounded the results.

One question now is how TREWScore can be used in a hospital or nursing home. David Hager, a co-author and director of the Medical Progressive Care Unit at the Johns Hopkins Hospital, said the algorithm could be programmed into an electronic health records system to alert doctors and nurses about a patient at risk of septic shock.

John Hopkins University
http://tinyurl.com/pjlj5gx

Near-death brain signalling accelerates demise of the heart

What happens in the moments just before death is widely believed to be a slowdown of the body’s systems as the heart stops beating and blood flow ends.

But a new laboratory study by the University of Michigan Medical School reveals a storm of brain activity that erupts as the heart deteriorates that may play a surprising destabilizing role in heart function.

This near-death brain signalling may be targeted to help cardiac arrest patients survive. Most of the more than 400,000 Americans who experience cardiac arrest die without immediate help.

“Despite the loss of consciousness and absence of signs of life, internally the brain exhibits sustained, organized activity and increased communication with the heart, which one may guess is an effort to save the heart,” says senior study author Jimo Borjigin, Ph.D., associate professor of neurology and associate professor of molecular and integrative physiology.

However the brain signalling at near-death may, in fact, accelerate cardiac demise, according to the study.

Researchers with backgrounds in engineering, neuroscience, physiology, cardiology, chemistry, and pharmacology looked at the mechanism by which the heart of a healthy person ceases to function within just a few minutes without oxygen.

While the animal study examined asphyxia-induced cardiac arrest, sudden cardiac death can also follow fatal cardiac arrhythmias, ischemic stroke, traumatic brain injury, brain hemorrhage and epilepsy.

For the study, performed in rats, researchers simultaneously examined the heart and brain during experimental asphyxiation and documented an immediate release of more than a dozen neurochemicals, along with an activation of brain-heart connectivity.

Following a steep fall of the heart rate, brain signals strongly synchronized with the heart rhythm, as visualized beat-by-beat using a new technology developed in the Borjigin laboratory called electrocardiomatrix.

According to the study, blocking the brain’s outflow significantly delayed ventricular fibrillation, in which the lower chambers of the heart quiver and the heart cannot pump any blood. It’s the most serious cardiac rhythm disturbance.

“The study suggests that a pharmacological blockade of the brain’s electrical connections to the heart during cardiac arrest may improve the chances of survival in cardiac arrest patients,” Borjigin says.

University of Michigan Health System
http://tinyurl.com/nzfjzvd
Blood conservation with a patient dedicated arterial blood gas analyser

Anemia is a common complication of critical care, with up to 90% of ICU (Intensive Care Unit) patients being anemic by their third day in the ICU [1]. Anemia is associated with poor patient outcomes, especially amongst those patients with cardiovascular disease. The treatments of choice for anemia are the minimization of blood loss and the transfusion of red blood cells when necessary.

This article considers the issues in critical care around anemia, transfusions and blood conservation. With blood-based diagnostic testing being a significant factor in cumulative blood loss and the risk of anemia, the use of a patient dedicated arterial blood gas analyser to minimize blood loss is also described.

Anemia in the intensive care unit

Causes

The reasons for anemia in critically ill patients are multifactorial and include acute blood loss (e.g. from trauma, surgery or internal bleeding), iatrogenic blood loss associated with diagnostic sampling and blunted red blood cell production. Of these, blood loss associated with diagnostic testing is the factor that is most easily controlled by the intensivist. Laboratory results are an important tool to achieve diagnosis and guide medical care, and a certain amount of blood is required to obtain this information. The gold standard and a certain amount of blood is required to achieve diagnosis and guide medical care, and a certain amount of blood is required to obtain this information. The gold standard for monitoring oxygenation, acid-base status and ventilation is an arterial blood gas measurement – and consequently is one of the most frequently ordered tests in the ICU [2].

Patients with indwelling central venous or arterial catheters have more frequent blood draws as blood sampling is easier [2], and relatively large volumes are drawn in comparison to that needed for the measurement itself. When sampling from an arterial line it is important to remove an adequate discard volume to ensure that a representative blood sample is obtained. If an insufficient discard volume is removed, the sample will be contaminated with flush solution, consequently, removal of at least three times the dead space volume is recommended [3] and the average discard volume drawn is 3.2mL [4].

Since blood samples may be drawn up to 24 times in a day within the ICU [5], a series of small iatrogenic blood losses can add up, resulting in patients developing iatrogenic (or hospital-acquired) anemia. Table 1 shows reported average phlebotomy-induced blood loss (ml/day) for various ICUs.

Effects of anemia

Oxygen delivery is determined by arterial blood oxygen content and cardiac output. Healthy individuals increase cardiac output in response to anemia, but many critically ill patients have limited capacity to generate the cardiac output required for adequate tissue oxygenation. Loss in oxygen carrying capacity in critically ill patients can cause reduced tissue oxygenation and eventually ischemia of end organs.

Blood transfusions within the ICU

Frequency of transfusions

Due to the prevalence of anemia in intensive care, a large number of patients receive blood transfusions in the form of packed red blood cell (PRBC) transfusions [1]. In two large multicentre cohort studies in the United States and Western Europe, 37% and 45% of intensive care patients received PRBC transfusions respectively [1, 6]. Notably, longer stays result in a higher rate of transfusion, with a reported 85% of patients residing in the ICU for one week or more requiring blood transfusions [4].

Consequences

Blood transfusions are expensive, can be in short supply and can have deleterious effects on patient outcome. Although the risks are very low, PRBC transfusions can have adverse effects, leading to significant morbidity and mortality. With a growing understanding of these side effects, a recent guideline document has concluded that transfusion limits should be reduced to a hemoglobin reading of 7g/dL for critical care patients, unless an underlying condition indicates otherwise [7]. Estimates of the cost of transfusions vary widely, depending on the scope of what is used in the calculation. For example, a recent meta-analysis of six studies concluded that a two-unit transfusion of blood in Europe cost an average of €877 or $1225 [8]. However, taking into account the management of complications, the Mayo Clinic has estimated the true total cost of transfusion of red blood cells to be approximately double this at $1241 for a single unit [9]. Transfusions are, therefore, a significant cost in critical care, and avoidance of transfusion is a worthwhile economic, as well as clinical, goal.

Blood conservation strategies

The main methods for reducing the contribution of blood tests to the incidence of iatrogenic anemia have been identified as:

- Reduction of unnecessary testing
- Drawing smaller samples
- Reinfusion of the discard volume

Appropriate testing

While there have been repeated calls within literature to reduce blood measurement frequencies, studies to evaluate the effect of education on appropriate use of phlebotomy have shown no significant change in practice. Evidence shows that avoidance of excessive testing is hard to implement and ICUs presently continue to take what is considered a high number of blood draws.

<table>
<thead>
<tr>
<th>Reporting country</th>
<th>Setting</th>
<th>Average phlebotomy-induced blood loss (ml/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
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<tr>
<td>USA</td>
<td>General surgical ICU</td>
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<tr>
<td>Europe</td>
<td>Medical ICUs</td>
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</tr>
</tbody>
</table>

Table 1: Average phlebotomy-induced blood lost in critically ill patients [5].
A further issue is whether more frequent testing in some patients could be desirable in order to more rapidly detect deteriorating condition and intervene. Introduction of continuous measurement modalities often identify that large excursions in condition occur much more frequently than is evident from intermittent measurement [10]. There are systemic factors of staff cover and blood gas analyser availability that make both rapid and frequent testing of the unstable patient difficult. This has, for example, led to difficulties in implementing protocols such as tight glycemic control.

**Drawing smaller samples**

If collection tubes are used for blood sampling, switching from adult-to pediatric-sized tubes may reduce diagnostic blood loss by over 40% [11]. For the majority of blood gas analysers, a typical sample volume of 150μl will provide results for blood gas, electrolytes, hemoglobin, haematocrit and blood sugar. However, a 2001 survey found that pediatric tubes were routinely used in only 14% of adult ICUs [4]. Furthermore, whilst the use of pediatric sampling tubes reduces the volume of blood drawn from a patient, it does not address blood loss associated with the discard volume.

