

AO

# AO Annual Report 2019





# Content

---

## Message from the President and CEO

### 1. Education

- AO Trauma
- AO CMF
- AO Spine
- AO VET
- AO Recon

### 2. Innovation

- Highlights
- Trauma
- Spine
- CMF
- Vet
- More from the AO Technical Commission

### 3. Research

- Preclinical research
- Trauma
- CMF
- Spine
- Vet
- Clinical evidence

### 4. Publications

The AO drives international efforts to combat fracture-related infection  
Latest editions: available now

### 5. Finance and governance

- Financial overview
- Income statement
- Employees
- Governance
- Transparency

### 6. Corporate Social Responsibility (CSR)

- AO Alliance
- Local engagement
- Malawi



## **From the President and CEO: A year of change and development**

In 2019, the AO enhanced its focus on meeting the needs of its global network with new technologies, new formats, and new approaches. We rolled out our new branding and launched myAO, your digital gateway to expertise, education, and innovation, at our 2019 flagship event, the AO Davos Courses.

Every part of the AO has proven its commitment to responding rapidly to the fast-changing environment with innovation and agility. In education, research, and development, innovation is at the core of all that we do. As an organization, we embrace the need for constant progress in ensuring we meet the needs of our network and partners in a more responsive and effective way. The creation of the AO Innovation Translation Center is evidence of this process.

In 2019, the AO's governing body, the AO Foundation Board, granted AO Recon the status of a clinical unit that complements the AO's clinical divisions as an increasingly relevant specialty.

Five years after its start as an initiative, AO Recon has become an integral part of the AO. As the need for high-quality arthroplasty education continues to grow on a global scale, so does AO Recon's number of educational offerings and its footprint in improving patient care in this specialty. The AO is proud of what AO Recon has achieved so far, and excited to support it in its continued evolution.

Also in 2019, we launched sports medicine as a new initiative to provide quality education in this expanding field.

## 1

# Education

The AO is the world's premier education provider to health care professionals working in the fields of trauma and musculoskeletal disorders. Each year we offer over 830 educational events around the world, supported by nearly 9,000 faculty, and attended by over 58,000 participants.

The AO Davos Courses are our flagship educational event. It is there that participants from all fields have the opportunity to find out about the newest approaches to education, training, and treatment, meet leaders in their fields, and also to share experiences and learn from each other. People who have participated in AO courses around the world come to Davos, Switzerland, for an unforgettable experience that acts as a gateway to excellence in their field.

In 2019, the AO Davos Courses attracted more than 1,500 health care professionals from over 100 countries. During the event they had the chance to experience the latest approaches to education, training, and treatment, learning from leaders in their fields. The face-to-face nature of the AO Davos Courses means that participants can interact with their peers and learn from each other, and also put their questions directly to clinical experts. This year's event also showcased the AO's research, innovation, and development activities, which complement its position as the premier educator in its fields.

Explore the detail on AO education provision across our organization, in 2019, below.

# AO Trauma

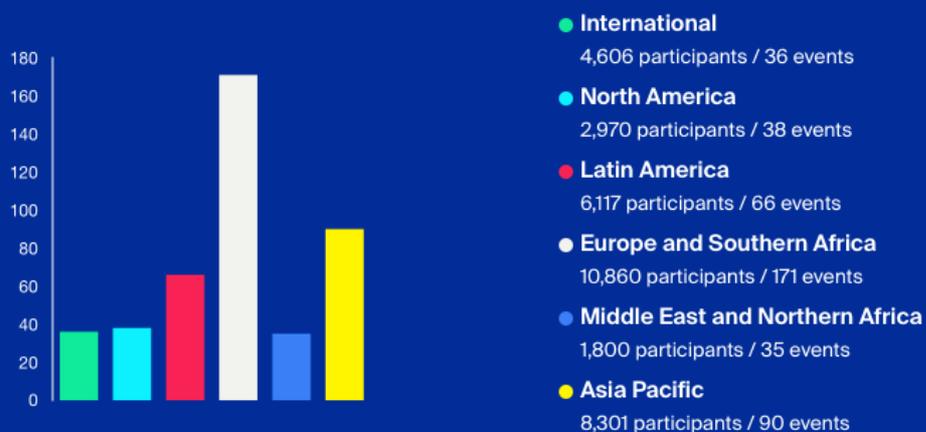
Education is at the core of the AO's global work to improve patient outcomes. To date more than 600,000 health care professionals in over 124 countries have participated in AO courses.

In 2019, most events were held in Europe and Southern Africa, closely followed by Asia Pacific, Latin America, North America, and then the Middle East and Northern Africa.

## AO Trauma events all over the world

### Events

34,654 participants / 436 events



### Faculty involvement

5,398 faculty / 14,940 faculty days



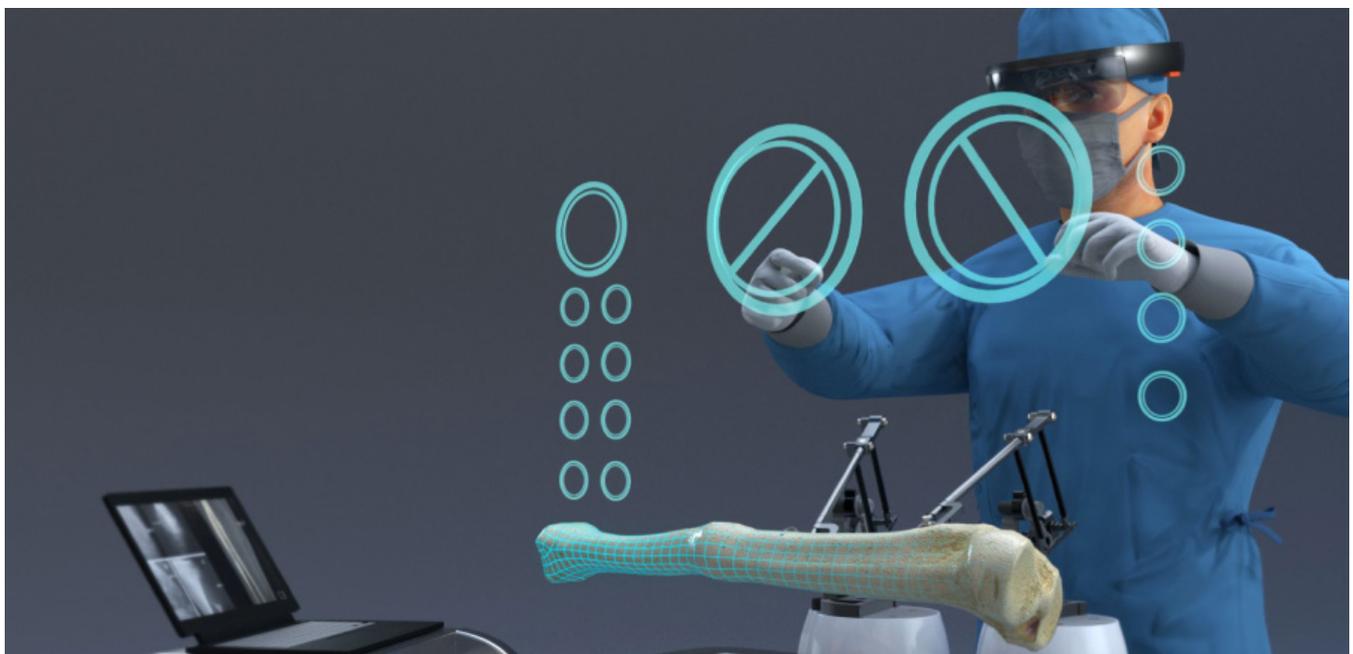
# The Competency-based Training and Assessment Program

The Competency-based Training and Assessment Program (CTAP) aims to establish the AO as the globally recognized trusted provider of proficiency certificates in key areas of trauma surgery. The program will consolidate AO Trauma as the global leader in surgical education by focusing on training and assessment of knowledge and skills.

