European Society of Cardiology (ESC) Annual Congress Report From Munich 2018

Yasutsugu Shiono, MD, PhD; Takashi Akasaka, MD, PhD

The 2018 Annual Congress of the European Society of Cardiology (ESC) was held between the 25th and 29th August in Munich, Germany. As with previous international major conferences,^{1,2} this congress was also full of exciting topics in cardiology.

Munich is the capital city of the German state of Bavaria, which is a major center of culture, technology, business, and education. Delegates enjoyed the congress in the vibrant atmosphere of the city and pleasant cool weather (**Figure 1A**). Because the ESC is regarded as the summit in the field of cardiology, the congress attracted over 30,000 delegates, comprising physicians, researchers, students, paramedical personnel, and industries, from more than 150 countries.

Thousands of presentations, including 14 late-breaking science sessions and 5 hotlines, were delivered and provided truly invaluable learning opportunities, most of which were designed to be attractive and interactive. A lot of sessions were in open spaces or even in open-air theaters so that people were able to feel free to join those sessions (**Figure 1B–D**). The venue was so huge and so many sessions were going on simultaneously that the ESC App that we could have on our mobiles was a must-have item to get the most out of this enormous congress.

As usual, a lot of Japanese delegates attended and made lots of presentations, including Japanese Circulation Society (JCS) joint sessions with ESC, young investigator awards, and the late-breaking sessions, that truly were a great contribution to this congress. We will briefly highlight key topics and interesting presentations from the congress.

Inaugural Session

The inaugural session on the first day began with opening remarks by ESC President, Jeroen Bax. He appeared in a video demonstrating an imaginary cardiovascular lab for how cardiology might become in the future (**Figure 2A**). In this video, he emphasized the importance of creativity in science by saying that our biggest limitation is often our lack of imagination. He continued that no one knows where science will lead us in the future, but what we do know is that we must keep pushing ourselves to dream bigger and bolder, reflecting on several breakthroughs achieved in cardiology over the past decades. Following his

inspiring opening remarks, Professor Eugene Braunwald gave the inaugural address in which he stated that a good partnership between academia and industry is key in medicine and that collaboration between academia and industry will become even more important when taking account advances in medicine such as precision medicine, digital health, and big data etc. In his speech, he made reference to Japanese scientist Dr. Akira Endo as a successful example of the relationship between academia and industry (**Figure 2B**). He said that the discovery of statins, also called “penicillin for lipid”, might have never happened without Dr. Endo, which was a proud moment for many Japanese there.

JCS Activities in ESC

The contribution from JCS to this congress was as huge as in previous years. As well as thousands of attendees, the number of abstracts submitted from Japan and also those accepted was the largest in the world. As recognition of this great contribution to the ESC, the JCS received a special award from the ESC and the plaque was presented to the President of JCS, Professor Issei Komuro, at the Awards Ceremony (**Figure 3A,B**).

During the congress, there were 3 JCS-ESC joint sessions. The first session was “Adipose tissue and cardiovascular disease” (**Figure 4A**), the second was “New strategies for diagnosis and treatment in dilated cardiomyopathy” (**Figure 4B**), and the last one was “New frontiers in interventional cardiology” (**Figure 4C**). All sessions were chaired by professors from both societies, and 6 presentations from JCS and 7 from ESC were made. We shared our in-depth knowledge in the basic and clinical sciences through these collaborative sessions.

The JCS booth was housed in the ESC plaza, together with many booths from other countries’ circulatory societies (**Figure 4D**). The booth was decorated with a Japanese lantern and paper cranes to create a welcoming atmosphere. It was a spot where people dropped by and had lively conversations to get to know each other better. Japanese scientific activities as well as our culture were introduced to people from other countries.

In the Hot Line sessions, FREED (Febuxostat for Cerebral and Cardioresvascular Events PrEvEntion

The opinions expressed in this article are not necessarily those of the editors or of the Japanese Circulation Society.