**Reinfusion of the discard volume**

One of the simplest methods to address iatrogenic blood loss is to re-infuse the discard volume once the blood sample is drawn. However, this is not without risk e.g. potential to re-infuse clot(s)/contaminated discard, potential for error including the possibility of confusing the discard syringe with the blood sample, infection and air embolism. Closed sampler devices allow sampling of undiluted blood whilst safely storing the discard volume in a reservoir within the line’s circuit. This ensures return of the discard volume to the circulation whilst maintaining a closed system. A recent review article [12] concludes that use of closed blood samplers:

- Reduces the amount of blood drawn;
- Has no detrimental effect on rate of catheter related infections; and
- Has promising evidence for reduction in anemia and transfusions

The strongest evidence for the latter was a 250 patient study that found use of a blood conservation device was independently associated with lower RBC transfusions (control group 0.13 units vs. active group 0.068 units RBC/patient/day) [13]. The study had broad inclusion criteria, and it is likely that patient groups requiring higher rates of testing and therefore more at risk of anemia are likely to have benefitted more greatly than indicated.

**Patient dedicated analysers and blood conservation**

The Proxima system (Sphere Medical, Cambridge, UK) is a patient dedicated blood gas analyser newly introduced to support the aforementioned blood conservation strategies (Figure 1). The Proxima Sensor is integrated into the patient’s arterial line operating as a closed system to minimize blood handling and infection risk. During the sample measurement procedure, the user draws blood into the Proxima Sensor using a closed sampler device. Once the sample has been analysed, all blood is returned to the patient resulting in zero net loss of blood. Results are displayed on the bedside monitor. With regard to appropriate sampling, a patient dedicated analyser can redefine the boundaries of what is appropriate testing frequency. As well as minimizing the impact of ‘confidence’ testing by less experienced staff, it also facilitates more frequent or faster response testing where indicated.

**Conclusions**

Undoubtedly medical personnel cause substantial blood losses in their patients, with phlebotomy being an extensively studied example. Consequently, within the ICU setting, the total amount of diagnostic blood loss is a significant predictor of anemia and subsequent allo-geneic transfusion. Transfusions are associated with poorer outcomes and longer stays, with subsequent cost implications. Therefore, blood conservation strategies have the potential to not only benefit patients, but also help reduce costs of care. Proxima embodies a device that supports these strategies, whilst also allowing more frequent measurement if appropriate.

**References**


**The authors**

Dr Jess Fox and Dr Gavin Troughton, Sphere Medical www.spheremedical.com
Real-time view aids control

Video laryngoscopy involves indirect visualization of the larynx during endotracheal intubation. Rather than viewing the larynx by line-of-sight as in direct laryngoscopy, a clinician sees real-time images of the larynx on a monitor. The images can be seen by more than one person. They can also be magnified and manipulated during a procedure, to permit detailed examination, and recorded for later use.

One of the biggest advantages of VL, however, is that it enables “control of the endotracheal tube (ETT) in its trajectory between the vocal cords and folds toward the airway. This type of clearly displayed view facilitates fast, accurate ETT placement in difficult airways, preventing complications resulting from improper tube placement.”

A recent development

Though direct laryngoscopy had been witness to a series of innovations (different blade lengths, the use of prisms and fibre-optic light channels), the emergence of video capabilities in the surgical suite is perhaps the most significant step in laryngoscopy development in recent decades. The first attempt at video laryngoscopy centred on rigid fibre-optic devices, which allowed eyepieces to be attached to video cameras. For various reasons, they did not gain acceptance. One survey, in 1998, found that fibre-optic bronchoscopes and retrograde guidewire equipment had much higher uptake than rigid fibre-optic laryngoscopes. This was especially pronounced in younger anesthesiologists. Older anesthesiologists preferred direct laryngoscopy.

The key breakthrough for VL occurred in 2001, when Canadian surgeon John A. Pacey embedded a miniature video chip into a modified laryngoscope. The system, known as GlideScope, provided comparable or superior laryngeal exposure compared to DL, even in the hands of inexperienced operators.

Development of user-friendly features

Currently, several types of VLs are available from different vendors, ranging from small hand-held devices to those that can display on a big external screen. They employ a variety of enabling features, such as high-resolution micro-cameras, small portable flat-screen monitors as well as channels to help guide the endotracheal tube. Some devices feature a monitor on the handle. While the first Glidescope had a black-and-white LCD display, today’s models have colour video chips. Most devices on the market are re-usable; however, there are some disposable models too.

The Toronto study

In 2005, a team led by anesthesiologist Richard Cooper of Toronto General Hospital published results of the first authoritative study on VL (GlideScope) in almost 750 patients. The authors found that the device “yielded a comparable or superior glottic view” compared to DL, and that successful intubation was “generally achieved even when DL was predicted to be moderately or considerably difficult.” Although VL was abandoned in 3.7% of patients, they surmised this might be due to “limited prior experience or difficulty manipulating the endotracheal tube,” as the “majority of the failures occurred despite a good or excellent glottic view.”

VL has since proven useful in situations of both anticipated and unanticipated difficult intubations.
In 2010, a German study of 120 patients with a predicted difficult airway found that both Glidescope and direct-coupled interface (DCI) VL improved intubation success in comparison with direct laryngoscopy.

**Video laryngoscopy and critical care**

Studies in the US and Europe in recent years seem to endorse the growing importance of VL in the critical care environment. One study, on urgent endotracheal intubations in the ICU at the Long Island Jewish Medical Center in New York, found an esophageal intubation rate of 19% for DL versus just 0.4% for VL and a difficult intubation rate of 22% for DL compared to 7% for VL. Another study, at an academic-medical ICU in Arizona, found first attempt success for VL at 79%, compared to 62% for DL. Ultimate success for VL was 98% while the rate for DL was 91%. Such findings have been echoed in Europe - for example in a 2014 meta-study at the ICU in France’s St. Eloi Teaching Hospital. VL is now described by the European Society for Intensive Care Medicine as “a new standard method for tracheal intubation in the ICU.”

**Out-of-hospital applications**

Another high-impact application for VL is in out-of-hospital settings, above all the emergency environment. The implications of this are major. A recent Norwegian meta-analysis concluded that although pre-hospital airway management remained controversial, the success rate of emergency tracheal intubation could be considered as a measure of the health of an emergency medical system.

In an out-of-hospital setting, intubation can result in increasing mortality. According to a study of severe head injury patients in Los Angeles in the year 2000, mortality may be double that of those who had not been intubated.

Though approaches such as rapid sequence intubation (RSI) coupled with direct laryngoscopy had shown some promise, the results of a trial in 2003 were both conclusive, and negative - and dramatically demonstrated the downsides of pre-hospital intubation. The trial was conducted by the University of California-San Diego and sought to have trained paramedics perform RSI in adult patients with severe closed head injuries. However, “data analysis showed worse outcomes in RSI patients than in controls, and the trial was stopped.”

**Newer technology, lower training**

The constraints of pre-hospital intubation were again demonstrated in a retrospective observational study on brain injury patients by the University of Arizona’s Department of Emergency Medicine in 2008. Like the Los Angeles study eight years previously, this too concluded that emergency intubation was “associated with increased risk of death after controlling for a number of injury severity indicators.” It also discussed the need for optimal paramedic training and about making decisions to intubate in the field.

The availability (or lack of availability) of trained personnel remains a key factor for successful intubation. Along with typical field conditions such as poor weather, dust, a lack of lighting etc., an inadequate level of training in DL aggravates the challenge of intubation.

This is where VL has major advantages. Although the seminal Toronto study on GlideScope in 2005 found VL comparable to DL, in spite of limited or lack of prior experience by clinicians, future work has shown VL's advantages compared to DL, even when used by less experienced staff.

In 2008, a study by Ireland’s University College Hospital Galway found VL to be associated with fewer intubation attempts and optimization manoeuvres, and easier to use than DL. Indeed, it concluded VL was “a superior device” for use by personnel “infrequently required to perform tracheal intubation.”

One year later, a German study of 20 medical personnel, untrained in tracheal intubation, found that the GlideScope technique led to a significant higher success rate (93%) as compared with direct laryngoscopy (51%). The study covered about 200 patients.

More conclusive evidence on the reduced need for training in VL came after a meta-analysis of 17 controlled trials with almost 2,000 patients in 2012. This established that while there was no difference in first attempt or overall success comparing DL to VL among expert users (senior anaesthesia residents or anaesthesia attending), non-experts (including house staff, medical students) achieve quicker intubation times as well as a higher first attempt success rate using VL.