CTAP meets our network's needs for personalized, just-in-time learning, their appetite for additional skills training and practice, while also filling the gap in terms of validated, robust systems for performance assessment. It uses the latest digital teaching, training, and assessment tools, such as VR simulation in combination with online and immersive face-to-face learning experiences.

One distinguishing feature of CTAP is its sweeping impact in the sector. Once fully rolled out, it will benefit everyone from patients to health care professionals at all stages of their careers, to hospitals, insurers, and licensing and accrediting bodies.

Approved and funded in 2019, development on its future global roll-out is underway.



CTAP visualization

# myAO: our digital gateway to expertise, education and innovation

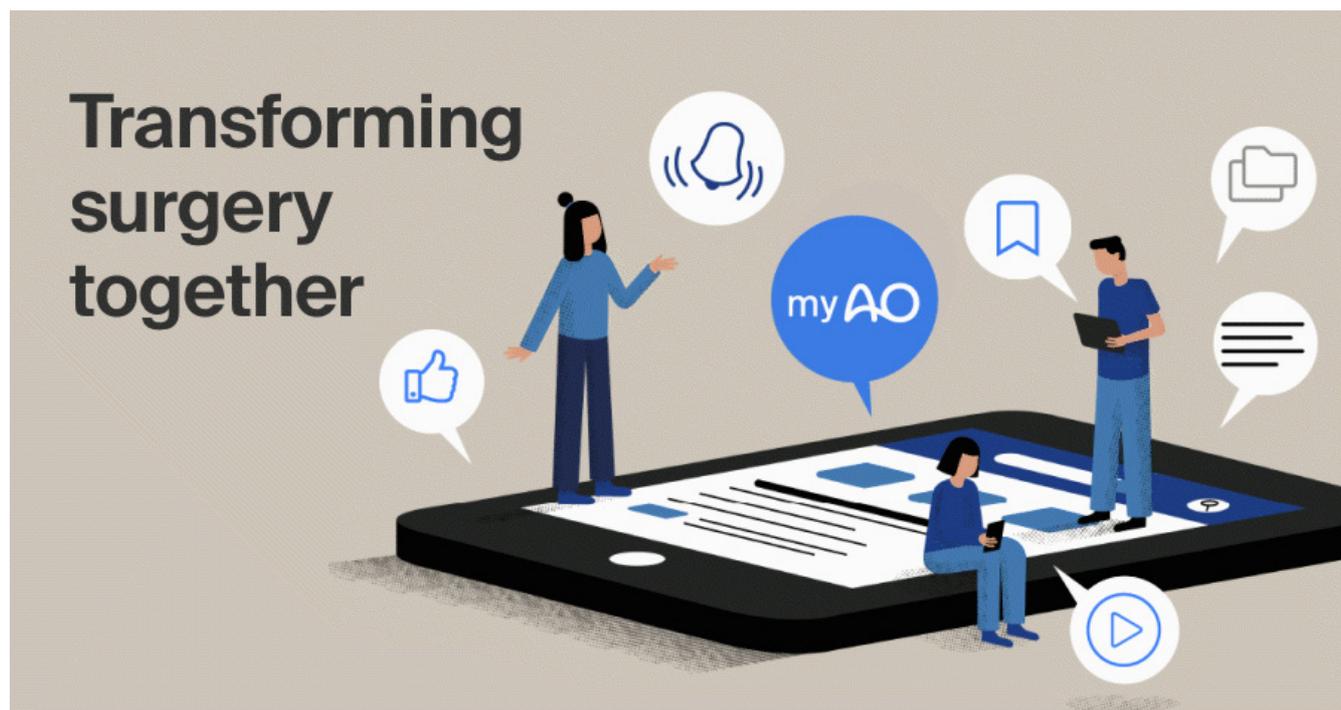
myAO is a community knowledge exchange platform that offers surgeons the opportunity to connect with each other and provides a new way of accessing dependable, verified, content that is tailored to their needs.

The platform offers users the chance to enjoy intuitive access to dependable knowledge when they need it. myAO provides personalized knowledge, critical insights from clinical experts, and verified videos on demand.

Within myAO, users have the opportunity to engage with leading experts in their field. Find out what they've published recently, see articles they share, and deepen your insight into areas of interest.

Launched during the AO's flagship educational event, the AO Davos Courses 2019, myAO has seen solid growth and increasing engagement across the network, and is constantly working to expand the features available and enhance the user experience.

[Sign up to myAO](#)



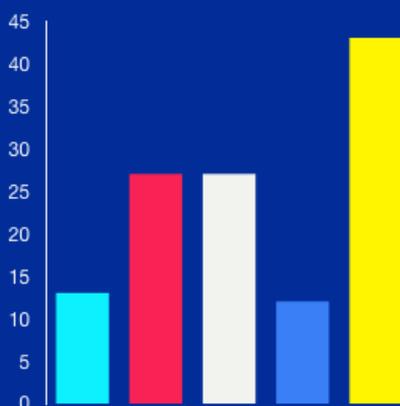
# AO CMF

In 2019, AO CMF continued to offer its audiences more diverse learning experiences in their field. At the forefront of personalization, AO CMF puts the patient clearly front and center in all its work to enhance the skills of CMF surgeons around the world.

## AO CMF events all over the world

### Events

6,690 participants / 122 events



- **North America**  
956 participants / 13 events
- **Latin America**  
2,067 participants / 27 events
- **Europe and Southern Africa**  
848 participants / 27 events
- **Middle East and Northern Africa**  
502 participants / 12 events
- **Asia Pacific**  
2,317 participants / 43 events

### Faculty involvement

1,114 faculty / 2,038 faculty days



- **North America**  
146 faculties / 313 faculty days
- **Latin America**  
215 faculties / 289 faculty days
- **Europe and Southern Africa**  
190 faculties / 390 faculty days
- **Middle East and Northern Africa**  
118 faculties / 195 faculty days
- **Asia Pacific**  
445 faculties / 852 faculty days

# At the forefront of personalization

The AO CMF network brings together outstanding surgeons in every continent who are passionate about improving the patient experience. For CMF, as a field, new technologies already open up a myriad of new avenues for personalization in developing patient-centric solutions in clinical settings.

