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CARDIOPULSE

The EAST study: redefining the role of rhythm control therapy in atrial fibrillation

EAST, the Early treatment of Atrial fibrillation for Stroke prevention Trial

Early and comprehensive maintenance of sinus rhythm is conceptually of paramount importance to prevent cardiovascular complications related to atrial fibrillation (AF). The EAST will evaluate the effect of early and modern rhythm control interventions on the outcome of patients with AF.

Unmet needs in the management of atrial fibrillation

Atrial fibrillation is not only a common condition and increasingly so in ageing populations, it is also a common cause of stroke, cardiovascular death, and cardiovascular hospitalizations. Even on optimal anticoagulation and rate control therapy, AF patients are at an unacceptable risk for cardiovascular death, in particular sudden death and death from heart failure. Furthermore, many patients with AF are hospitalized because of AF, illustrating the unmet needs in the current evidence-based management of AF.

Would it not be reasonable to assume that treating AF should reduce cardiovascular complications associated with AF?

Recent sub-analyses of the ROCKET-AF, AVERROES, and ACTIVE-W trial populations suggest that mortality and possibly strokes may be lower in patients with intermittent forms of AF compared with those with chronic AF,[1,2] suggesting that 'more AF may beget more complications'. While these hypothesis-generating data support our intuition that sinus rhythm must be good for patients in AF, the evidence is sobering: with the exception of the ATHENA trial,[3] six other controlled trials such as AF-CHF[4] and AFFIRM[5] have failed to demonstrate that rhythm control therapy improves prognosis or prevents cardiovascular complications in AF patients. Additionally, there was a slight excess of cardiovascular events in patients randomized to rhythm control therapy.

Early and comprehensive rhythm control therapy of AF: a window of opportunity?

Why has rhythm control therapy of AF not been effective in the prevention of cardiovascular complications, namely cardiovascular death, stroke, and heart failure? The rhythm control interventions used in the published trials were only moderately effective (e.g. sinus rhythm rates at the end of follow-up were 30% in the 'rate control' group and 60% in the rhythm control group in AFFIRM[5]). In rare cases, proarrhythmia may have played a role, although antiarrhythmic drugs are often used safely.[1,6,7] Furthermore, the majority of patients enrolled in AFFIRM and AF-CHF suffered from long-standing atrial fibrillation, where much of the atrial damage induced by AF was presumably irreversible.[8]

Interestingly, stroke rates in AF-CHF were numerically smaller in the rhythm control group (3 vs. 4%[4]), as well as in the dronedarone arm of the ATHENA trial.[7] Also of interest, the mortality in AF patients is highest in the early period after diagnosis of the arrhythmia, suggesting that the early months after the initial diagnosis of AF may provide a window of opportunity for both effective rhythm control therapy and for successful prevention of cardiovascular complications. Furthermore, anticoagulant therapy was often withdrawn from patients in rhythm control arms, e.g. in the AFFIRM trial, based on the assumption that sinus rhythm was present, resulting in a potentially avoidable excess risk of ischaemic stroke, possibly induced by asymptomatic recurrences of AF.

Figure 1 Countries enrolling in the EAST study.