A slightly more nuanced view of the role of training in DL and VL has been published recently by the Department of Medicine at the University of Arizona. The study analysed intubations performed in the emergency department (ED) by residents over a seven-year period from 2007 to 2014. It found that the first pass success for DL was approximately 70% for postgraduate Year 1 residents and increased to 73% for postgraduate Year 3 residents. On the other hand, the first pass success for VL was approximately 75% for postgraduate Year 1 residents (similar to DL) but improved significantly to 90% for postgraduate Year 3 residents.

**Texas study on first-pass success in emergency medicine**

More research on the role of training in VL is likely to be conducted in the years to come, but it is nevertheless clear that VL can generally be done better than DL by personnel with less training.

This has immediate implications for emergency medicine. In Texas, EMS staff at Baylor College of Medicine conducted a clinical study in 2012 to “evaluate the role of VL in prehospital airway management compared to traditional DL,” and develop a VL deployment process plan. They noted that though “there was no scientific evidence” favouring VL over DL in a prehospital setting, a low first-pass success rate in DL remained an issue of concern. The results were conclusive. Over a four-month period, the first-pass success for VL was 90%, compared to 65% for DL.

**Estimating the use of video laryngoscopy**

At the moment, there is no data on the number of intubations via VL either in the US or Europe. However, it may be assumed that the short-term potential for VL is as high as the incidence of difficult intubations in non-emergency situations, estimated at 5.8%.

Data on emergency intubations is available only for the US, Canada and Australia. One study in 2015 by Harvard Medical School estimates that the use of video laryngoscopy in emergency departments increased from less than 1% in 2002-2005 to 27% in 2012.

**Of smartphones and video laryngoscopes**

Professional societies have stepped up support for VL. The American Society of Anaesthesiology’s latest guidelines (2013) on managing difficult airways mentions video-assisted laryngoscopy as an initial approach to intubation. On its part, “The British Journal of Anaesthesia” (the official journal of The College ofAnaesthetists) is more assertive. It notes that video laryngoscopy has become the new standard of care in airway management, and that it should replace direct laryngoscopy the way smart phones replaced standard cell phones.
PAHO’S Strategy for Universal Access to Health and Universal Health Coverage: implications for health services and hospitals

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ABSTRACT: Moving towards Universal Access to Health and Universal Health Coverage (UAH/UHC) is an imperative task on the health agenda for the Americas. The Directing Council of the Pan American Health Organization (PAHO) recently approved resolution CD53.R14, titled Strategy for Universal Access to Health and Universal Health Coverage. From the perspective of the Region of the Americas, UAH/UHC “imply that all people and communities have access, without any kind of discrimination, to comprehensive, appropriate and timely, quality health services determined at the national level according to needs, as well as access to safe, affordable, effective, quality medicines, while ensuring that the use of these services does not expose users to financial hardship, especially groups in conditions of vulnerability”.

PAHO’s strategic approach to UAH/UHC sets out four specific lines of action toward effective universal health systems. The first strategic line proposes: a) implementation of integrated health services delivery networks (IHSDNs) based on primary health care as the key strategy for reorganizing, redefining and improving healthcare services in general and the role of hospitals in particular; and b) increasing the response capacity of the first level of care.

An important debate initiated in 2011 among hospital and healthcare managers in the region tried to redefine the role of hospitals in the context of IHSDNs and the emerging UAH/UHC movement. The debates resulted in agreements around three main propositions: 1) IHSDNs cannot be envisioned without hospitals; 2) The status-quo and current hospital organizational culture makes IHSDNs inviable; and 3) Without IHSDNs, hospitals will not be sustainable. This process, that predates the approval of PAHO’s UAH/UHC resolution, now becomes more relevant with the recognition that UAH/UHC cannot be attained without a profound change in healthcare service and particularly in hospitals.

In this context, a set of challenges both for hospitals and for the first level of care based on the experience of hospital and healthcare services managers and the vision they have for hospitals in IHSDNs is presented.

Stratégie de l’OPS pour un Accès Universel à la Santé et à la Couverture de Santé Universelle : implications pour les services de santé et les hôpitaux dans la région LAC

Aller vers l’accès universel à la santé et à la couverture de santé universelle (UAH/CHU) est un impératif du programme de santé pour les Amériques. Le Conseil directeur de l’Organisation Panaméricaine de Santé (OPS) a récemment approuvé la résolution CD53.R14, intitulée Stratégie d’accès universel à la santé et à la couverture de santé universelle. Du point de vue de la région des Amériques, UAH/CHU « implique que toutes les personnes et les communautés ont accès, sans aucune forme de discrimination, aux services de santé de qualité, complets, appropriés et en temps opportun, déterminés au niveau national selon les besoins, ainsi que l’accès à des médicaments sûrs, abordables et efficaces, de qualité, tout en s’assurant que l’utilisation de ces services n’expose pas les utilisateurs à des difficultés financières en particulier les groupes dans des conditions de vulnérabilité ».

L’approche stratégique de l’OPS à UAH/CHU définit quatre lignes d’action spécifiques vers des systèmes universels de santé efficaces. La première ligne stratégique propose : a) la mise en œuvre des réseaux intégrés de prestation des services (IHDSN) basé sur les soins de santé primaires comme stratégie clé pour la réorganisation, la redéfinition et l’amélioration
des services de soins en général et pour le rôle des hôpitaux en particulier ; et b) l’augmentation de la capacité de réponse du premier niveau de soins.

Un important débat initié en 2011 entre l’hôpital et les gestionnaires de santé de la région a essayé de redéfinir le rôle des hôpitaux dans le contexte de l’IHSDN et du mouvement naissant UAH/UHC. Les débats ont abouti à des accords autour de trois propositions principales : 1) les IHSDN ne peuvent être envisagés sans les hôpitaux ; 2) Le statu quo et la culture organisationnelle actuelle rendent les IHSDN non viables ; et 3) Sans les IHSDN, les hôpitaux ne seront pas durables. Ce processus, qui est antérieur à l’approbation de la résolution UAH/UHC de l’OPS, devient maintenant plus pertinent avec la reconnaissance que l’UAH/UHC ne peut pas être atteinte sans un changement profond du service de soins de santé et en particulier dans les hôpitaux.

En ce contexte, est présenté un ensemble de défis à la fois pour les hôpitaux que pour le premier niveau de soins basé sur l’expérience de l’hôpital et des services de gestion des soins et la vision qu’ils ont pour les hôpitaux dans les IHSDN.

Private hospitals in Latin America – An investor’s perspective

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**ABSTRACT:** Private hospitals are expanding in Latin America, but the industry is less developed in this region than in some other emerging markets. Groups of hospitals are emerging in countries such as Brazil, Mexico, Colombia and Peru. However, they haven’t reached the size of hospital groups in Malaysia, India and South Africa. They also remain domestically focused, while companies from the aforementioned three emerging markets outside Latin America have expanded to multiple other countries and have listed on stock exchanges to access more capital to finance their expansion. It is very likely that these trends seen in other emerging markets will manifest in Latin America as it continues to develop.

Hôpitaux privés en Amérique Latine - Point de vue d’un investisseur

Les hôpitaux privés se multiplient en Amérique Latine, mais l’industrie est moins développée dans cette région que dans d’autres marchés émergentes. Des groupes hospitaliers émergent dans des pays comme le Brésil, le Mexique, la Colombie et le Pérou. Mais ils n’ont pas encore atteint la taille des groupes hospitaliers que l’on trouve en Malaisie, en Inde et en Afrique du Sud. Ils restent également très attachés au marché national, tandis que certaines entreprises de ces trois pays émergents situés hors Amérique Latine se sont développées dans de nombreuses autres régions et sont cotées en bourse afin d’avoir accès à des capitaux plus importants pour financer leur expansion. Étant donné que l’Amérique Latine poursuit sa croissance, il est très probable que ces tendances observées dans d’autres marchés émergentes se manifestent également dans cette région.

Argentina. A country of contrast and paradox

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**ABSTRACT:** In Argentina, health is not considered a state policy, and it does not benefit from effective action in all areas of government. The budget is essentially used up by structural costs, and despite having made progress in some areas such as vaccinations, there is little impact on the community as a whole from the promotion of health and the prevention of prevalent chronic illnesses linked to metabolism and lifestyle. The biggest health expenditure is private, including so-called “out-of-pocket spending,” which leads to inequality, with over 40% of the population without explicit health coverage. In the national system, coverage is linked to formal employment and Obras Sociales and is essentially managed by trade unions. Social determinants therefore continue leading to illness, which the health system then attempts to cure at enormous human and financial cost. Recommendations of international bodies (PAHO, WHO, FLH, IHP) stress the importance of organising state and private RISS, but very little has been done in this regard.