## A dynamic learning experience: Lighthouse Courses

In 2019, AO CMF successfully launched its new Lighthouse Course concept. This new, dynamic, learning experience kicked off in September with a two-day intensive course in Madrid, Spain, which proved to be part of a transformative event in AO CMF history. The rollout of the Lighthouse Course concept, one year and a half in the making and the successor to AO CMF's existing wet lab courses, ushers in a new era in continued surgical education. The concept brings together three key components: a standardized approach to a competency-based curriculum; carefully selected, easily accessible, premier lab sites; and affordable access to tailored content delivered by renowned AO CMF faculty.

The courses are aimed at experienced trainees, early career surgeons and experienced surgeons in Oral Maxillofacial, Plastics or ENT. Lighthouse Courses allow surgeons to immediately apply the knowledge gained in their clinical practices.

# Blended learning, enhanced online offerings

Diversifying the range of blended and online learning opportunities for the AO CMF network has been a key priority for AO CMF in 2019. The Management of Facial Trauma course was further developed and is now able to respond to surgeons' needs for timely, focused, educational offerings.

AO CMF faculty members are being provided with "best-in-class" training in teaching online and delivering high-value education via camera. In North America, the fourth semiannual AO CMF Course—Computer-Aided Maxillofacial Surgery, led by Drs Bradley Strong, Daniel Buchbinder, and Michael Grant, introduced participants to cutting-edge tools and technologies designed to improve surgical workflows.

An Emerging Technologies Session was the highlight of the course with dedicated hands-on instructional time using intraoperative computed tomography (CT); intraoperative navigation; virtual reality goggles; augmented reality goggles for anatomical visualization and surgical planning; 3-D printers used for fabrication of patient-specific models and implants.

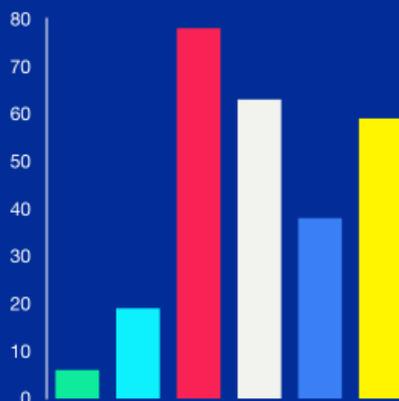
# AO Spine

In 2019, AO Spine offered educational events (including courses, seminars, symposia, and webinars) for surgeons and ORP across the world. Most events were held in Asia Pacific, followed by Latin America, Europe and Southern Africa, Middle East and Northern Africa, and North America.

## AO Spine events all over the world

### Events

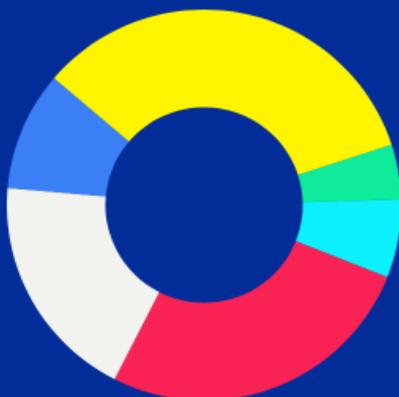
13,803 participants / 263 events



- **International**  
400 participants / 6 events
- **North America**  
1,174 participants / 19 events
- **Latin America**  
3,560 participants / 78 events
- **Europe and Southern Africa**  
2,813 participants / 63 events
- **Middle East and Northern Africa**  
1,263 participants / 38 events
- **Asia Pacific**  
4,593 participants / 59 events

### Faculty involvement

1,820 faculty / 2,487 faculty days



- **International**  
35 faculties / 113 faculty days
- **North America**  
104 faculties / 161 faculty days
- **Latin America**  
560 faculties / 659 faculty days
- **Europe and Southern Africa**  
356 faculties / 470 faculty days
- **Middle East and Northern Africa**  
169 faculties / 245 faculty days
- **Asia Pacific**  
596 faculties / 840 faculty days

# The AO Spine Global Diploma Exam

This is a cumulative assessment of knowledge and decision-making with respect to treating patients with spinal conditions. It enables candidates to demonstrate that they have attained a level of knowledge expected of a specialist spine surgeon after five years of practical experience.

The Diploma Exam has been designed by a group of worldwide leaders in spine surgery education. What makes the AO Spine Diploma Exam unique is that it's the first and only truly global certification from a world-leading organization in medical education, associated with the global reputation of AO Spine as the leading global academic community in spine care.

# AO VET

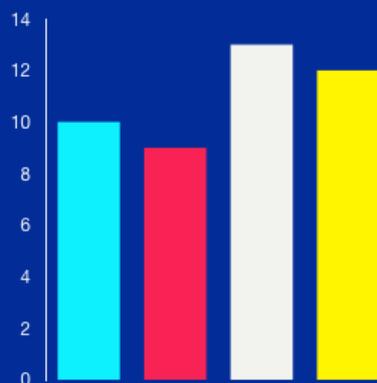
---

In 2019, AO VET offered educational events (including courses, seminars, symposia, and webinars) for surgeons and ORP across the world. Most events were held in North America, followed by Asia Pacific, Europe and Southern Africa, and Latin America.

## AO VET events all over the world

### Events

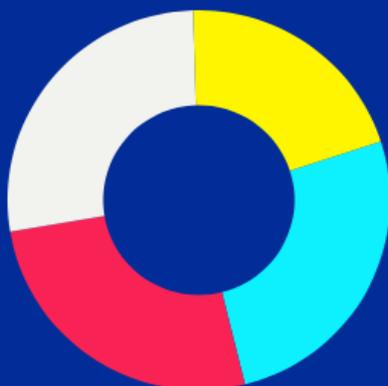
2,527 participants / 44 events



- **North America**  
997 participants / 10 events
- **Latin America**  
420 participants / 9 events
- **Europe and Southern Africa**  
499 participants / 13 events
- **Asia Pacific**  
611 participants / 12 events

### Faculty involvement

345 faculty / 938 faculty days



- **North America**  
80 faculties / 245 faculty days
- **Latin America**  
86 faculties / 246 faculty days
- **Europe and Southern Africa**  
93 faculties / 255 faculty days
- **Asia Pacific**  
86 faculties / 192 faculty days

## **AO VET retreat**

AO VET held a retreat in Cascais, Portugal, in May 2019, focusing on officer and faculty engagement, education and community topics. Under the leadership of the AO VET International Board, 84 Faculty from 24 countries took part in the two-day event, and celebrated AO VET's 50th anniversary.

## **Curriculum development**

At the Cascais retreat, progress was made in developing guidelines for course chairs and faculty. These guidelines, rolled out in 2019, address requirements, responsibilities, selection processes, performance measurements, and rotation principles. The rotation principles enable mentorship and advancement within the AO VET community while retaining existing talent.

## **Strengthening AO VET activities in China**

AO VET's new strategic cooperation with an eminent veterinary medical academy in China extends the AO's reach into the Chinese market, supporting the AO's mission of improving patient outcomes.

# AO Recon

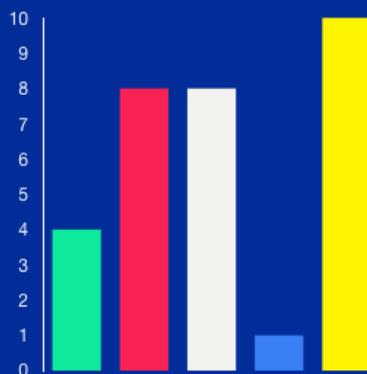
---

In 2019, AO VET offered educational events (including courses, seminars, symposia, and webinars) for surgeons and ORP across the world. Most events were held in North America, followed by Asia Pacific, Europe and Southern Africa, and Latin America.