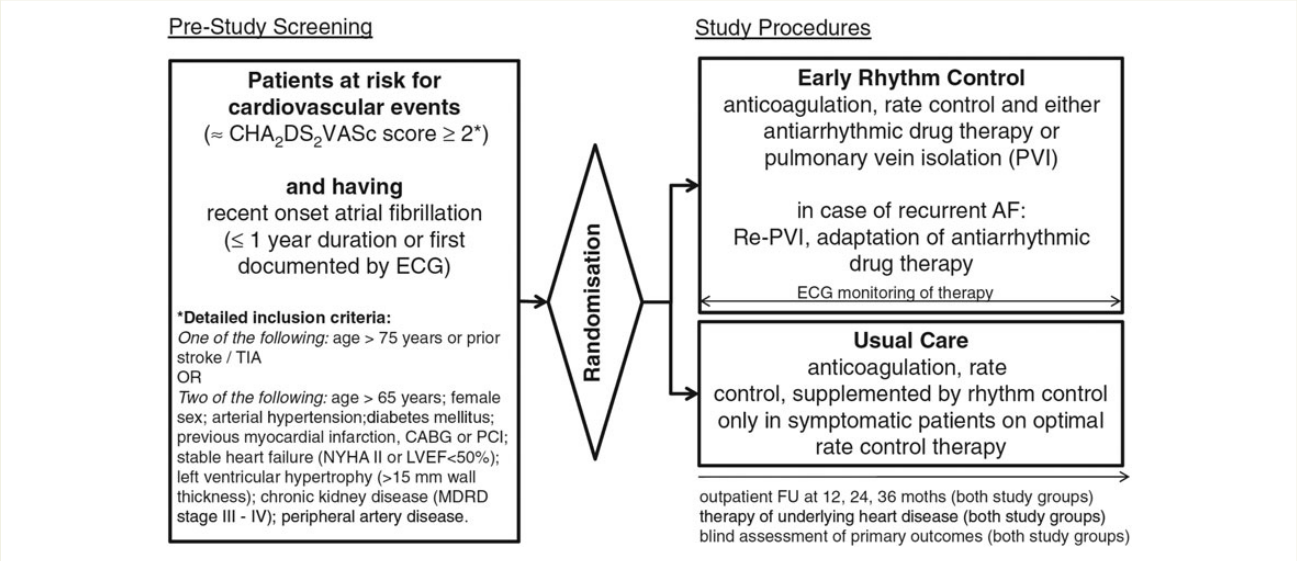


Figure 2 Flow chart of the EAST study. Reproduced from Kirchhof *et al.*[9]

The advent of catheter-based isolation of the pulmonary veins has provided a new therapeutic tool rendering rhythm control therapy more effective, especially in synergy with antiarrhythmic drugs. Especially when applied to patients with recent-onset atrial fibrillation, modern rhythm control therapy should hence be more powerful than older approaches in maintaining sinus rhythm.

Design and status of the EAST

In view of these considerations, the German Atrial Fibrillation competence NETwork association and the European Heart Rhythm Association teamed up to plan and conduct the EAST–AFNET 4 trial (Early treatment of Atrial fibrillation for Stroke prevention Trial, www.easttrial.org). The EAST has already enrolled more than 1500 patients in 11 European countries (Figure 1)—and we want to enrol another 1250 patients.

The EAST will answer the burning question, whether an early and comprehensive rhythm control therapy applied on top of oral anticoagulation and rate control can improve outcomes in patients with recent-onset atrial fibrillation.

In the EAST study patients with recent-onset AF and a certain stroke risk profile (approximating a CHA_2DS_2–VASc score of 2 or more) are randomized to either usual care following the current ESC guidelines on AF, or to usual care supplemented by early rhythm control therapy (*Figure* 2). Early rhythm control therapy consists of an antiarrhythmic drug and/or catheter ablation [including pulmonary vein isolation (PVI)] and is monitored by systematic ECG recordings. The trial is powered to detect a 25% reduction in the primary outcome of cardiovascular death, stroke, acute heart failure, or myocardial infarction. A co-primary outcome will assess whether early rhythm control therapy can prevent hospitalisations. Over 100 centres, all organized in study clusters are participating in the trial. If you are interested in participating, please contact the AFNET central office (info@kompetenznetz-vorhofflimmern.de) or the EAST study team (east@cri-muc.eu).