Right to healthcare is already required, but it’s a long way from being sufficient. The whole population needs to be provided with explicit and effective universal health coverage, in order to ensure healthcare access and equality, and organise healthcare networks which make awareness, promotion, prevention, and rehabilitation more effective for all, using existing, high-level structural and human resources.

L’Argentina. Un pays de contraste et paradoxe

En Argentine, la santé n’est pas une politique d’État, et elle ne bénéficie pas d’une action efficace dans tous les secteurs du gouvernement. Le budget est essentiellement utilisé par des coûts structuraux et malgré avoir fait des progrès dans certains domaines tels que les vaccins, il y a peu d’impact sur la Communauté dans son ensemble de la promotion de la santé et la
prévention des maladies chroniques répandues liées au métabolisme et au mode de vie. Les plus grandes dépenses de santé sont privées, y compris ce qu’on appelle « dépenses remboursables », qui conduit à des inégalités, avec plus de 40 % de la population sans couverture santé explicite. Dans le système national, la couverture est liée à l’emploi formel et Obras Sociales et est essentiellement gérée par les syndicats.

Les facteurs sociaux continuent donc à porter la maladie, que le système de santé en sorte tente de soigner avec d’énormes coûts humains et financiers. Les recommandations d’organismes internationaux (OPS, OMS, FLH, IHF) soulignent l’importance de l’organisation de l’État et privée du RISS, mais très peu a été fait à cet égard.

Le droit aux soins de santé est déjà en place, mais il est loin d’être suffisant. L’ensemble de la population doit avoir une couverture maladie universelle, explicite et efficace, afin d’assurer l’égalité et l’accès aux soins et d’organiser des réseaux de soins qui rendent la sensibilisation, la promotion, la prévention et la rééducation plus efficaces pour tous, à l’aide du niveau de structure existant et des ressources humaines.

### Hospital 360°

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**ABSTRACT:** There are forces that are greater than the individual performance of each hospital institution and of the health system structure of each country. The world is changing and to face up to the future in the best possible way, we need to understand how contexts and emerging trends link up and how they affect the hospital sector. The Colombian Association of Hospitals and Clinics, ACHC, has thus come up with the Hospital 360° concept which uses hospitals capable of anticipating changing contexts by means of the transition between present and future and takes on board the experience of global, socioeconomic, demographic, political, environmental and technological fields as its model.

Hospital 360° is an invitation to reinvent processes and institutions themselves allowing them to adapt and incorporate a high degree of functional flexibility.

Hospital 360° pursues goals of efficiency, effectiveness and relevance, but also of impact and sustainability, and is coherent with the internal needs of hospital institutions and society for long-term benefits.

**Hôpital 360°**

Il y a des forces qui sont supérieures à la performance individuelle de chaque institution hospitalière et à la structure du système de santé de chaque pays. Le monde change, et pour faire face à l’avenir de la meilleure façon possible, nous devons comprendre comment les contextes et les tendances émergentes sont connectés et comment ils impactent le secteur hospitalier. L’Association colombienne des hôpitaux et des cliniques, ACHC, a donc mis au point avec Hospital 360° un concept qui utilise des hôpitaux capables d’anticiper l’évolution des contextes au moyen de la transition entre le présent et l’avenir et qui prend en compte, comme modèle, l’expérience dans des secteurs global, socio-économique, démographique, politique, environnemental et technologique.

Hôpital 360° est une invitation à réinventer les processus et les institutions elles-mêmes leur permettant de s’adapter et d’intégrer un degré élevé de flexibilité fonctionnelle.

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### Operating private hospitals in Mexico

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**ABSTRACT:** Mexico is one of the richest countries in Latin America and over the last several decades there have been many changes in the healthcare delivery systems, from universal healthcare coverage for all Mexicans to the fast paced expansion of private healthcare. Like many countries, Mexico has both private and public health systems and hospital administrators are facing challenges on multiple fronts in addition to facing exciting new opportunities. In this article you will get a bird’s eye view of this ever changing panorama. How the new growing middle class consumerism has impacted physicians, health insurance and private healthcare industry.

**Des hôpitaux privés au Mexique**

Le Mexique est un des pays les plus riches d’Amérique Latine qui, au cours de ces dernières décennies, a connu de nombreux changements en matière de prise en charge des soins de santé, comme la couverture universelle pour tous les Mexicains jusqu’à l’expansion rapide des services privés. Comme beaucoup de pays, le Mexique dispose à la fois de systèmes privés et publics et les directeurs d’hôpitaux doivent faire face à de nombreux défis tout en étant confrontés à de nouvelles opportunités intéressantes.

Cet article fournit un aperçu de ce milieu en constante évolution. Comment le consumérisme de la classe moyenne émergente a impacté le secteur privé des soins de santé, l’assurance santé et les médecins.
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Similar safety after TAVR, surgery in lower-risk ‘real-world’ patients

For patients at low-to-intermediate risk, transfemoral TAVR is a safe alternative to surgery, with comparable survival at 1 year, according to a large registry study.

For the OBSERVANT trial, Marco Barbanti, MD, of Ferrarotto Hospital (Catania, Italy), and colleagues looked at 7,618 Italian patients with aortic stenosis and low-to-intermediate surgical risk who underwent either surgery (n = 5,707) or TAVR (n = 1,911) between 2010 and 2012.

Patients were propensity-matched into 650 pairs, although surgically-treated patients still had slightly higher levels of albumin and hemoglobin and the TAVR group—restricted to those undergoing transfemoral procedures—presented with greater oxygen dependency. Additionally, annulus diameter was greater in the TAVR arm (22.2 vs 21.3 mm; P < .001).

Compared with surgery, TAVR was associated with a lower mean post-procedural aortic valve gradient (10.3 vs 13.6 mm Hg; P < .001) but a higher incidence of aortic regurgitation grade ≥ 2 (9.8% vs 2.0%; P < .001).

Rates of all-cause death and major adverse cardiac and cerebrovascular events (MACCE), the primary endpoints, were comparable between treatment groups. Similarly, there were no differences in rates of stroke, acute MI, or repeat hospitalization for either acute heart failure or cardiac reasons.

Rates of mortality, stroke, cardiac tamponade, and infection in the peri-procedural period also were comparable between the surgery and TAVR arms.

“[TAVR] is probably ready to be tested even in lower-risk population,” Dr. Barbanti told TCTMD in an email. However, “the results of the OBSERVANT study are limited by its observational nature. Well-conducted [RCTs] will probably tell us if the excellent results of [TAVR] in high-risk patients will be confirmed even in a less sick and younger population.”

TCTMD
http://tinyurl.com/ocwgwvm

Slowing down muscle loss in heart failure patients

Whenever cardiac insufficiency or serious heart defects worsen, such deterioration is often associated with a loss of muscular mass and muscular strength. Scientists at the Charité – Universitätsmedizin Berlin have now succeeded in identifying the mechanism that underlies this disease, also known as cardiac cachexia. On the basis of these latest findings it may now be possible to influence the processes that strengthen and accelerate protein degradation in the body with the help of certain medications. Patients in advanced states of myocardial insufficiency generally lose their muscle mass and muscle strength. Indeed a fact that until now has negatively impacted the clinical course of the disease and that has resulted in poor prognoses for patients. Such pathological muscle loss impacts the skeletal muscles in particular. The responsible molecular signalling pathways have not yet been fully understood. One cause of this degenerative process lies in the system that regulates the blood pressure and salt/water supply in the body - the so-called renin-angiotensin-aldosterone system (RAAS). This is strongly activated in the context of the disease process and associated with cardiac cachexia leading to an increase in the formation of the effector peptide angiotensin II. Angiotensin II directly affects the muscle and increases protein degradation there, resulting in a loss of muscular mass and strength.

To date, patients suffering from heart failure have been treated with medications that inhibit the renin-angiotensin-aldosterone system. While this treatment option slows muscle loss for a certain period, conventional medications lose their efficacy after just a few years. With a view to finding new treatment methods, scientists collaborating with Dr. Jens Fielitz, cardiologist at the Charité and group leader at the Experimental and Clinical Research Center (ECRC) have now been examining the precise signal pathway that prompts protein degradation in muscle. In particular, angiotensin II increases the production of a specific protein in muscle called muscle RING-finger 1 (MuRF1), which plays a key role in muscle loss. “We have been able to identify and characterize the function of a new transcription factor that regulates this process. Our experiments have also revealed the specific mechanisms that either activate or inhibit the production of MuRF1 protein, that is
to say that either reduce or increase muscle loss”, says Privatdozent Dr. Jens Fieltz. He adds “Our findings can now provide insights into important unanswered questions in that they delineate a new signal pathway that is important in the emergence of cardiac cachexia.” By suppressing this signal it may be possible to inhibit the muscle loss caused by angiotensin II and therefore offers high potential in terms of therapeutic options.