## AO Recon events all over the world

### Events

4,553 participants / 31 events



- **International**  
491 participants / 4 events
- **Latin America**  
505 participants / 8 events
- **Europe and Southern Africa**  
2,453 participants / 8 events
- **Middle East and Northern Africa**  
43 participants / 1 events
- **Asia Pacific**  
1,061 participants / 10 events

### Faculty involvement

349 faculty / 629 faculty days



- **International**  
30 faculties / 67 faculty days
- **Latin America**  
88 faculties / 167 faculty days
- **Europe and Southern Africa**  
102 faculties / 164 faculty days
- **Middle East and Northern Africa**  
16 faculties / 40 faculty days
- **Asia Pacific**  
113 faculties / 191 faculty days

# AO Recon increases its educational footprint and significance

2019 was another consecutive year of strong growth for AO Recon, with geographical reach and content offered expanding significantly compared to previous years. AO Recon was also recognized as a fundamental part of the AO organization, in its transformation from an initiative into a clinical unit. This institutional recognition underscores the AO's awareness of the significance of arthroplasty for surgeons across the globe, and the intense needs they have for the AO's outstanding educational offerings in their field.

## New in 2019: practical exercises in the complex course

AO Recon is proud to offer practical exercises as a fundamental feature of all of its courses. In 2019, AO Recon introduced new practical exercises with either dry bones or anatomical specimens to the AO Recon Course—Complex Total Hip and Knee Arthroplasty. These exercises received excellent feedback from faculty and participants and greatly enhance the already existing offering.



AO Recon course, Dubai Courses 2019

## 2

# Innovation

**"Innovation remains at the forefront in all the AO does to further its mission: finding solutions to clinical problems that meet patient treatment needs."**

Robert McGuire, President, AO Foundation

Today the AO is the leading innovator in the surgical treatment of bone fractures and disorders. Innovation at the AO goes from bench to bedside, including basic research, product development, and clinical validation.

At the core of the AO's innovations and approvals process is the AO Technical Commission.

A key part of developing and bringing innovations to market, the AO Technical Commission is central to the AO landscape. It plays a crucial role in quality control and product development, forming an essential link between AO clinical divisions, the other institutes, and the AO's global network.



## Highlights

The longstanding cooperation between the AO Technical Commission and DePuy Synthes has resulted in the development of numerous implants and instruments to address specific clinical problems. Over the past decade, this joint work has delivered over 200 innovative solutions, each of which makes a contribution to improving patient care and outcomes in the treatment of trauma and musculoskeletal disorders.

## AO Technical Commission approvals in 2019

In 2019, the AO Technical Commission approved a suite of products that will benefit patient outcomes across all areas in which the AO is active.

### [Reamer Irrigator Aspirator System \(RIA 2\):](#)

A redesigned and improved reamer-irrigator-aspirator system with new features to simplify assembly and handling. RIA 2 offers an efficient method to clear the medullary canal of bone marrow and debris, to enlarge the medullary canal for implant insertion, to harvest bone graft material and to manage infection in cases of osteomyelitis.

### [Universal Small Fragment System:](#)

Designed by a dedicated Task Force comprising selected members of the following Expert Groups: Hand, Foot and Ankle, Upper Extremity, Lower Extremity, it seeks to simplify small fragment procedures. This innovative concept allows existing and future 2.7 mm/3.5 mm implants to be supported with only one basic set of instruments. This reduces operating room complexity and speeds up the operation workflow.

### [Partially Threaded Cannulated Compression Headless Screws, Quick Insertion Screws, Y-shaped Nitinol Staple:](#)

A variety of new implants and instruments developed to improve surgery for various indications.

[MatrixRIB self-drilling screws and screw guides:](#)

Developed by the Thorax Surgery Expert Group for improved operating room efficiency, more reliable screw insertion and ensuring screw locking strength during rib fixation. The MatrixRIB Self-Drilling screws can be used in both the open and Minimally Invasive Plate Osteosynthesis (MIPO) approaches.

[PROTI 360°:](#)

A family of integrated titanium-coated PEEK cages that promote spinal fusion in patients with degenerative disc disease. These implants have design features that provide primary mechanical stability to the spine and promote faster and long-lasting biological fixation with the vertebral end plates.

[Symphony Occipito-Cervico-Thoracic System:](#)

Developed as an enhanced set of instruments and implants for posterior fixation of the upper (occipito-thoracic) spine.

[CMF distractor:](#)

Approved and launched: used for lengthening or bone transport to correct congenital deficiencies or post-traumatic defects in the mandible, the midface, or the cranium in pediatric and adult patients.

[Human LCP Distal Femoral Plate for veterinary applications:](#)

Demonstrates cross-pollination in the AO by leveraging innovation from human implants to improve patient care in veterinary surgery.