Received November 16, 2018; revised manuscript received November 16, 2018; accepted November 18, 2018; J-STAGE Advance

Publication released online December 6, 2018

Department of Cardiovascular Medicine, Wakayama Medical University, Wakayama, Japan

Mailing address: Yasutsugu Shiono, MD, PhD, Department of Cardiovascular Medicine, Wakayama Medical University, 811-1

Kimiidera, Wakayama 641-8509, Japan. E-mail: doors@herb.ocn.ne.jp

ISSN-1346-9843 All rights are reserved to the Japanese Circulation Society. For permissions, please e-mail: cj@j-circ.or.jp

Figure 1. Snapshots of ESC 2018. (A) Main entrance to ESC 2018 in Munich. (B,C) Sessions in open spaces. (D) Garden cafes at the congress center.

Figure 2. Inauguration ceremony. (A) ESC opening address by President Professor Jeroen Bax. (B) Inaugural address by Professor Eugene Braunwald.

StuDy) was presented by Dr. Kojima in the main auditorium. This study was a multicenter, prospective, randomized open-label, blinded endpoint, 2-arm parallel treatment groups study aiming at comparing the occurrence of cerebral, cardiovascular, and renal events in elderly patients with hyperuricemia at risk for cerebral or cardiorenovascular disease treated with febuxostat and those treated with conventional therapy, and showed a lower rate of the primary endpoint in the febuxostat group compared with the standard therapy group (hazard ratio=0.750 (95% confidence interval [CI], 0.592–0.950), $P=0.017$).

Remarkably, 4 young Japanese researchers were short-listed as finalists in the Young Investigators Award (YIA)

sessions in basic science, population science, and coronary pathophysiology and microcirculation. Dr. Toshiyuki Ko from University of Tokyo won the YIA award in the Basic Science session (**Figure 3C**) for his research entitled “Single-cell analysis of non-cardiomyocytes in heart reveals a critical regulator of cardiac homeostasis”, which was also picked up as a hot topic and broadcast on ESC TV (**Figure 3D**).

Late-Breaking Science

A total of 92 late-breaking science studies were presented in the hot line and late-breaking sessions. Those presenta-

tions that would potentially provide practice-changing insights garnered significant attention, covering a variety of subjects including interventional cardiology, telemedicine, pharmacological science, imaging, arrhythmias and electrophysiology (EP), heart failure, and basic and translational science. The followings are some that we thought

were clinically interesting.

ASCEND

ASCEND (A Study of Cardiovascular Events iN Diabetes) aimed to clarify whether aspirin is useful for primary prevention of cardiovascular events in diabetic patients.³

A total of 15,480 patients with diabetes who had no prior history of cardiovascular disease were randomized to receive aspirin 100mg daily or matching placebo and followed for a mean of 7.4 years. A significant reduction was found in serious vascular events defined as the first vascular event including myocardial infarction (MI), stroke or transient ischemic attack, or death from any vascular cause, excluding any confirmed intracranial hemorrhage (8.5% vs. 9.6%; rate ratio, 0.88; 95% CI, 0.79–0.97; $P=0.01$). In contrast, major bleeding was increased by 29% (4.1% with aspirin vs. 3.2% with placebo: rate ratio, 1.29; 95% CI 1.09–1.52; $P=0.003$). As a result, the benefits from avoiding serious vascular events with aspirin were cancelled by the excess of major bleeding. During this meeting, another study assessing aspirin use, ARRIVE, was presented and failed to show a role for aspirin in primary prevention.⁴ Based on these 2 studies, it seems that the role of aspirin in primary prevention is limited at present.