Charité – Universitätsmedizin Berlin
http://tinyurl.com/oavp2ve

3-D MRI DTI may help detect muscle injuries that occur as result of long-distance running

The results of a study indicate that Magnetic Resonance Imaging (MRI) Diffusion-Tensor Imaging (DTI) could be used for the prognosis and treatment of sports injuries in athletes.

The researchers obtained DTI three-dimensional (3-D) measurements of the upper leg from the hip to the knee, including the hamstring and other susceptible muscles, in a single imaging session. The technique revealed changes that qualitative T2-weighted MR imaging with fat suppression was not able to show, and could be used to help clinicians detect long-term changes in the upper leg from sports-related muscle injuries.

The researchers evaluated five male amateur long-distance runners using a 3-T MR examination of both upper legs at one week before, two days after, and three weeks after the runners took part in a marathon. A musculoskeletal radiologist used three grades to evaluate the level of muscle injury using T2-weighted images with fat suppression. The radiologist noted the specific muscle and its location, the cranio-caudal, and axial length of the hemorrhage and/or edema, and manually segmented six muscles in both upper legs based on T1- and T2-weighted images.

Lead author of the study, Martijn Froeling, PhD, at the University Medical Centre Utrecht (Utrecht, Netherlands), said, “Our method revealed subtle changes in DTI-derived parameters of muscle that occurred during marathon running, which were still measurable after three weeks. The elevated mean diffusivity, which was still present after three weeks, might be related to the natural disease course of fatigue-induced muscle disorders. These findings might be related to a high risk for injury in biceps femoris and semitendinosus muscles during long-distance running. DTI may eventually allow for design of personalized rehabilitation programs. The method could be especially useful in longitudinally evaluating athletes after muscle injury and could give a better prognosis when affected muscle function is restored.”

Medimagging
http://tinyurl.com/pyzgp8c

MRI-powered millirobots

Hydrocephalus is a nightmarish medical condition. Accumulating fluid in the skull ratchets up pressure on the brain and can cause lifelong mental disabilities. Current treatment requires physicians to cut through the skull and implant pressure-relieving shunts.

The necessary surgery is effective but invasive. For surgeries like these, science fiction authors have long dreamed of shrinking surgeons to mere millimeters to allow them to navigate interior passageways of the body instead of cutting large access holes. Arriving at problem sites, the fictional physicians might provide targeted drug delivery or surgical intervention.

Aaron T. Becker, electrical and computer engineering professor at the UH Cullen College of Engineering, is working collaboratively to deliver a robotic version of this micro-surgeon. His submission to ICRA, the flagship conference of the IEEE Robotics and Automation Society in Seattle, Wash., was nominated for best conference paper and best medical robotics paper.

“Hydrocephalus, among other conditions, is a candidate for correction by our millirobots because the ventricles are fluid-filled and connect to the spinal canal,” Becker said. “Our non-invasive approach would eventually require simply a hypodermic needle or lumbar puncture to introduce the components into the spinal canal, and the components could be steered out of the body afterwards.”

Using a clinical Magnetic Resonance Imaging (MRI) scanner, the researchers map routes to problem sites on high-quality brain images to deliver medical interventions with tiny, manoeuvrable robotic components. Becker and his colleagues hack the scanners to enable them to use the MRI’s own magnetic fields to push the small metal-filled robots. The team has already demonstrated use of magnetic forces to actuate needle-biopsy robots and to walk robots around an MRI.

However, MRI scanners are not designed to push robots around, so they cannot apply enough force to pierce tissues or insert needles. These weak forces are a significant obstacle to using the MRI for medical interventions.

A toy called a Gauss gun inspired Becker’s solution. The toy offers surprising results from a simple row of steel balls separated intermittently by several high-powered magnets. A single steel ball rolled toward one end of the row sets off a chain reaction when it smashes into the first ball. Sequentially, each steel ball smashes into the next until the last ball flies forward at a speed much faster than the initial ball’s. Spacing between the magnets and steel balls stores potential energy, which the first ball converts to speed when it hits one end.

Similarly, the medical robot is a barrel self-assembled from smaller, separate components that navigate easily through the body. Each barrel component is 3D-printed from high-impact plastic with slender titanium rod spacers that separate two steel balls.

Magnets are unnecessary because the MRI scanners magnetize the steel balls. The first component is a specialized delivery vehicle equipped with an 18-gauge needle tip used to pierce membranes or deliver drugs. The final component is a trigger with a long spacer so the two steel balls are only weakly attracted to each other. The approaching trigger is attracted to the barrel, which unleashes the stored potential energy and fires the other end component towards the target. Additional barrel components increase firing speeds.

“The work is still conceptual, but we have demonstrated the procedure working on plastic, fluid-filled containers, or phantoms, inside an unmodified clinical MRI scanner,” Becker said. “The benefit of our research is that we can now create clinically relevant forces inside a standard MRI scanner, using just the MRI magnetic field.”

University of Houston
http://tinyurl.com/np4d47t
New embryo image processing technology could assist in IVF implantation success rates

A collaboration between biologists and engineers at Monash University has led to the development of a new non-invasive image processing technique to visualize embryo formation. Researchers were able to see, for the first time, the movement of all of the cells in living mammalian embryos as they develop under the microscope. This breakthrough has important implications for IVF (in vitro fertilization) treatments and pre-implantation genetic diagnosis (PGD). In the future, this approach could help with embryo selection before the embryo is implanted back into the uterus to improve IVF success rates.

This latest research provides new insights into embryo formation and challenges the prevailing model of cell placement through division.

Mammalian embryos start out as a small group of identical cells. Then at an early stage, some of these cells take up an internal position within the embryo. These internal cells are the ones that will go on to form all of the cells of the body while the remaining outer cells go on to form other tissues such as the placenta.

For many years, researchers theorized that the internal cells adopt their position through a special process of cell division, but due to technological limitations, this had never actually been shown. Using their newly developed imaging methods, the Monash University researchers were able to demonstrate that this model of embryo formation was incorrect.

The researchers then applied cutting-edge laser techniques to the mammalian embryo (previously used in fly and plant embryos or cultured cells only) to determine what forces were acting on the cells to make them move inside the embryo. Using these new imaging techniques, researchers were able to see how the cells moved and changed shape over time as they were ‘pushed’ inside to form the internal mass. They showed that there are differences in the tension of the membranes of the cells and these differences are what determine which cells will move inside to form the body. By altering the tension of the cells using lasers or genetic manipulations, researchers could change which cells move inside the embryo. These findings also offer future potential to make alterations to improve inter-cellular forces and cell formation.

Work is underway to use this new custom image segmentation technology with non-invasive imaging approaches to see how human embryos used in IVF or pre-implantation genetic diagnosis (PGD) first organize their cells.

Monash University
http://tinyurl.com/pzrusds

Choosing horses for courses: Using liquid agents to embolize endoleaks

It is important to use the right embolic agent for the job – an embolic agent that is particularly suitable for one indication may not at all be appropriate for another. Robert Morgan, vascular interventional radiologist, St Georges Hospital, London, UK uses liquid embolic agents, such as ethylene vinyl oxide copolymer (EVOH-based) liquid agents, of which Onyx (Medtronic) is an example, for endoleak embolization. Some potential advantages that liquid embolics offer in endoleak embolization are that they enable more rapid and complete filling of the endoleak cavity when compared with coils. They can also represent a less expensive option in situations where otherwise multiple coils would be needed.

Morgan makes the point that liquid embolic agents are particularly suitable for endoleak embolization because they can be used “to fill the cavity”. Other embolic agents such as coils have been used for endoleak embolization (although they are unsuitable for large cavities) and particles are completely unsuitable for endoleak embolization, he notes. He also clarifies that he would use embolization with particles mainly for small vessel embolization, such as uterine fibroid embolization, and embolization with coils mainly for the embolization of hemorrhage.