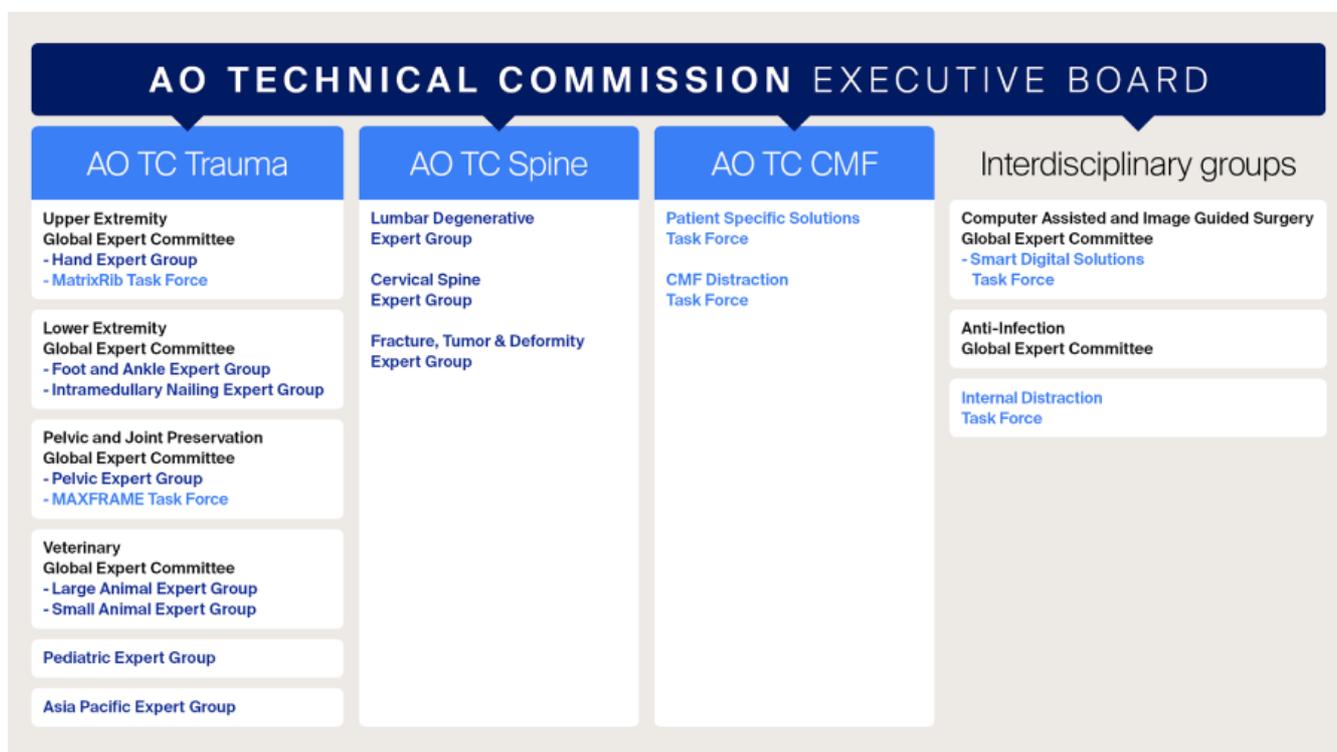


AO Technical Commission Experts' Symposium, September 2019, San Francisco, California, US

# Changes in the AO Technical Commission

## AO TC's new structure

The AO Technical Commission is the AO's innovation driver. Focused on the introduction of change and new ideas in all areas of its operation, in 2018 the AO Technical Commission launched discussions about how to be more efficient and achieve better outcomes in its four specialties: trauma, spine, CMF, and veterinary surgery. The clear need and motivation for this comes from the AO Technical Commission's desire to take interdisciplinary collaboration to a new level, to improve its overview of clinical needs, and to achieve greater flexibility in its [core structure](#).



# Trauma:

## The latest innovations in the field of trauma surgery.

### **Universal Small Fragment System**

Designed to help you perform more procedures with less equipment, the innovative concept of the USF System markedly reduces operating room complexity and improves workflow efficiency.

[Read article](#)

### **RIA 2 System: new-generation reamer-irrigator-aspirator**

The next generation reamer-irrigator-aspirator for use in adults and adolescents. With exchangeable heads for intraoperative flexibility, it also offers better access to previously limited anatomies (tibia).

[Read article](#)

### **Quick Insertion Screws**

The new Easy Loader Screwdriver provided with the new Quick Insertion Screws has a special mechanism to protect the post of the screw from early breakage.

[Read article](#)

### **Elite Y Compression Staples**

When space is limited, these new Y staples offer an option to position two legs perpendicular to the bone axis.

[Read article](#)

### **MatrixRIB Self-Drilling Screws**

Reducing the duration and complexity of the procedure, as well as reducing the amount of capital equipment needed in the operating room.

[Read article](#)

### **Partially Threaded Cannulated Compression Headless Screws**

Boasting a compound cutting edge on the tip for easier insertion, designed to reduce insertion force for cutting the thread into the bone.

[Read article](#)

## Spine:

# The latest innovations in the field of spine surgery.

### **PROTI 360™**

A family of integrated titanium interbody cages that promote spinal fusion, intended for use in patients with degenerative disc disease.

[Read article](#)

### **Symphony Occipito-Cervico-Thoracic System**

Enhanced set of instruments and implants for posterior fixation of the upper cervico-thoracic spine: a solution for unmet clinical needs in fixation.

[Read article](#)

## CMF:

# The latest innovations in the field of CMF surgery.

### **New CMF Distractor System**

Improving an established best-in-class solution to correcting congenital deficiencies or acquired defects.

[Read article](#)

## Vet:

# The latest innovations in the field of veterinary surgery.

### LCP Distal Femur Plate for veterinary applications

To treat comminuted fractures of the proximal phalanx in horses with the goal of improving survival and reducing complications.

[Read article](#)

## More from the AO Technical Commission

Explore more of the achievements from the AO TC in 2019. In addition to the below, the AO TC laid the groundwork for partnership with icotec ag on the joint development of a new spinal stabilization system based on icotec's proprietary BlackArmor Carbon/PEEK composite implant material.

### Meet the Experts

Learn about the AO Technical Commission's most recently approved medical devices and explore hot topics in trauma and orthopedic surgery.

[Read article](#)

### Experts' Symposia

Where outstanding minds come together in a robust process to improve available treatments.

[Read article](#)

### Internal Distraction Task Force

Open fractures with bone loss, tumors, and infected bone are the main reasons for segmental bone defects. They are challenging to treat, especially when larger than about 3 cm. This task force will work to meet clinical needs in this area.

[Read article](#)

### Smart Digital Solutions Task Force

Established under the guidance of the Chairperson Benedikt Braun from Germany, it is working on a narrative review that aims to provide an overview and categorization of current demands, digital solutions, and ongoing activities in patient monitoring in the field of trauma.

[Read article](#)

# 3

## Research

**"In research, questioning generally accepted theorems allows and unleashes creativity."**

Stephan M Perren. Director, AO Research Institute Davos (ARI), 1967-1996.

The AO is a medically-guided, not-for-profit organization, a global network of surgeons, and the world's leading education, innovation, and research organization specializing in the surgical treatment of trauma and musculoskeletal disorders.

At the core of the AO's research process is the AO Research Institute Davos, which works to advance orthopedic patient care through innovative research and development.

# Preclinical Research

---

## AO Research Institute Davos: Research with impact

The AO Research Institute Davos (ARI) is recognized as a research-leader in Switzerland, Europe, and the world. ARI's purpose is advancing patient care through innovative orthopedic research and development. Explore a selection of ARI's impactful research, published in 2019.

Tognato R, Armiento AR, Bonfrate V, Levato R, Malda J, Alini M, Eglin D, Giancane G, Serra T.

### **A Stimuli-Responsive Nanocomposite for 3D Anisotropic Cell-Guidance and Magnetic Soft Robotics**

Adv Funct Mater. 2019;29(9):10

[Read article](#)

Moriarty TF, Harris LG, Mooney RA, Wenke JC, Riool M, Zaat SAJ, Moter A, Schaer TP, Khanna N, Kuehl R, Alt V, Montali A, Liu J, Zeiter S, Busscher HJ, Grainger DW, Richards RG.

### **Recommendations for Design and Conduct of Preclinical in Vivo Studies of Orthopedic Device-Related Infection**

J Orthop Res. 2019;37(2):271-87

[Read article](#)

Wangler S, Peroglio M, Menzel U, et al

### **MSC Homing Into Intervertebral Discs Enhances the Tie2-positive Progenitor Cell Population, Prevents Cell Death, and Induces a Proliferative Response**

Spine. 2019;44(23):1613-1622

[Download](#)

Nowicki B, Nehrbass D, Arens D, Stadelmann VA, Zeiter S, Otto S, Kircher P, Stoddart MJ.

### **Medication-related Osteonecrosis of the Jaw in a Minipig Model: Parameters for Developing a Macroscopic, Radiological, and Microscopic Grading Scheme**

J Craniomaxillofac Surg. 2019;47:1162-1169

[Read article](#)

Fletcher JWA, Windolf M, Richards RG, Gueorguiev B, Buschbaum J, Varga P.