Etienne Aliot, France
Axel Brandes, Denmark
Lars Eckardt. Germany
Arif Elvan, Netherlands
Michele Gulizia, Italy
Hein Heidbuchel, Belgium
Josef Kautzner, Czech Republic
Lluis Mont, Spain
John Morgan, UK
André Ng, UK
Lukasz Szumowski, Poland
Sakis Themistoclakis, Italy
Isabelle C. Van Gelder, Netherlands
Stephan Willems, Germany
Paulus Kirchhof, UK

References

References are available as supplementary material at *European Heart Journal* online.

Recurrent atrial fibrillation reduced after renal denervation with pulmonary vein ablation in select patients

Renal denervation (RD) reduces recurrent atrial fibrillation (AF) when performed with pulmonary vein isolation (PVI) ablation in patients with AF and hypertension, according to research presented by Dr Alexander Romanov, Russian Federation at ESC Congress 2014.

Dr Romanov said: 'The prevalence of AF ranges from 1.5 to 2% in developed countries. This arrhythmia is associated with increased mortality, a five-fold risk of stroke and a 3-fold incidence of congestive heart failure. The vast majority of patients with AF also have arterial hypertension'.

He added: 'Up to 10% of patients with arterial hypertension are resistant to modern drug treatment and have so-called resistant hypertension, which is associated with an increased risk of cardiovascular events'.

Renal sympathetic denervation (RD) in addition to its anti-hypertensive effects may also exert antiarrhythmic effects, with reports suggesting a potential role for both AF and ventricular tachyarrhythmias. On the other hand, hypertension is an established risk factor for AF, and many cases of apparently 'lone' AF can be attributed to latent hypertension.

The aim of the study was to assess the impact of adding RD as an adjunct to PVI in patients with AF and moderate or severe resistant hypertension on AF recurrences and blood pressure changes.

The data for this analysis were obtained from two prospective, randomized, and double-blind studies. The analysis included 80 patients with a history of symptomatic drug refractory paroxysmal and persistent AF and moderate/severe resistant hypertension who underwent PVI and RD (*Figure 1*) compared with PVI only.

The researchers found that RD reduced the likelihood of AF when performed with PVI in hypertensive patients. At 12-month follow up, 63% of the patients who had PVI and RD were AF-free compared with 41% of patients in the PVI-only group.

The benefit was most dramatic in patients with severe drug-resistant hypertension and those with persistent AF, although non-significant trends were also seen in patients with moderate hypertension and those with paroxysmal AF. Dr Romanov said: 'We could speculate that the limited number of patients enrolled did not allow this trend to reach statistical significance. The use of RD in moderate hypertension as well as the effect on paroxysmal AF deserves further investigation'.

He concluded: 'We found that the addition of RD to PVI may be beneficial in patients with severe resistant hypertension and/or persistent AF. These results confirm our earlier findings but in a larger and more diverse cohort of patients. Additional and larger trials are needed to validate our results, and to assess the effects of combined treatment on maintenance of sinus rhythm and blood pressure control beyond one year'.