GLOBAL LEADERS

GLOBAL LEADERS assessed short-term (1 month) dual antiplatelet therapy (DAPT) followed by long-term (23 months) single potent antiplatelet treatment. This was a randomized, open-label superiority trial to assess whether ticagrelor, in combination with aspirin for 1 month, followed by ticagrelor alone, improved outcomes after percutaneous coronary intervention (PCI) compared with standard antiplatelet regimens.⁵ A total of 16,000 patients scheduled to undergo PCI for stable coronary artery disease (SCAD) or acute coronary syndromes (ACS) were randomly allocated in 1:1 ratio to 75–100mg aspirin daily plus 90mg ticagrelor twice daily for 1 month, followed by 23 months of ticagrelor monotherapy, or standard DAPT with 75–100mg aspirin daily plus either 75mg clopidogrel daily (for SCAD) or 90mg ticagrelor twice daily (for ACS) for 12 months, followed by aspirin monotherapy for 12 months. The composite primary endpoint was the cumulative incidence of all-cause death or new Q-wave MI within 2 years and the secondary endpoint was the rate of moderate or severe bleeding over the 2-year period. At 12 months, the primary endpoint was significantly lower in the experimental group than in the standard DAPT group (1.95% vs. 2.47%, risk ratio 0.79; $P=0.028$), but this was not the prespecified primary endpoint. At 24 months, the difference in the primary endpoint was in favor of the experimental group but was no longer statistically significant (3.81% vs. 4.37%, risk ratio 0.87; $P=0.073$). The bleeding event rate was similar in each group (risk ratio 0.97).

By definition, ticagrelor in combination with aspirin for 1 month followed by ticagrelor alone for 23 months was not superior to current standard antiplatelet therapy. However, if the trial had been planned to assess the primary endpoint at 1 year, it would have demonstrated superiority of the short-term DAPT. This study reminds us of how difficult and important designing high quality clinical studies is.

CULPRIT-SHOCK

The 1-year outcome of CULPRIT-SHOCK was another interesting study.⁶ Last year, against all odds, the 30-day results of CULPRIT-SHOCK demonstrated worse outcome of immediate multivessel PCI than culprit-lesion-only PCI in patients with acute MI complicated by cardiogenic shock, which led to the downgrading of immediate

multivessel PCI in patients suffering from cardiogenic shock to Class III in the 2018 Guidelines on myocardial revascularization.

CULPRIT-SHOCK was an investigator-initiated, randomized, open-label, multicenter trial that compared culprit-lesion-only PCI with immediate multivessel PCI in patients with acute MI complicated by cardiogenic shock. The 1-year composite endpoint (death or renal-replacement therapy) was 52.0% with culprit-lesion-only PCI and 59.5% with multivessel PCI (relative risk 0.87; 95% CI 0.76–0.99; $P=0.048$). The difference in all-cause mortality at 30 days was attenuated at 1 year, which was 50% for culprit-lesion-only PCI and 56.9% with multivessel PCI (relative risk 0.88; 95% CI 0.76–1.01; $P=0.07$). Also, culprit-lesion-only PCI was associated with a higher risk of repeat revascularization (relative risk 3.44; 95% CI 2.39–4.95; $P<0.001$) and rehospitalization for congestive heart failure (relative risk 4.46; 95% CI 1.53–13.04; $P=0.003$). The advantage of culprit-lesion-only PCI over multivessel PCI on all-cause mortality reduced with time and more events occurred afterwards. This study raised sobering thoughts on how to manage acute MI patients complicated with cardiogenic shock.

MITRA-FR

Lastly, MITRA-FR was a multicenter, randomized, open-label, controlled phase 3 trial that was conducted to examine whether percutaneous mitral valve repair (MVR) could reduce the rate of all-cause death or unscheduled hospitalization for heart failure compared with optimal medical treatment alone. A total of 304 patients with symptomatic heart failure, poor left ventricular function (left ventricular ejection fraction [LVEF] 15–40%), and severe secondary mitral regurgitation (MR) were enrolled. Patients received optimal medical treatment, and then were randomly assigned to undergo percutaneous MVR or no intervention (control group). More than 90% of procedures were performed successfully and there were no significant safety concerns. MR was substantially reduced in patients who underwent the procedure compared with the control group (91.9% of the intervention group had a reduction in MR to mild to moderate or lower). Nevertheless, there was no statistically significant difference in the primary endpoint of death and unscheduled heart failure rehospitalization at 12 months, which occurred in 55% of patients receiving the intervention and 52% of patients treated with medical therapy alone ($P=0.53$). Although MR reduction was achieved with the intervention, it did not translate into a clinical benefit in patients with heart failure.⁷

New Guidelines

Four guidelines were revised and the “4th Universal Definition of Myocardial Infarction” was launched at this meeting. We summarize what is new in these guidelines.