**Importance of Locking Plate Positioning in Proximal Humeral Fractures as Predicted by Computer Simulations**

J Orthop Res. 2019;epub Jan 28

[Read article](#)

Gehweiler D, Teunis T, Varjas V, Kerstan D, Gueorguiev B, Kamer L, Noser H.

**Computerized Anatomy of the Distal Radius and Its Relevance to Volar Plating, Research, and Teaching**

Clin Anat. 2019;32(3):361-8

[Read article](#)

# Trauma

---

## AO Trauma: Leading the way in research

Learn more about the latest research from AO Trauma in 2019, and find out more about what AO Trauma research opportunities could offer you.

### **Improving clinical outcome measurements of fracture treatment**

With the new AO Trauma Clinical Priority Program (CPP) Patient Outcome, orthopedic surgeons and scientists recognize the importance of outcome measurement in fracture treatment.

[Learn more](#)

### **Elucidating the etiology of fracture-related infections and developing interventions**

Combined efforts under the umbrella of the AO Trauma CPP Bone Infection improve patient care.

[Learn more](#)

### **Learning From Failures in Orthopedic Trauma—Key Points for Success**

A valuable resource that helps surgeons improve their understanding and prevention of failures in osteosynthesis.

[Buy the book](#)

### **Manual of Fracture Management—Foot and Ankle**

This book examines the techniques and procedures for the management of fractures and dislocations of the foot and ankle.

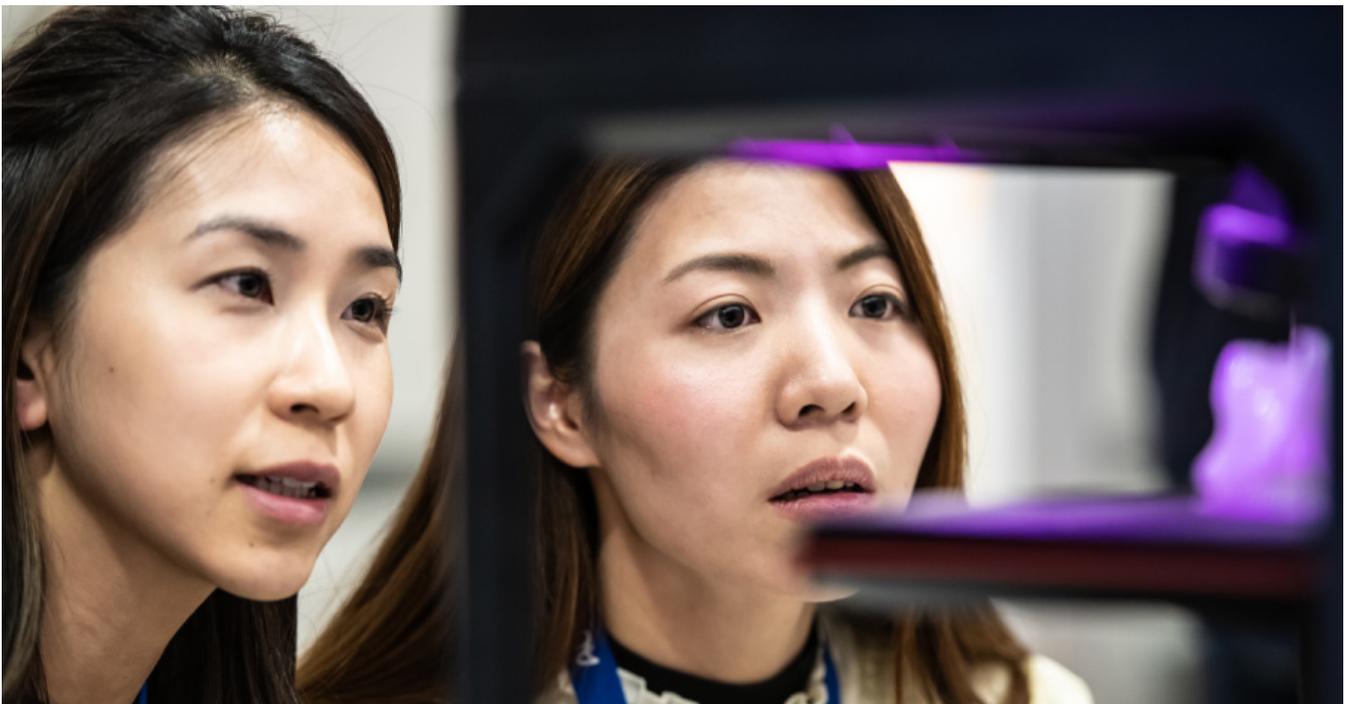
[Buy the book](#)

# CMF

---

## The latest research in craniomaxillofacial surgery.

At the forefront of personalization and innovation in the field



AO CMF 3D printing at the AO Davos Courses 2019

## Patient experience: Front and center

In 2019, the AO CMF Injury Symptom Battery, a novel patient-reported outcome tool, was developed, in response to the heterogenous nature of CMF trauma injuries to best capture the full spectrum of the patient's experience. Developed to be modular in nature, facilitating patients to report their condition using an electronic device relevant to their injury (ocular, nasopharyngeal, oral, ear) modules and items regardless of injury site (Appearance, Cognitive, Impact, Pain/Sensation, Psychosocial modules).

# A focus on craniomaxillofacial distraction

CMF distraction is used for lengthening or bone transport to correct congenital deficiencies or acquired defects in the mandible, midface, or cranium. The new CMF Distractor featured in Innovations 2019 may look similar the pre-existing system, but there are some key differences: the distraction bodies are approximately 5 mm longer in the latest version. This aims to improve performance in important areas, offering an improved experience for clinician and patient alike.

Enhancements include features designed to deliver a smoother, more controlled, application and reliable results.

[Find out more here](#)

# Spine

---

A comprehensive approach to research to improve patient care: involving surgeons, health care professionals, and patients.

## Degenerative Cervical Myelopathy

Degenerative cervical myelopathy is a common disease, estimated to affect up to 5 percent of people over the age of 40. Despite this, there are many questions regarding its cause and treatment that we do not yet fully understand. Unfortunately, it is also disabling, with very few patients making a full recovery. In order to improve the lives of those affected, we need to gain a better understanding of the condition with the help of patients, their supporters, researchers, doctors, surgeons, and allied health professionals.

RECODE-DCM (REsearch Objectives and COmmon Data Elements for Degenerative Cervical Myelopathy) aims to shape the way future DCM research is carried out through a standardized definition for DCM, a consensus-based list of unanswered DCM research questions, ranked according to priority, and via a standardized set of baseline characteristics and outcomes to be measured in DCM research.

The process adhered to James Lind Alliance (JLA) methodology; 3,404 research ideas were gathered from 429 individuals (including surgeons, health care professionals, and patients with degenerative cervical myelopathy) using an online survey. These were further refined, before the top seven unique questions per stakeholder group (20 questions) and a further six questions were selected by the AO Spine RECODE-DCM Steering Committee, and discussed at a face-to-face consensus meeting in New York, United States, where the top ten priorities for research were agreed as below.