Commenting on some of the difficulties of using liquid embolic agents, Morgan makes the point that there are mainly two types of liquid embolic agents: “The cyanoacrylate adhesives (or glue-type embolics) and the EVOH-based agents (or Onyx-type embolics).” While glue is relatively inexpensive in Europe, it polymerizes in ionic fluids (such as blood) and is used with a non-ionic solvent such as dextrose to stop the glue polymerizing in the catheter. “This is why there is a need to inject glue and withdraw the catheter, to prevent the catheter sticking to the glue, which makes it a more difficult embolic for endoleaks. On the other hand, Onyx is easier to use and fills the cavity without adhering to the catheter, so you can inject it and then leave the catheter there until the end, but is more costly than glue. Onyx is dissolved in dimethyl sulphoxide in order to stop it from polymerizing in the catheter. It is a useful embolic for endoleaks. The main difference between glue and Onyx is that the glue has the potential to stick to the catheter in the small vessels that the catheter is located in, and this is a pitfall of glue use,” Morgan clarifies. He also notes that due to these reasons, he does not use glue to embolize endoleaks.

“I would embolize the majority of type I endoleaks that are not suitable for treatment with other more conventional treatments with Onyx, and I would only embolize type II endoleaks in the presence of an increasing sac size,” he said. In some cases, a combination of coils and Onyx may be more effective than Onyx alone, he adds.

In a debate on the suitability of liquid embolics for the embolization of type I endoleaks at the Charing Cross International Symposium held in April in London, UK, Morgan told delegates that embolization with Onyx is effective for some patients with anatomically suitable type I endoleaks that are not suitable for conventional treatment options. He also maintained that liquid embolic agents are ideally suited for type I endoleak embolization, occasionally in combination with coils.

This approach is not universally accepted. While many experts consider Onyx to be a valid tool in peripheral embolization and for type II endoleak management, they believe that its use must be restricted as an embolic agent for type I endoleaks. His opponent on the debate at the Charing Cross International Symposium, Fabrizio Fanelli, Rome, Italy, said: “Liquid embolic agents have a limited spectrum of applications. There is a high risk of non-target embolization in the case of high flow conditions”, and stated that more “standard” techniques must be selected in case of type I endoleaks.

Interventional News
http://tinyurl.com/okxvppc
SonoSite supports Help in Motion mobile hospitals

German charity Help in Motion has equipped its two new mobile hospital vehicles with robust and portable NanoMaxx™ point-of-care ultrasound systems from SonoSite. The charity was founded by entrepreneur Ralph Mueller to provide healthcare to deprived populations in Germany and overseas. Herr Mueller explained: “I’ve travelled extensively around the world and have always tried to make sure I see the real country, as well as the landmarks and luxury of the tourist trail. I have seen so many people with limited or no access to the most basic healthcare facilities – no doctors, medicine, or money to pay for any care if it exists. Five years ago I decided it was time I used my money to pay for any care if it exists. Five months to plan and construct, and include water treatment units, a power generator and a chemical toilet, as well as robust, portable laboratory and medical instruments, such as the point-of-care ultrasound systems. Herr Mueller said: “Our doctors often have to treat people in challenging conditions, with no proper roads, mountainous terrain and severe floods. The Unimogs will be able to cope with these difficulties and provide treatment rooms, giving our patients much-appreciated privacy. The ultrasound systems are also ideal for this kind of environment, where technology has to be robust and able to cope with humidity and dust. These devices will make a tremendous difference to what our doctors can achieve, giving them extra confidence in what they are diagnosing. We recently held a workshop to introduce the vehicles to 60 doctors and the ultrasound systems were very well received; the doctors were impressed and looking forward to using them in the field.”

Overseas trips so far have included the Philippines, where many of the poorer indigenous population have very little access to healthcare, and Sierra Leone in the recent Ebola crisis. Herr Müller said: “We aim to provide free medical examinations, basic care and minor surgery wherever we can. However, it is very important that everything we do has the support and approval of the local population and existing healthcare system in that region. Similarly, we are working towards liaising with community and welfare services in Germany, where we plan to offer the same services to homeless populations in the larger cities.”

The foundation plans to introduce two more fully-equipped Unimogs every year, with the aim of eventually leaving the vehicles permanently in territories with the greatest need. Herr Müller concluded: “We look forward to seeing how the new mobile hospitals help our doctors to treat disadvantaged people around the world, and thank sponsors like SonoSite for the support they have given to the project.”

CALENDAR OF EVENTS

For more events see: www.ihe-online.com/events/

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
<th>City/Location</th>
</tr>
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<tbody>
<tr>
<td>October 18-21, 2015</td>
<td>CMEF Autumn 2015</td>
<td>Wuhan, China</td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="http://www.chinaexhibition.com">www.chinaexhibition.com</a></td>
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<tr>
<td>November 16-19, 2015</td>
<td>Medica</td>
<td>Düsseldorf, Germany</td>
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<td><a href="http://www.medica.de">www.medica.de</a></td>
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<tr>
<td>November 29-December 4, 2015</td>
<td>RSNA</td>
<td>Brussels, Belgium</td>
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<tr>
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<td><a href="http://www.rsna.org">www.rsna.org</a></td>
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<tr>
<td>January 25-28, 2016</td>
<td>Arab Health</td>
<td>Dubai, UAE</td>
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<tr>
<td>April 6-8, 2016</td>
<td>Med-e-Tel</td>
<td>Luxembourg</td>
</tr>
<tr>
<td>April 11-13, 2016</td>
<td>SEACare 2016</td>
<td>Osaka, Japan</td>
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<tr>
<td>April 17-20, 2016</td>
<td>CMEF Spring 2016</td>
<td>Kuala Lumpur, Malaysia</td>
</tr>
<tr>
<td>April 19-21, 2016</td>
<td>ConHiT</td>
<td>Berlin, Germany</td>
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<tr>
<td>June 8-10, 2016</td>
<td>eHealth Week</td>
<td>Amsterdem, The Netherland</td>
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<tr>
<td>June 8-11, 2016</td>
<td>Cardiosim</td>
<td>Nice, France</td>
</tr>
<tr>
<td>June 22-25, 2016</td>
<td>CARS</td>
<td>Heidelberg, Germany</td>
</tr>
<tr>
<td>August 27-31, 2016</td>
<td>ESC Congress 2016</td>
<td>Rome, Italy</td>
</tr>
<tr>
<td>September 10-14, 2016</td>
<td>CIRSE</td>
<td>Barcelona, Spain</td>
</tr>
<tr>
<td>September 21-24, 2016</td>
<td>ICR 2016 - International Congress of Radiology</td>
<td>Buenos Aires, Brazil</td>
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<tr>
<td>October 1-5, 2016</td>
<td>ESICM</td>
<td>Milan, Italy</td>
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Dates and descriptions of future events have been obtained from usually reliable official industrial sources. IHE cannot be held responsible for errors, changes or cancellations.
Life sciences at the service of human health

Alan & co
Manufacturers medical and dental disposable products: cotton, sutures and cellulose protection. Customers are importers and distributors only.

Axinesis
Innovative medical robotic technologies dedicated to the rehabilitation of impaired upper limbs of stroke adults or cerebral palsy children.

Beldico
Beldico produces and markets sterile & disposable medical devices for baby feeding, for milk collection and milk processing.

CAE
Since 1996, CAE has been developing and manufacturing innovative, SUPERIOR QUALITY WEIGHING SOLUTIONS, which combine ergonomics, robustness, hygiene and design.

Diagonode
Diagonode (Liège, Belgium) provides highly trusted and cost-effective In Vitro Diagnostic kits for infectious diseases compatible with most of the PCR systems.

DNAlytics
RheumaKit
The first biomarker-based IVD tool in rheumatology providing an early differential diagnosis for patients with undifferentiated arthritis.

Mahusaca
Mahusaca produces the Droper, an energy self-sufficient infusion pump, using mechanical compression only, not needing energy supply (no batteries, no electricity), allowing constant drip flow.

Hymetec
HYMETEC develops and commercializes disinfection products and equipments against bacteria, viruses, germs, spores present in the medical and other fields.

2-support
The Life Observer Mobile is a continuous and innovative supervision for unstable patients in general hospitals. Contactless & emission free.

CAE

SMI
Is a manufacturer of absorbable and non absorbable sterile surgical sutures. SMI developed a complete range with a total of more than 1000 different products notably for ophthalmic, cardiac and plastic surgery.

Sterisys
STERISYS is a global solution provider for industrial ethylene oxide (EO) and steam sterilisation systems.