Management of Arterial Hypertension

Guidelines for the management of arterial hypertension were jointly issued with European Society of Hypertension (ESH).⁸

The following are new concepts in the guidelines.

- (1) Blood pressure (BP) measurement: wider use of out-of-office BP measurement with ambulatory BP monitoring (ABPM) and/or home BP monitoring (HBPM), especially HBPM, as an option to confirm the diagnosis of

hypertension, detect white-coat and masked hypertension, and monitor BP control.

- (2) Less conservative treatment of BP in older and very old patients: Lower BP thresholds and treatment targets for older patients, with emphasis on considerations of biological rather than chronological age (i.e., the importance of frailty, independence, and the tolerability of treatment). Recommendation that treatment should never be denied or withdrawn on the basis of age, provided that treatment is tolerated.
- (3) A single-pill combination (SPC) treatment strategy to improve BP control: preferred use of 2-drug combination therapy for the initial treatment of most people with hypertension. A single-pill treatment strategy for hypertension with the preferred use of SPC therapy for most patients. Simplified drug treatment algorithms with preferred use of an angiotensin-converting enzyme (ACE) inhibitor or angiotensin-receptor blocker (ARB), combined with a calcium-channel blocker (CCB) and/or a thiazide/thiazide-like diuretic, as the core treatment strategy for most patients, with β -blockers used for specific indications.
- (4) New target ranges for BP in treated patients: to better identify the recommended BP target and lower safety boundaries for treated BP, according to a patient's age and specific comorbidities.
- (5) Detecting poor adherence to drug therapy: A strong emphasis on the importance of evaluating treatment adherence as a major cause of poor BP control.
- (6) A key role for nurses and pharmacists in the longer-term management of hypertension: their important in the education, support, and follow-up of treated hypertensive patients is emphasized as part of the overall strategy to improve BP control.

Diagnosis and Management of Syncope

These Guidelines were developed with the European Heart Rhythm Association (EHRA), and also endorsed by European Academy of Neurology (EAN), European Federation of Autonomic Societies (EFAS), European Federation of Internal Medicine (EFIM), European Union Geriatric Medicine Society (EUGMS), and European Society of Emergency Medicine (EUSEM).⁹

New/upgraded Class I recommendations

- (1) Management of syncope in the emergency department (ED): Low-risk: discharge from ED; High-risk: early intensive evaluation in ED, syncope unit (SU) vs. admission; Neither high or low: observation in ED or in SU instead of being hospitalized. High- and low-risk features are based on syncopal event, past medical history, physical examination, and ECG.
- (2) EP-guided pacemaker (HV interval >70 ms).
- (3) Syncope and high-risk hypertrophic cardiomyopathy (HCM): implantable cardioverter-defibrillator (ICD).
- (4) Syncope and atrial fibrillation (AF): catheter ablation.

Other new/revised concepts

- (1) New/revised clinical settings and tests
 - (1-1) Tilt testing: concept of hypotensive susceptibility
 - (1-2) Increased role of prolonged ECG monitoring (external or implantable)
 - (1-3) Home video recordings of spontaneous events
 - (1-4) Syncope without prodrome, normal ECG and normal heart (adenosine-sensitive syncope)
 - (1-5) Neurological cases: ocular systole
- (2) New/revised indications for treatment