Andros Tofield

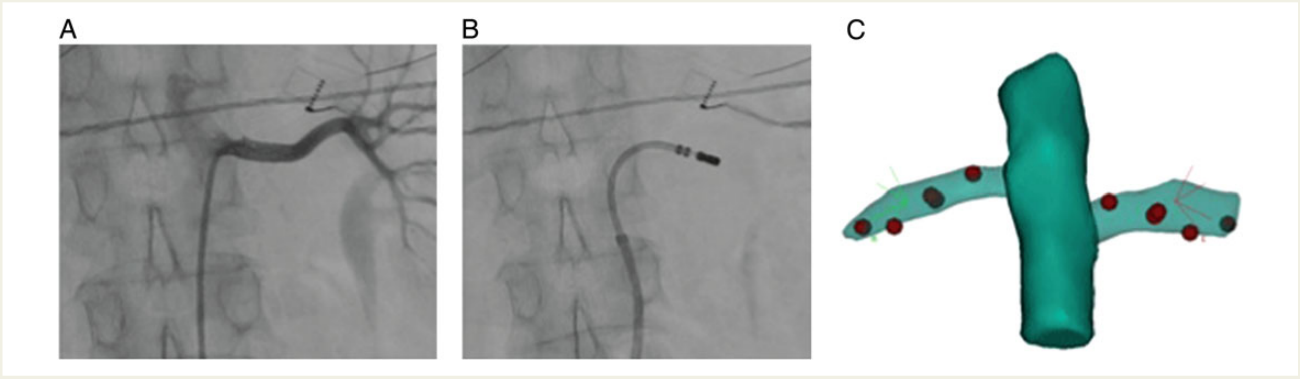


Figure 1 (*A*) Angiography of the left renal artery. (*B*) Renal ablation with the ablation catheter. (*C*) Three-dimensional reconstructions with sites of radiofrequency ablation represented in red.

New method predicts optimal number and location of automated external defibrillators

A new innovation was presented at ESC Congress 2014 by Dr Benjamin Dahan from France

According to the predictive method, Paris needs 350 AEDs located in public places for optimal prevention of out of hospital cardiac arrest (OHCA).

Dr Dahan said: 'Out of hospital cardiac arrest is a major public health issue with an annual incidence ranging between 50 and 100 per 100 000 of the general population in Europe and North America. Because the vast majority of OHCA start with ventricular fibrillation, early defibrillation and cardiopulmonary resuscitation are the only way to save the victim. Every minute of delay prior to defibrillation, decreases survival by 10%'.

He added: 'Except for a few recent encouraging reports, survival after OHCA remains poor at 7 to 8%. Survival has not improved over time despite decades of research and major financial investments in resuscitation. In the last two decades, public access defibrillation has been developed with a large deployment of AEDs for lay rescuers'.

Dr Dahan continued: 'However, although the benefits of AEDs are undeniable, public utilisation rates remain very low and thus the effectiveness of such programmes could be dramatically improved. One of the key issues is the disparity between the location of AEDs and OHCAs. To optimise AED deployment, policy makers have to consider many scientific, geographic, societal and political issues. Systematic scientific approaches are needed to improve the cost-effectiveness of public access to defibrillation programmes'.

The goal of the current study was to determine the optimal number of AED to be deployed in Paris. The researchers conducted a systematic analysis of all OHCA locations during 2000–2010. They then simulated different scenarios to evaluate how useful AEDs would have been to the OHCA cases such as comparing the effect of distance between AEDs, from 200 to 2000 m.

The researchers also tested the scenario of having AEDs in all well-known public areas including subway stations, post offices, pharmacies, and bike sharing stations. Using road network information and a geographic information system, they calculated the median distance (in metres) between OHCAs and potential AED locations. The plot distribution was modelled using a non-linear regression model.

Dr Dahan said: 'The inflection point of the trend line in the figure represents the optimal number of AEDs. Benefit for additional AEDs is poorer. We estimated that in Paris, the optimal number of AEDs located in public places was ~350'.

He added: 'Geographic optimisation modelling could be used for many urban areas, taking into account population density, population movements, urbanisation and other demographic data. This approach brings scientific rigour to the process of determining the optimal number of AEDs required in different urban areas'.

Dr Dahan continued: 'The expense of deploying AEDs is an important issue, with each device costing approximately €1000, plus maintenance. AEDs are underused because lay rescuers do not know where they are. Our approach to modelling the number and location of AEDs should dramatically improve cost-effectiveness by avoiding an excess number and ensuring they are accessible. Previous research has shown that efficient public access defibrillation programmes may improve the number of OHCA survivors by 100%'.

He concluded: 'In the current financial climate it is essential to avoid wasting resources. Our modelling ensures that the ideal number of AEDs can be deployed at the optimal location. This could be the change needed to improve the survival rates of out of hospital cardiac arrest'.

ESC Press Office

Corrigendum

Corrigendum to: Cardiopulse piece 'Training of Cardiologists in China, catching up with the rest of the world', [CardioPulse, Eur Heart J:**35:**2621-2622].