WILL-PHARMA
Besides the delivery of pharmaceutical products, Will-Pharma is the legal manufacturer of gelatin sponges, oxidized regenerated cellulose, surgical mesh and neurosurgical patties.
Glucose meter offers wireless connectivity

Nova Biomedical’s StatStrip Glucose Hospital Meter System now offers bidirectional wireless connectivity to the hospital’s HIS or LIS with complete security to protect patient data. The wireless connectivity can transmit patient results directly from the patient bedside, alleviating the need to bring the meter to a fixed location for meter docking and data transmission. Wireless connectivity saves time for the caregiver and allows for faster charting of results and clinical decision making to improve patient care. StatStrip Glucose’s dual-band wireless connectivity provides complete security and encryption to ensure that patient data remains uncompromised. Nova now offers a full range of StatStrip Glucose wireless connectivity capabilities, including wireless meters, wireless carrying cases, and wireless docking stations. All of the wireless devices use industry standard PCO1-A2 data format and are compatible with a choice of middleware partners. StatStrip Glucose is the only glucose meter cleared by the U.S. Food and Drug Administration (FDA) for use with all patients, in all healthcare settings, including critical care. The device received this clearance in 2014 after an extensive, nearly four-year study conducted at five major university medical centers, which included 1,698 critically ill patients with over 257 clinically significant interferences for over the last eight years—including over 8,000 medi- cal decision-making procedures. Carestream’s DRX-Excel systems are configured with a table and a tube in one system. An optional integrated flat panel detector produces high-resolution images for general radiography as well as fluoroscopic sequences. The DRX-Excel platform also is available as a conventional R/F system that uses either CR cassettes or DRX-1 detectors with an image intensifier. By expanding its product portfolio to include fluoroscopy, which is performed by many hospitals and imaging centres, Carestream enables healthcare providers to benefit from purchasing these systems from a single supplier. Both DRX-Excel systems offer a source-to-image detector distance of 180 cm, an ergonomic design and the ability to select an image intensifier for fluoroscopy or use the optional flat panel detector. The DRX-Excel Plus has an elevating table that tilts for fluoroscopy exams and can be lowered or raised to provide flexible, comfortable imaging for patients. Table weight capacity is 265 kg (584 pounds). The DRX-Excel has a fixed table with a weight limit of up to 200 kg (440 pounds) and has the tilt capability for fluoroscopy exams. Both systems feature productivity-enhancing capabilities including a positioning pedal that allows hands-free operation - which is helpful for interventional exams - and a remote control that can move the table from anywhere in the room. Other options include integration of a Carestream DRX detector; four-way float top table movement; and the ability to stitch multiple images together for long-length exams. These systems support Carestream’s X-Factor approach, which enables a DRX detector to be shared among an R/F room and other DRX mobile or room-based radiography or R/F systems.

NOVA BIOMEDICAL
MEDICA Hall 03 / D45-2
www.ihe-online.com & search 46832

CARESTREAM HEALTH
MEDICA Hall 10 / E65
www.ihe-online.com & search 46897

Radiography/fluoroscopy systems with optional flat panel detector

Carestream Health has entered the radiography/fluoroscopy (R/F) market with two systems that deliver high-quality, cost-effective imaging: the DRX-Excel and DRX-Excel Plus. These systems can enhance workflow and perform contrast exams using fluoroscopy that can be associated with a radiography image, in addition to specialized contrast procedures that record both fluoroscopy and radiography sequences and interventional procedures. Carestream’s DRX-Excel systems are configured with a table and a tube in one system. An optional integrated flat panel detector produces high-resolution images for general radiography as well as fluoroscopic sequences. The DRX-Excel platform also is available as a conventional R/F system that uses either CR cassettes or DRX-1 detectors with an image intensifier. By expanding its product portfolio to include fluoroscopy, which is performed by many hospitals and imaging centres, Carestream enables healthcare providers to benefit from purchasing these systems from a single supplier. Both DRX-Excel systems offer a source-to-image detector distance of 180 cm, an ergonomic design and the ability to select an image intensifier for fluoroscopy or use the optional flat panel detector. The DRX-Excel Plus has an elevating table that tilts for fluoroscopy exams and can be lowered or raised to provide flexible, comfortable imaging for patients. Table weight capacity is 265 kg (584 pounds). The DRX-Excel has a fixed table with a weight limit of up to 200 kg (440 pounds) and has the tilt capability for fluoroscopy exams. Both systems feature productivity-enhancing capabilities including a positioning pedal that allows hands-free operation - which is helpful for interventional exams - and a remote control that can move the table from anywhere in the room. Other options include integration of a Carestream DRX detector; four-way float top table movement; and the ability to stitch multiple images together for long-length exams. These systems support Carestream’s X-Factor approach, which enables a DRX detector to be shared among an R/F room and other DRX mobile or room-based radiography or R/F systems.

Compact electrocardiograph

The CARDIOVIT FT-1 provides the power and flexibility of a PC in a portable ECG, bidirectional Wi-Fi communication and the Culprit Coronary Artery Algorithm for early STEMI detection. The CARDIOVIT FT-1 is ultra-portable; even with the battery, it weighs just over a kilo. The 8-inch high-resolution multi-touch screen can be operated with a simple swipe gesture and easy one-handed operation. The completely flat and closed surface of the device is very easy to clean and highly hygienic. Bidirectional communication allows for easy data access, while Wi-Fi as a standard feature enables the direct and fast transmission of ECG reports to an EMR system. Easy Wi-Fi connectivity, combined with ECG preview on a large display, supports paperless workflow and cost saving. SCHILLER’S most advanced algorithms are implemented in the CARDIOVIT FT-1. They consist of ETM, a simultaneous 12-lead ECG interpretation programme for uncompromising quality and reliability and CCAA, a software that helps correctly identify the site of obstruction in the coronary artery. The anatomical hook up adviser helps to place the electrodes correctly and supplies a colour coded lead quality check. In case of lead reversal, warnings for limb or chest leads are immediately displayed, before ECG acquisition.

SCHILLER
MEDICA Hall 09 / E05
www.ihe-online.com & search 46857

Upgraded portable ultrasound

The HM70A with Plus is an upgraded portable ultrasound device derived from the original HM70A. With additional transducers and enhanced imaging, HM70A with Plus serves the needs of various medical environments including general imaging, OB/GYN, cardiovascular, MSK (Musculoskeletal) and emergency facilities. The addition includes the S-Vue Transducers (Curved Array and Volume), which provide higher sensitivity and easier visualization for difficult cases. Users will also benefit from the new hockey stick transducer for MSK, allowing sophisticated diagnosis of bones and tendon. The HM70A with Plus is also complemented by a TEE (Transesophageal Echocardiogram) transducer, as well as cardiovascular imaging.
features such as the Strain and Stress Echo. Strain provides a graphic segmental analysis displaying left ventricular motion and dysynchrony at the same time and Stress Echo offers customizable reports to help analyse cardiac changes under stressful circumstances. The HM70A with Plus now features the MultiVision, an imaging enhancer, which delivers higher spatial and contrast resolution. The upgrade of the versatile system also provides an extended battery life up to 4.5 hours when used with the optional cart.

**SAMSUNG MEDISON**

MEDICA Hall 09 / C63

[www.ihe-online.com & search 46895](http://www.ihe-online.com & search 46895)

**Blood gas analyser with fetal scalp and neonatal capillary sampling**

Radiometer has launched the ABL90 FLEX PLUS blood gas analyser, featuring a MicroMode measuring function for extremely small volume blood samples. The state-of-the-art analyser is ideal for the delivery room or the neonatal intensive care unit (NICU). MicroMode measuring – combined with the new 45 µl safeCLINITUBES plastic capillary tubes – allows delicate capillary sampling procedures, enabling immediate assessment of a potentially distressed fetus or critically ill neonate. Up to 17 critical parameters can be determined rapidly at the point of patient care from a single very small volume sample, with results available in 60 seconds. Operation is both safe and simple, with automatic inlet opening and closing to minimize manual processes and reduce the risk of errors. To ensure data integrity, the analyser can be connected to the AQUIRE point-of-care management system. The comprehensive analytical capabilities of the ABL90 FLEX PLUS blood gas analyser and safe sampling devices can be complemented with the company’s TCM CombiM monitor, allowing continuous, non-invasive, transcutaneous monitoring of oxygenation and ventilation in real time. This combination of blood gas analysis and transcutaneous monitoring – Radiometer’s NeoOne solution – is particularly beneficial in the NICU, providing a more complete clinical picture for these at-risk patients.