- (2-1) Reflex syncope: algorithms for selection of appropriate therapy based on age, severity of syncope and clinical forms
- (2-2) Reflex syncope: algorithms for selection of best candidates for pacemaker therapy
- (2-3) Patients at risk of sudden cardiac death (SCD): definition of unexplained syncope and indication for ICD
- (2-4) Implantable loop recorder as alternative to ICD in selected cases
- (3) (Outpatient) syncope management unit
 - (3-1) Structure: staff, equipment, and procedures
 - (3-2) Tests and assessments
 - (3-3) Access and referrals
 - (3-4) Role of the clinical nurse specialist
 - (3-5) Outcome and quality indicators
- (4) Management in the ED
 - (4-1) List of low-risk and high-risk features
 - (4-2) Risk stratification flowchart
 - (4-3) Management in ED observation unit and/or fast-track to SU
 - (4-4) Restricted admission criteria
 - (4-5) Limited usefulness of risk stratification scores

Myocardial Revascularization

Guidelines on myocardial revascularization were published together with the European Association for Cardio-Thoracic Surgery (EACTS), and also with the contribution from the European Association for Percutaneous Cardiovascular Interventions (EAPCI).¹⁰

New/upgraded Class I indication

- (1) Calculation of the Syntax Score, if left main or multi-vessel revascularization is considered
- (2) Radial access as standard approach for coronary angiography and PCI
- (3) Drug-eluting stents (DES) for any PCI
- (4) Systematic re-evaluation of patients after myocardial revascularization
- (5) Stabilized NSTEMI-ACS patients: revascularization strategy according to principles for SCAD
- (6) Use of radial artery grafts over saphenous vein grafts in patients with high-degree stenosis
- (7) Myocardial revascularization in patients with CAD, heart failure, and LVEF $\leq 35\%$: coronary artery bypass graft (CABG) preferred
- (8) For PCI of bifurcation lesions, stent implantation in the main vessel only, followed by provisional balloon angioplasty with or without stenting of the side branch
- (9) Immediate coronary angiography and revascularization, if appropriate, in survivors of out-of-hospital cardiac arrest and an ECG consistent with STEMI
- (10) Assess all patients for risk of contrast-induced nephropathy

Management of Cardiovascular Diseases During Pregnancy

Guidelines have been updated from the 2012 version. Selected updates are as follows. However, it should be noted that the recommendations in these Guidelines mostly correspond to evidence level C because prospective or randomized studies are frequently absent in this field.¹¹

New/upgraded class I recommendations

- (1) Right heart catheterization is recommended to confirm the diagnosis of pulmonary arterial hypertension (PAH). This can be performed during pregnancy but

Figure 5. (A) Digital health area and (B) session. (C) 3D printed organs.

- with very strict indications.
- (2) Low-molecular-weight heparin (LMWH) in therapeutic doses is recommended for pregnant patients with chronic thrombo-embolic pulmonary hypertension.
- (3) In patients with pulmonary embolism, thrombolytic therapy is recommended only in severe hypotension or shock.
- (4) In women at high risk for thrombo-embolism, it is recommended to convert LMWH to unfractionated heparin (UFH) at least 36h prior to delivery and stop the UFH infusion 4–6h prior to anticipated delivery. aPTT should be normal before regional anesthesia.
- (5) In women at low risk for thrombo-embolism on therapeutic LMWH, induction or caesarean section is recommended to be performed 24h after the last dose of LMWH.
- (6) In women considering pregnancy and requiring heart valve surgery, it is recommended to choose the prosthesis in consultation with a pregnancy heart team.
- (7) It is recommended to manage pregnancy in women with mechanical heart valves in a center with a pregnancy heart team.
- (8) It is recommended to perform risk assessment in all women with cardiac diseases of childbearing age and before conception, using the modified World Health Organization (mWHO) classification of maternal risk.
- (9) Intervention is recommended before pregnancy in patients with mitral stenosis (MS) and valve area $<1.0\text{ cm}^2$.
- (10) During the 2nd and 3rd trimesters until the 36th week, vitamin K antagonists (VKAs) are recommended in women needing a low dose (low-dose VKA: warfarin $<5\text{ mg/day}$, phenprocoumon $<3\text{ mg/day}$, or acenocou-

marol $<2\text{ mg/day}$).