The author of this piece was published as Heng E, Ben MD PhD FACC. The author's name is He Ben MD PhD FACC.

HIGHCARE: the HIGH altitude CArdiovascular Research study

A scientific expedition on Mount Everest to measure the effects of altitude on blood pressure

Many hypertensive subjects travel to high altitudes, but little is known on the behaviour of blood pressure (BP) under this condition. A few observations obtained through conventional BP measurements suggest that BP may increase with acute exposure to high altitude. However, conventional BP measurements cannot reliably describe the behaviour of BP in daily life, which can best be assessed through 24 h ambulatory BP monitoring (ABPM). This approach, however, has rarely been used at high altitude, and little is known on ABP changes and antihypertensive drugs' efficacy under acute and prolonged exposure to hypobaric hypoxia.

In particular, the efficacy of angiotensin-receptor blockers under this condition is unknown. This may be clinically relevant, considering that renin–angiotensin system activity changes at altitude. HIGHCARE-HIMALAYA study assessed the changes in 24 h ABP under acute and prolonged exposure to increasing altitude and the BP lowering efficacy and safety of angiotensin-receptor blockade in this setting. Indeed, it represents the first-ever ABPM study of a significant number of subjects at very high altitude in the Mt Everest area.

Mt Everest is the highest mountain on Earth, with its summit at 8848 m (29 029 ft.) above sea level (a.s.l.). The mountain, part of the Himalaya range in High Asia, is located on the border between Sagarmatha Zone, Nepal, and Tibet, China.

Forty-seven healthy, normotensive lowlanders were randomized to telmisartan 80 mg or placebo in a double-blind, parallel group trial. Conventional and ambulatory BPs were measured at baseline and on treatment: after 8 weeks at sea level, under acute exposure to 3400 and 5400 m altitude, the latter upon arrival and after 12 days (Mt Everest Base Camp).

Blood samples were collected for plasma catecholamines, renin, angiotensin, and aldosterone.

In both groups, exposure to increasing altitude was associated with:

(1) Significant progressive increases in conventional and 24 h BP, persisting throughout the exposure to 5400 m;
(2) Increased plasma noradrenaline and suppressed renin–angiotensin–aldosterone system (RAAS).

HIGHCARE HIMALAYA: Mt. Everest

Everest base camp, Nepal: Parati tent.

HIGHCARE HIMALAYA: base camp

Telmisartan lowered 24 h ABP at sea level and at 3400 m (between-group difference 4.0 mmHg, 95% CI 2.2–9.5 mmHg), but not at 5400 m. This study demonstrated that ABP increases progressively with increasing altitude, remaining elevated after 3 weeks. Angiotensin-receptor blockade maintains its BP lowering efficacy at 3400 m but not at 5400 m.

The cardiovascular changes occurring at high altitude are mainly due to decreased atmospheric pressure leading to hypoxia (deprivation of adequate oxygen supply) and hypoxemia (decreased partial pressure of oxygen in blood).

Professor Gianfranco Parati, Chairman and Principle Investigator of the HIGHCARE2008 Project and Professor of Cardiovascular Medicine at the Department of Health Sciences, University of Milano-Bicocca, organized this study by recruiting 50 healthy subjects, who were playing the double role of volunteers in a physiological investigation and investigators in a multidisciplinary study.

HIGH altitude Cardiovascular Research took place in 2008 on Mount Everest south slopes in the Himalayas (HIGHCARE–HIMALAYA). Most of the data collection occurred at Namche Bazar (3400 m a.s.l.) and at Mt Everest South Base Camp (5400 m a.s.l.) in Nepal, while a subgroup of alpinists also collected data at Mt Everest Camps 1 and 2 (6400 m a.s.l).