**SPECTRA254**

[www.ihe-online.com & search 46830](http://www.ihe-online.com & search 46830)

**Mobile X-ray**

Mobilett Mira Max is a fully digital mobile X-ray system that helps speed up the examination workflow while decreasing overall operating costs in the process. Mobilett Mira Max has been developed for both versatile everyday use and for demanding clinical situations, where rapid image availability and high image quality are vital. Mobile X-ray systems are being used in a range of applications – from broken legs to lung examinations, from newborns to trauma patients. Advantages of mobile systems are that there is no need to transport the patient and examinations can be performed even in quite small spaces. The important factors here are intuitive operation and very high image quality to provide diagnostic certainty, especially when seconds count. Mobilett Mira Max comes with the MAX (Multiple Advances in X-ray) functions that support users in their everyday work (MAX assistance) and have a positive effect on image quality (MAX detection). The advantages of MAX assistance are clear when it comes to ease and speed of operation: the system is equipped with a special tube arm that offers nearly unrestricted visibility while being moved, and also provides particular positioning flexibility. The integrated detector holder has been designed to enable the operator to manoeuvre the system with convenient foot space. For even higher image quality than previously available, Siemens provides two new detectors for Mobilett Mira Max, as part of the MAX detection function: the extra-compact MAX mini detector measuring 24 cm x 30 cm, which, for example, is ideally suited for examinations in an incubator or of smaller joints. The MAX wi-D detector (35 cm x 43 cm) weighs only three kilograms and is automatically recharged on the system during transportation. The detectors can be easily, quickly and safely shared between the MAX portfolio of radiography, fluoroscopy and mobile X-ray systems.

**SIEMENS HEALTHCARE**

MEDICA Hall 10 / A20

[www.ihe-online.com & search 46831](http://www.ihe-online.com & search 46831)

**UVC rapid disinfection system**

The RDS-30 Series is an essential rapid disinfection system that eliminates deadly pathogens MRSA, CRE and C. diff in only 30 seconds. The RDS-30 Series is designed for the rapid disinfection of shared tools and electronics in hospitals, private practices, outpatient clinics and other healthcare facilities. It is made to be used daily for disinfecting a wide range of patient care, administrative, diagnostic and entertainment tools; from medical tablets to cell phones, keypads to TV remotes, the RDS-30 Series infects all surfaces in less than 30 seconds. The system may be purchased alone or as part of a comprehensive Spectra254 UVC light disinfection system. The RDS-30 Series is compact, powerful and fast and has the ability to disinfect both wired and wireless handheld devices as well as shared tools. The device uses six custom built UVC germicidal bulbs to eradicate pathogens. RDS-30 Series systems are compact enough to be used on a counter at a nurse’s station or on a mobile cart that is moved from room to room. They feature a 1-click start and reset for easy use. The RDS-30 Series’ ultra pure quartz shelf allows UVC wavelength to reach the underside of an object. A visual, audio and a digital display provide information about each decontamination cycle. The system is operated with easy to use controls on the unit itself. Spectra254’s comprehensive decontamination range of products includes the Spectra 1000 Series mobile room sanitizing system and the Spectra 500 medical transport sanitizing system, in addition to the RDS-30 Series. Multiple analyses performed for Spectra254 in independent scientific testing documented that UVC light from Spectra254’s systems is highly effective (greater than 99 percent) in killing MRSA and C. difficile spores on solid surfaces and in disinfecting surfaces over a range of exposure times and distances. A recent study shows the system is 99.9 percent effective at killing an Ebola surrogate on surfaces at a distance of up to 9 meters.
Anatomically intelligent ultrasound tool

Under the brand name of HeartModelAI, a new anatomically intelligent ultrasound (AIUS) tool brings advanced quantification, automated 3D views and robust reproducibility to echocardiography and is Philips’ fastest 3D AIUS ultrasound measurement method. Using HeartModelAI, clinicians can quickly, easily and confidently assess disease states, determine treatment, and guide related therapies. In a recent comparison at one hospital, clinicians were able to acquire and analyse the data necessary to calculate the dimensions and volumes of the left atrium and ventricle (LA and LV) between 3 and 6 times faster using 3D measurements and HeartModelAI than with conventional 2D measurements and conventional volume analysis. With a rich digital database of anatomical structural models and adaptive system technology, HeartModelAI has access to advanced clinical information that automatically adapts to variability in patient anatomy. This knowledge-based identification and patient-specific adaptation provides proven quantification of the left ventricle and atrium, and display of routine apical views. HeartModelAI is part of a suite of new tools and technologies available on Philips’ EPIQ 7 ultrasound system which has been designed to enhance automation and reproducibility. HeartModelAI helps to make the collecting of critical cardiac ultrasound measurements easier and more reproducible, which will not only enable time savings, but will hopefully extend the adoption of 3D echocardiography exams to more clinicians.

**PHILIPS HEALTHCARE**

MEDICA Hall 10 / A22

[www.ihe-online.com & search 46896](http://www.ihe-online.com & search 46896)

Direct connectivity for patient dedicated arterial blood gas analyser

A new functionality has been added to the Proxima patient dedicated arterial blood gas analyser to allow direct connectivity to hospital information systems. This is crucial in the efficient management of patient data generated by the Proxima system and enables point-of-care coordinators and other laboratory staff to remotely monitor the use and performance of this new analytical in-line system being used directly at the patient’s bedside. The new enhancement ensures that all patient test data for blood gas and electrolyte measurements, as well as system quality control data, can be transferred via an Ethernet connection to the hospital information network. This direct data transfer uses the standard HL7 communication protocol format that is easily integrated into information management systems, such as the Laboratory Information System and electronic Patient Data Management Systems. The CE-marked Proxima supports proactive patient care, particularly at critical times, since it enables rapid and frequent measurement without leaving the patient. This is possible as the Proxima sensor is a miniaturized version of a blood gas analyser that is integrated directly into the patient’s arterial line, meaning that all blood is returned to the patient. Operated using the dedicated bedside monitor with touch screen interface, the system provides simple, clear routines guiding the user. Patient results are then displayed clearly on this monitor and also electronically transferred for permanent record within information management systems.

**SPHERE MEDICAL**

[www.ihe-online.com & search 46899](http://www.ihe-online.com & search 46899)

Disposable access port disinfection device

Curos Port Protector is a disposable, passive disinfection device for patients with long-term catheters or receiving intravenous treatment. Studies have shown it reduces Central Line Associated Bloodstream Infections (CLABSI) and Catheter Related Bloodstream Infections (CRBSI) in hospitals. Its effectiveness was tested in vitro against *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Candida glabrata*. CLABSI is a serious, preventable infection contracted while in health care facilities. A recent study found that implementation of a disinfectant cap would reduce rates of CLABSI, lower costs and shorten hospital stays. Use of a disinfectant cap was associated with an estimated saving of almost €265,000 per year in the hospital studied. The device has an integrated, disinfecting pad impregnated with 70% isopropanol alcohol, which cleans the IV or catheter access port, killing bacteria in three minutes – and providing ongoing protection for up to seven days. Curos Port Protectors also provide a proven way of reducing infection risk for those patients who continue to receive treatment at home through intravenous needle-free devices and catheters.

**VYGON**

[www.ihe-online.com & search 46903](http://www.ihe-online.com & search 46903)
World-leading X-Ray imaging subsystems

Wherever safety and security matter, we deliver

For over 40 years Thales has been at the forefront of radiological imaging, consistently offering customers the world’s largest array of dedicated applications. Our commitment to innovation had led to the expansion of our image intensifier and Pixium digital detector range as well as integration of CMOS technology. Our strong expertise in many fields allows Thales to create a real partnership with customers – from the preliminary steps of integration to the final release. And all with the lowest total cost of ownership available in the market today. Experience the Thales difference.

UNPARALLELED INNOVATION
Access the very latest technologies: CMOS and a-Si substrate, CsI and Gadox scintillator

BEST-IN-CLASS PERFORMANCE
Enable outstanding image quality with the lowest dosage for the patient

OPTIMISED RELIABILITY
Ensure customer availability to equipments and solutions

HIGH-VALUE SERVICES
Benefit from a large range portfolio of innovative services

PRICE COMPETITIVE
Provide solutions that consistently deliver the lowest total cost of ownership

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