- (11) Flecainide or propafenone are recommended for prevention of supraventricular tachycardia (SVT) in patients with Wolff-Parkinson-White (WPW) syndrome.
- (12) LMWH is the drug of choice for the prevention and treatment of venous thrombo-embolism (VTE) in all pregnant patients.
- (13) It is recommended that the therapeutic dose of LMWH is based on body weight.
- (14) In pregnant women on LMWH or UFH, it is recommended to perform weekly anti-Xa level monitoring or aPTT monitoring with dose adjustment (within 36h).

The 4th Universal Definition of Myocardial Infarction

The 4th Universal Definition of Myocardial Infarction has been published together with American College of Cardiology (ACC), American Heart Association (AHA), and World Heart Federation (WHF).¹²

New/updated concepts

- (1) Differentiation of MI from myocardial injury.
- (2) Highlighting peri-procedural myocardial injury after cardiac and non-cardiac procedures as discrete from MI.
- (3) Consideration of electrical remodeling (cardiac memory) in assessing repolarization abnormalities with tachyarrhythmia, pacing, and rate-related conduction disturbances.
- (4) Use of cardiovascular magnetic resonance imaging to define the etiology of myocardial injury.
- (5) Use of computed tomographic coronary angiography in suspected MI.
- (6) Type 1 MI: emphasis on the causal relationship of

- plaque disruption with coronary atherothrombosis.
- (7) Type 2 MI: settings with oxygen demand and supply imbalance unrelated to acute coronary atherothrombosis.
 - (8) Type 2 MI: relevance of presence or absence of CAD to prognosis and therapy.
 - (9) Differentiation of myocardial injury from type 2 MI.
 - (10) Type 3 MI: clarify why type 3 MI is a useful category to differentiate from SCD.
 - (11) Types 4–5 MI: emphasis on distinction between procedure-related myocardial injury and procedure-related MI.
 - (12) Cardiac troponins: analytical issues.
 - (13) Emphasis on the benefits of high-sensitivity cardiac troponin assays.
 - (14) Considerations relevant to the use of rapid rule-out and rule-in protocols for myocardial injury and MI.
 - (15) Issues related to specific diagnostic change (“delta”) criteria for the use of cardiac troponins to detect or exclude acute myocardial injury.
 - (16) Consideration of new non-rate-related right bundle branch block with specific repolarization patterns.
 - (17) ST-segment elevation in lead aVR with specific repolarization patterns, as a STEMI equivalent.
 - (18) ECG detection of myocardial ischemia in patients with an implantable cardiac defibrillator or a pacemaker.
 - (19) Enhanced role of imaging including cardiac magnetic resonance imaging for the diagnosis of MI.

In addition, new sections as follows.

- (1) Takotsubo syndrome
- (2) MI with non-obstructive coronary arteries (MINOCA)
- (3) Chronic kidney disease
- (4) AF
- (5) Regulatory perspective on MI
- (6) Silent or unrecognized MI

Digital Science Sessions

In these exhibitions, interesting technologies and products were showcased in the booths, and also there were “digital health area sessions” that were dedicated to these cutting-edge technologies (**Figure 5A,B**).

3D Printer

The 3D printer can replicate the complex anatomic models of human structures with very similar texture to real human organs. It has already been introduced in a variety of medical fields. For example, 3D printed organs can be used for training junior doctors and also for experts to plan surgical or interventional procedures before they are actually delivered to their patients (**Figure 5C**). (For further information: https://www.youtube.com/watch?v=ebZmWV_4jlC&frags=pl%2Cwn)

Signal-Processed Surface ECG

Computer technology is already indispensable in cardiology; for example, artificial intelligence (AI), big data, etc. Now, diastolic function can be assessed not by echocardiography but by ECG alone. Computer-based wavelet signal processing seems to have made it possible.¹³ (For further information: https://www.youtube.com/watch?v=aOUGJ6D_a8g)

Portable Devices to Monitor Vital Signs

Portable devices now enable individuals to measure their

BP, heart rate, and even ECG by themselves. It seems that the new product from Apple Inc. has a similar function. In the foreseeable future, people monitor their own BP, heart rate, and ECG through those devices and discuss the results with health professionals, which will potentially lead to health promotion and early diagnosis of cardiovascular disease (for further information: www.maisense.com).