The expedition aimed to assess the physiological (cardiovascular, pulmonary, neural, endocrine, metabolic, hematologic and molecular) changes induced by the exposure to marked and prolonged hypobaric hypoxia and to determine how these changes may be influenced by the angiotensin AT1 receptor blocker telmisartan and by other non-pharmacological interventions aimed at counteracting high-altitude hypoxia, namely controlled slow breathing exercise and the application of continuous positive airway pressure (CPAP).

Continuous positive airway pressure and controlled slow breathing have been shown to be useful treatments of chronic clinical conditions associated with hypoxemia and may be of aid in the treatment of acute mountain sickness.

Renin–angiotensin–aldosterone system is involved in the pathogenesis of a number of cardiovascular pathological conditions, including hypertension and heart failure, and drugs interfering with RAAS (including AT1 angiotensin-receptor blockers) are beneficial under these conditions. High altitude induces important changes in RAAS although the exact character of these changes is poorly understood. Telmisartan has also been suggested to exert metabolic effects through PPAR-gamma agonism, a feature that may be relevant at high altitude since insulin sensitivity is reduced under conditions of high-altitude exposure.

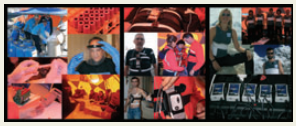
Beyond AT1 antagonism, some other relevant physiological changes at high altitude that have been explored and whose data have been already published include:

- Iron metabolism (which is tightly coupled to oxygen homeostasis and erythropoiesis), i.e. how hypoxia regulates iron acquisition for erythropoiesis in humans, a topic relevant to common hypoxia-related disorders;
- The molecular modifications induced by exposure of subjects to different levels of altitudes and to pharmacological treatment, by studying the urinary peptidome;
- Lung diffusing capacity for carbon monoxide and its major determinants (haemoglobin, alveolar volume, pulmonary capillary blood volume, and alveolar-capillary membrane diffusion) in early high-altitude adaptation;
- The presence of increased extravascular pulmonary fluid (high altitude pulmonary oedema, even in its subclinical form) by assessing CPAP effects on haemoglobin oxygen saturation during prolonged altitude exposure.

Besides basic measurements—consisting of, assessing symptoms (Lake Louise Score), body temperature, SpO_2 (pulse oximetry), blood pressure, heart rate, fluid balance—to investigate the physiological and pathophysiological changes induced by high-altitude exposure, the following examinations were performed in 47 healthy subjects. Of note, we also tested at high altitude the applications of a smart garment previously developed for the monitoring of ECG, respiration, and movement (Maglietta Interattiva Computerizzata—MagIC).

Investigations performed in HIGHCARE-HIMALAYA

HIGHCARE HIMALAYA: lab work in tents at Mt Everest base camp (1)



HIGHCARE HIMALAYA: lab work in tents at Mt Everest base camp (2)

- Cardiovascular investigations: 24 h ABPM, non-invasive continuous blood pressure, and pulse interval monitoring beat by beat, echocardiography, arterial stiffness assessment.
- Endocrine and metabolic investigations: determination of plasma renin, aldosterone, ACE, angiotensin II, BNP, ADH, adrenalin, noradrenalin, cortisol, glucose, leptin, adiponectin, CCK, GIP-1; plasma and urine osmolality; insulin sensitivity and resistance.
- Neural investigations: sleep studies (polysomnography) and neuroreactivity tests (psychological and neuropsychological assessment).
- Haematology investigations: measurement of levels of: haemoglobin, erythropoietin, soluble transferrin receptor, iron, transferrin, ceruloplasmin, ferritin, GDF15, and hepcidin.
- Molecular and genetic investigations: measurement of serum IL-6, TNF-α, sTNF-RI, sTNF-RII; proteomic analysis of plasma/serum and urine; baseline genetic testing.
- Pulmonary investigations: standard pulmonary function tests, lung diffusion capacity for carbon monoxide; assessment of alveo-capillary barrier integrity indirectly performed measuring blood levels of serum surfactant protein B (SP-B).
- Climatic data: climate features of high altitude that have been considered for the interpretation of biological information include the decrease in temperature, atmospheric pressure, air density, water vapour, carbon dioxide, and impurities, an elevated and variable exposure to ultraviolet radiation.