1. Raising awareness
2. Natural history
3. Diagnostic criteria
4. Assessment and monitoring
5. Pathophysiology
6. Rehabilitation
7. Novel therapies
8. Socioeconomic impact
9. Imaging techniques
10. Individualizing surgery

# Metastatic tumor classification in AO Surgery Reference

AO Surgery Reference is a mobile and desktop resource for orthopedic surgeons, designed for the management of fractures, based on current clinical principles, practices, and available evidence. It is the world's most used resource to support surgeons in the correct evaluation of cases through the simulation of classifications for various types of fractures, and through self-explanatory drawings and textual information.

The AO Spine Knowledge Forum Tumor treatment recommendations and classifications for metastatic spine tumor have been adopted and implemented in the AO Surgery Reference. This module highlights the key considerations and surgical indications, when it comes to the evaluation of the metastatic spine tumor patient.

"We've come a long way in finding out which patients benefit from surgery, defining clear treatment indications, surgical strategy recommendations, and studying treatment outcomes," author Ilya Laufer explains. The AO Spine AO Surgery Reference for Metastatic Spine Tumor organizes concepts in a way that helps spine surgeons think systemically about their treatment indications and options, makes it easier to come up with a surgical plan, and to know exactly what techniques to use for each individual case.

## Focus Issue, "Knowledge Forums: Research in Motion"

Since being launched in fall 2010, AO Spine Knowledge Forums have redefined AO Spine's presence and impact in its field. These pathology-based study groups focus on degeneration, deformity, spinal cord injury, trauma, and tumor. Each is composed of surgeons and researchers with a proven track record of research, a passion for collaboration, and who are recognized key opinion leaders in the community. The main goal is knowledge creation to fill research voids, challenge long-held beliefs, influence practice worldwide, and positively influence all health care stakeholders.

Since 2011, AO Spine Knowledge Forums have published over 139 peer-reviewed articles in numerous esteemed peer-reviewed journals. In the Global Spine Journal Focus Issue, "Knowledge Forums: Research in Motion", we are proud to present some of the recent work by AO Spine's Knowledge Forums. Each of the five groups has contributed two articles that range from reviews of pressing issues and presenting key concepts that spine surgeons should know, to bringing to the forefront some key findings from their multicenter studies.

## ARI collaboration

AO VET is a key driver of innovation in research and development at the AO. Strong collaboration with ARI is at the core of this process, reflected in the successful delivery of two research projects:

- "Mechanical testing of locking and non-locking canine pancarpal arthrodesis plates"
- "Autonomous long term interfragmentary strains data collection in dogs"

The AO adheres to the highest welfare standards, and its Animal Welfare Advisory Group continued to review training courses and research grants using animal models.

## AO PEER: excellence in research

AO VET enabled the delivery of AO Program for Education and Excellence in Research (AO PEER) courses in North America, Latin America, and Europe in 2019.

## Driving innovation and cross-pollination at the AO

AO VET has developed into a powerful driver of innovation and cross-pollination within the AO, recently reflected in the development of the Human LCP Distal Femoral Plate for veterinary applications.

## Fracture Research Animal Models Database (FRAMD)

The year 2019 saw the rollout of the Fracture Research Animal Models Database (FRAMD), a strategy fund initiative, to AO early adopters. The database is designed to facilitate researchers' appreciation for the research animal fracture model selection process, the range of available models, and what each offers in terms of reproducibility, clinical translation and animal welfare.

## **The AO VET Courses in Ohio: 50 Years of Teaching Fracture Management in Animals**

Kenneth A Johnson, Veterinary and Comparative Orthopaedics and Traumatology (VCOT)

[Read article](#)

## **LCP Distal Femur Plate for veterinary applications**

To treat comminuted fractures of the proximal phalanx in horses with the goal of improving survival and reducing complications.

[Read article](#)

# Clinical evidence

---

The AO's clinical research specialists take the lead in conducting high-impact clinical studies and provides its customers with high quality clinical research services in locations around the world. Explore peer-reviewed publications from 2019.

[Bond MR, Versteeg AL, Sahgal A, et al](#)

**Surgical or Radiation Therapy for the Treatment of Cervical Spine Metastases: Results From the Epidemiology, Process, and Outcomes of Spine Oncology (EPOS0) Cohort**

Global Spine J.2020;10(1):21-29

[Read article](#)

[Versteeg AL, Sahgal A, Kawahara N, et al](#)

**Patient Satisfaction With Treatment Outcomes After Surgery and/or Radiotherapy for Spinal Metastases**

Cancer.2019;125(23):4269-4277

[Read article](#)

[Tuchman A, Lenke LG, Cerpa M, et al](#)

**Unilateral Versus Bilateral Lower Extremity Motor Deficit Following Complex Adult Spinal Deformity Surgery: Is There a Difference in Recovery Up to 2-year Follow-Up?**

Spine J.2019;19(3):395-402

[Read article](#)

[Sommer C, Chen MS, Espinoza-Rebmann K, et al](#)

**The influence of initial cartilage damages in Pilon fractures on the development of osteoarthritis and functional outcomes: A prospective multicentre case series**

Journal of Musculoskeletal Surgery and Research.2019;3(4):334-341

[Read article](#)

[Rothrock NE, Bass M, Blumenthal A, et al](#)

**AO Patient Outcomes Center: Design, Implementation, and Evaluation of a Software Application for the Collection of Patient-Reported Outcome Measures in Orthopedic Outpatient Clinics**

JMIR Form Res.2019;3(2):e10880

[Read article](#)

[Osinga R, Estermann L, Klein HJ, et al](#)

**Ulnar Variance in Scaphoid Fractures: Retrospective Analysis of 182 Cases**

J Hand Surg Asian Pac Vol.2019;24(1):13-16

[Read article](#)

[Moed BR, Barla J, Israel HA, et al](#)

**Current Trends in the Surgical Treatment of Open-Book Pelvic Ring Injuries: An International Survey Among Experienced Trauma Surgeons**

J Orthop Trauma.2019;33(Suppl 2):S61-S65

[Read article](#)

[Mittermiller PA, Bidwell SS, Thieringer FM, et al](#)

**The Comprehensive AO CMF Classification System for Mandibular Fractures: A Multicenter Validation Study**

Craniomaxillofac Trauma Reconstr.2019;12(4):254-265

[Read article](#)

[Maniglio M, Fornaciari P, Backer H, et al](#)

**Surgical Treatment of Mild to Severe Hallux Valgus Deformities With a Percutaneous Subcapital Osteotomy Combined With a Lateral Soft Tissue Procedure**

Foot Ankle Spec.2019;12(2):138-145

[Read article](#)

[Maheswaran A, Aiyer SN, Farouk O, et al](#)

**Assessment of Interobserver Variability for CT Scan-Based Evaluation of Posterior Ligament Complex Injury in Thoracolumbar Fractures: An International Multicenter Pilot Study**

Global Spine J.2020;10(2):118-129

[Read article](#)

[Lewis SJ, Wong IHY, Strantzas S, et al](#)

**Responding to Intraoperative Neuromonitoring Changes During Pediatric Coronal Spinal Deformity Surgery**

Global Spine J.2019;9(1 Suppl):15S-21S

[Read article](#)

[Kwan KYH, Bow C, Samartzis D, et al](#)

**Non-neurologic adverse events after complex adult spinal deformity surgery: results from the prospective, multicenter Scolio-RISK-1 study**

Eur Spine J.2019;28(1):170-179

[Read article](#)

[Kates SL, Hurni S, Chen MS](#)

**Development and Challenges in Setting Up an International Bone Infection Registry**

Arch Orthop Trauma Surg.2019;Nov 7. doi: 10.1007/s00402-019-03303-7.