Conclusions

The ESC 2018 in Munich was a comprehensive one-stop place where we learnt all about cardiology today and met people working in this field. Next year, the ESC will be held between 31 August and 4 September in Paris, France, which also promises to be exciting.

Acknowledgments

The authors thank the JCS international staff for their support for this report. We are also grateful to the ESC for permission to reprint part of the new guidelines.^{8–12}

Conflicts of Interest

Authors have no relationships relevant to the content of this paper.

References

1. Satoh K, Takahashi J, Matsumoto Y, Tatebe S, Aoki T, Kikuchi Y, et al. European Society of Cardiology (ESC) annual congress report from Barcelona 2017. *Circ J* 2017; **81**: 1758–1763.
2. Seo Y. Report of the American Heart Association (AHA) Scientific Session 2017, Anaheim, California. *Circ J* 2018; **82**: 323–327.
3. ASCEND Study Collaborative Group. Effects of aspirin for primary prevention in persons with diabetes mellitus. *N Engl J Med*, doi:10.1056/NEJMoa1804988.
4. Gaziano JM, Brotons C, Coppolecchia R, Cricelli C, Darius H, Gorelick PB, et al. Use of aspirin to reduce risk of initial vascular events in patients at moderate risk of cardiovascular disease (ARRIVE): A randomised, double-blind, placebo-controlled trial. *Lancet*, doi:10.1016/S0140-6736(18)31924-X.
5. Vranckx P, Valgimigli M, Jüni P, Hamm C, Steg PG, Heg D, et al. Ticagrelor plus aspirin for 1 month, followed by ticagrelor monotherapy for 23 months vs aspirin plus clopidogrel or ticagrelor for 12 months, followed by aspirin monotherapy for 12 months after implantation of a drug-eluting stent: A multicentre, open-label, randomised superiority trial. *Lancet*, doi:10.1016/S0140-6736(18)31858-0.
6. Thiele H, Akin I, Sandri M, de Waha-Thiele S, Meyer-Saraei R, Fuernau G, et al. One-year outcomes after PCI strategies in cardiogenic shock. *N Engl J Med*, doi:10.1056/NEJMoa1808788.
7. Obadia JF, Messika-Zeitoun D, Leurent G, Lung B, Bonnet G, Piriou N, et al. Percutaneous repair or medical treatment for secondary mitral regurgitation. *N Engl J Med*, doi:10.1056/NEJMoa1805374.
8. Williams B, Mancia G, Spiering W, Agabiti Rosei E, Azizi M, Burnier M, et al. 2018 ESC/ESH Guidelines for the management of arterial hypertension. *Eur Heart J* 2018; **39**: 3021–3104.
9. Brignole M, Moya A, de Lange FJ, Deharo JC, Elliott PM, Fanciulli A, et al. 2018 ESC Guidelines for the diagnosis and management of syncope. *Eur Heart J* 2018; **39**: 1883–1948.
10. Neumann FJ, Sousa-Uva M, Ahlsson A, Alfonso F, Banning AP, Benedetto U, et al. 2018 ESC/EACTS Guidelines on myocardial revascularization. *Eur Heart J*, doi:10.1093/eurheartj/ehy394.
11. Regitz-Zagrosek V, Roos-Hesselink JW, Bauersachs J, Blomström-Lundqvist C, Cifková R, De Bonis M, et al. 2018 ESC Guidelines for the management of cardiovascular diseases during pregnancy. *Eur Heart J* 2018; **39**: 3165–3241.
12. Thygesen K, Alpert JS, Jaffe AS, Chaitman BR, Bax JJ, Morrow DA, et al. Fourth universal definition of myocardial infarction (2018). *Eur Heart J*, doi:10.1093/eurheartj/ehy462.
13. Sengupta PP, Kulkarni H, Narula J. Prediction of abnormal myocardial relaxation from signal processed surface ECG. *J Am Coll Cardiol* 2018; **71**: 1650–1660.