About the HIGHCARE2008 Project

The HIGHCARE2008 Project was arranged by the Istituto Auxologico Italiano (Ospedale S. Luca, Milano, Osp. S. Giuseppe, Piancavallo, Verbania) and University of Milano-Bicocca (Dept. of Clinical Medicine and Prevention). The expedition took place in September 2008. For further information on the HIGHCARE Expedition, see http://highcareprojects.eu.

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The Istituto Auxologico Italiano

An institute in Italy dedicated to biomedical research and health care

The Istituto Auxologico Italiano, a private not for profit Foundation, is an institution for biomedical research and for the study of health service organization and management. Founded in 1958 it was set up as a Foundation in 1963. In 1972 the Italian government granted it legal status as a 'Scientific Institute for Hospitalisation and Treatment' (istituto di ricovero e cura a carattere scientico: IRCCS), or research hospital. Its official recognition as such has been confirmed and extended in subsequent years.

The nationally renowned clinics making up the Istituto Auxologico Italiano are highly specialized facilities where experimental and clinical research is integrated with top rate health care. They are also testing grounds for original models of health service organization and management.

First location of Istituto Auxologico Italiano in Milan.

Caramora Villa, San Giuseppe Hospital Scientific Institute, research, meetings and education centre

The interlocking disciplines of research and clinical care allow us to produce knowledge, technologies, and diagnostic and treatment protocols that foster the constant improvement of patients' conditions and serve as models for the National Health Service.

Our initial focus was on growth disorders, chiefly pituitary dwarfism, an area of research where we have long been acknowledged as pioneers. Gradually, we expanded our scientific and clinical operations to various aspects of human development, from conception through adulthood.

We study disorders and degenerative processes from the standpoint of prevention, diagnosis, treatment, and rehabilitation, with a special emphasis on growth, endocrine and metabolic disorders, cardiovascular diseases, and the neurosciences. In particular, we have a strong interest in medical and molecular genetics of these diseases.

Cardiovascular research includes:

The pathophysiology of the nervous control of the circulation in various disorders; atherosclerosis, arterial hypertension, myocardial infarction, heart failure, and autoimmune vasculitis; the development of non-invasive techniques for cardiovascular diagnosis; clinical cardiovascular pharmacology; and the genetic and immunological aspects of cardiovascular diseases.

An important and innovative field of research is cardiovascular rehabilitation after myocardial infarction and heart failure, and the investigation on the effects of hypoxia on the cardiovascular system

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American Medical News production discontinued

The print and online news publication of the American Medical Association has closed its doors due to declining advertising revenue and an unsustainable business model

After 55 years, *American Medical News*, the semi-monthly news source of the American Medical Association, ceased publishing in 2013, citing declining ad revenues and competition from other digital platforms. The AM *News*, which had a circulation of ~208 000, according to BPA Worldwide, was also published online.

'Over the last 10 years *AM News* has been unable to generate an operating surplus', Thomas J. Easley, senior vice president and publisher, periodic publications, said in a statement. 'We've analysed the situation exhaustively and do not foresee the trend improving. Despite the editorial excellence *AM News* consistently provides, it is not immune to the changes in the market, and we reached a point where we could not continue down a path that is not sustainable from a business perspective'.

Easley told *Folio* magazine that the *AM News* business model, which relied predominantly on print advertising, was problematic.

'The other products in our portfolio had a healthier blend between print and digital on the advertising side', Easley said. 'And more importantly, *Journal of the American Medical Association (JAMA)* and the JAMA Network have subscriptions and site licensing'.

According to AMA's 2012 Annual Report, the Association's publishing revenue dropped in 2012 by $9.4 million, which was primarily attributed to an $8.7 million decline in print advertising revenue.

Easley said one reason for revenue decline is the recent 'patent cliff', or the potential for sharply reduced revenues in the pharmaceutical industry—one of the news magazine's primary sources of advertising—stemming from patent expirations.

In terms of changing the business model, Easley said AMA had already reduced the number of print issues from 50 to 24 in 2009 and thought to do so again would erode the product's value. And expanding digitally was a bit of a catch-22.

'The challenge that we faced with transitioning to a digital model is that 90 percent of our revenue was coming from print,' Easley said. 'If we'd gone with the digital model, we would have cut all those costs associated with producing a print product but also would have lost all of the print revenues and we still would have had the challenge of covering the editorial expense associated with putting out such a high-calibre journalistic product'.

To continue delivering news to physicians, the association said it will augment current in-house communication products. Coincidentally, AMA's marketing department is in the process of repositioning and strengthening two of its alert, or digital news, systems—*AMA Morning Rounds* and *AMA Wire*—Easley said.

The decision to close the publication affected 20 full-time employees located in Chicago, Washington, DC, and New Jersey, according to AMA.

Andros Tofield

What in your view is the best cardiology innovation of the last decade?

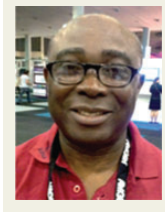
Four cardiologists from Africa, Europe, and India give their opinion

Suvankar Ghosh, Interventional Cardiologist Baroda, Vadodara, India

Suvankar Ghosh, Interventional Cardiologist, Baroda, Vadodara, India

For me the biggest boom in cardiology has been the introduction of primary angioplasty for patients with acute MI. Since the introduction of primary angioplasty, we have seen mortality rates due to acute MI in my city going down by 25–30%. Primary PCI overcomes the complications of thrombolytic drugs such as haemorrhagic stroke and also means that patients do not have to undergo debilitating bypass surgery.

I believe that because we are treating patients so promptly they a're less likely to go on to develop long-term complications, such as heart failure. Ultimately this could lead to even greater gains in survival.



Akpa Maclean Cardiologist, University of Port Harcourt Hospital, Port Harcourt, Nigeria

Akpa Maclean, Cardiologist, University of Port Harcourt Hospital, Port Harcourt, Nigeria

Novel oral anticoagulants for atrial fibrillation for me have had the most impact for patients. Before, we relied on beta blockers, but they weren't ideal and you had to be selective about their use. AF is a big issue in Nigeria, mainly because of poor access to treatment for rheumatic heart disease.

The benefit of the new anticoagulants is that they don't need monitoring and their safety profile for non-valvular AF is good—we've not had patients with bleeding. Now what we hope for is the same indication for valvular disease, to improve the lives of even more patients.

Egle Prascience, Third-year cardiology resident, Kaunas, Lithuania

Egle Prascience, Third-year cardiology resident, Kaunas, Lithuania

For me it has to be imaging. Advances in imaging technology, such as 3D echo and computed tomography, are providing vital information to help prevent some patients from having some interventional procedures. Computed tomography measures the calcium content of vessels. This means that cardiologists can identify those patients at greatest risk of MI who can be referred for angiography investigations. Others can be treated medically.

Another area is valve surgery where 3D echocardiography is being used to produce images of malfunctioning valves. This can help surgeons plan their operations.

Raghid Khatib, Cardiologist, Sweden

Raghid Khatib, Cardiologist, Sweden

For me it's the development of treatments for heart failure and better management of the condition since the introduction of biomarkers. There's also the use of ICDs, VADs, and pacemakers. A decade ago these were not available as they are now—nor as advanced or modern. They can also bridge the gap for patients waiting for heart transplants—temporarily or even long-term, given the length of waiting lists for organs. Some people are able to continue their lives on these devices.

We've also become better at assessing heart transplant suitability in patients with chronic heart failure and at identifying risk factors.