[Read article](#)

[Joeris A, Hoglinger M, Meier F, et al](#)

**The Impact of the AO Foundation on Fracture Care: An Evaluation of 60 Years AO Foundation**

Injury.2019;50(11):1868-1875

[Read article](#)

[Hengg C, Nijs S, Klopfer T, et al](#)

**Cement Augmentation of the Proximal Humerus Internal Locking System in Elderly Patients: A Multicenter Randomized Controlled Trial**

Arch Orthop Trauma Surg.2019;139(7):927-942

[Read article](#)

[Garcia-Retamero R, Petrova D, Cokely ET, et al](#)

**Scientific Risk Reporting in Medical Journals Can Bias Expert Judgment: Comparing Surgeons' Risk Comprehension Across Reporting Formats**

J Exp Psychol Appl.2019;Oct 14. doi: 10.1037/xap0000242. [Epub ahead of print]

[Read article](#)

[Charest-Morin R, Fisher CG, Versteeg AL, et al](#)

**Clinical Presentation, Management and Outcomes of Sacral Metastases: A Multicenter, Retrospective Cohort Study**

Ann Transl Med.2019;7(10):214

[Read article](#)

[Charest-Morin R, Fisher CG, Sahgal A, et al](#)

**Primary Bone Tumor of the Spine-An Evolving Field: What a General Spine Surgeon Should Know**

Global Spine J.2019;9(1 Suppl):108S-116S

[Read article](#)

[Cerpa M, Lenke LG, Fehlings MG, et al](#)

**Evolution and Advancement of Adult Spinal Deformity Research and Clinical Care: An Overview of the Scolio-RISK-1 Study**

Global Spine J.2019;9(1 Suppl):8S-14S

[Read article](#)

[Brorson S, Alispahic N, Bahrs C, et al](#)

**Complications After Non-Surgical Management of Proximal Humeral Fractures: A Systematic Review of Terms and Definitions**

BMC Musculoskelet Disord.2019;20(1):91

[Read article](#)

[Belangero W, Barla JD, Rienzi Bergalli DH, et al](#)

**Nutrition and Inflammation Influence 1-Year Mortality of Surgically Treated Elderly Intertrochanteric Fractures: A Prospective International Multicenter Case Series**

Geriatr Orthop Surg Rehabil.2019;10():2151459318816980

[Read article](#)

[Barzilai O, Versteeg AL, Sahgal A, et al](#)

**Survival, Local Control, and Health-Related Quality of Life in Patients With Oligometastatic and Polymetastatic Spinal Tumors: A Multicenter, International Study**

Cancer.2019;125(5):770-778

[Read article](#)

[Barzilai O, Boriani S, Fisher CG, et al](#)

**Essential Concepts for the Management of Metastatic Spine Disease: What the Surgeon Should Know and Practice**

Global Spine J.2019;9(1 Suppl):98S-107S

[Read article](#)

[Azi ML, Teixeira AAA, Cotias RB, et al](#)

**Induced-Membrane Technique in the Management of Posttraumatic Bone Defects**

JBJS Essent Surg Tech.2019;9(2):e22

[Read article](#)

AO

4

# Publications

Each year, the AO expands the range of high-quality, relevant publications available. Explore our recent publications below.

# AO drives international efforts to combat fracture-related infection

Fracture-related infection (FRI) is one of the most complex problems in modern orthopedic trauma surgery. Even after exemplary surgical care, patients can still suffer from infection at the site of the operation, and this has significant impact on their recovery. This area featured prominently in the AO's publications in 2019. Explore the AO's contribution to improving patient outcomes in this area, below.

**Diagnosing Fracture-Related Infection: Current Concepts and Recommendations**

[Download](#)

**General treatment principles for fracture-related infection: recommendations from an international expert group**

[Download](#)

**Evidence-Based Recommendations for Local Antimicrobial Strategies and Dead Space Management in Fracture-Related Infection**

[Download](#)

**Recommendations for Systemic Antimicrobial Therapy in Fracture-Related Infection: A Consensus From an International Expert Group**

[Download](#)

## Latest editions: Available now

The AO's publications are renowned for their quality and relevance to clinicians across the globe. Each year we endeavor to expand what we offer, to support our network in improving treatment by providing access to best-in-class research and guidance in all areas in which we are active.

### **AO Principles of Fracture Management**

3rd edition, Italian

### **AO Principles of Fracture Management**

3rd edition, Brazilian Portuguese

### **Techniques and Principles for the Operating Room**

Chinese

### **Osteotomies around the Knee**

Chinese

### **Fractures of the Pelvis and Acetabulum**

Turkish

[Learn more](#)

AO

# 5

## Finance and governance

Despite lower-than-expected third-party income for the year, the net result reached record levels, boosted by the financial performance of our portfolio due to the market recovery in 2019 following its poor performance in 2018. The decline in the portfolio's value the previous year was more than offset by performance in the current year.



Operating income

**97 million**

CHF



Financial result

**213 million**

CHF



Foundation equity

**1,420 million**

CHF

## Financial overview

Third-party income remained on a par with the prior year. Without the one-off impact from a change in the accounting methodology for deferred membership fees, third-party income would have increased by 3 . Higher expenses in the current year negatively impacted the Operating Result, which was CHF 9 million lower compared to the previous year, amounting to CHF -38 million.

A Financial Result of CHF 213 million was due to the strong performance of the global financial market in 2019. As a result, the AO Foundation's equity increased to CHF 1,420 million by the end of 2019.

AO Financial Overview	2018	2019	Variance A19/A18	
in million CHF	abs	abs	abs	%
Operating Income	98	97	-1	-1%
Operating Expenses	127	135	8	6%
Operating Result	-29	-38	-9	-31%
Financial Result	-98	213	311	317%
Net Result	-127	175	302	238%
Equity per 31.12.	1,245	1,420	175	14%

# Income statement

The 2019 income statement is as follows in comparison to the previous year and budget:

Income Statement Consolidated	2018 Actual		2019 Actual		2019 Budget		Variance A19/B19		Variance A19/A18	
	abs	%	abs	%	abs	%	abs	%	abs	%
in million CHF										
Cooperation Agreements	64.7	66%	62.9	65%	62.9	62%	0.0	0%	-1.8	-3%
3rd Party Income	33.6	34%	33.6	35%	38.1	38%	-4.5	-12%	0.0	0%
Total Operating Income	98.3	100%	96.5	100%	101.0	100%	-4.5	-4%	-1.8	-2%
R&D	24.6	19%	28.2	21%	32.0	22%	-3.8	-12%	3.6	15%
AO Technical Commission	4.5	4%	4.6	3%	4.4	3%	0.2	5%	0.1	3%
Community Development	6.3	5%	7.1	5%	6.8	5%	0.3	4%	0.8	13%
Education	59.9	47%	59.2	44%	63.9	45%	-4.7	-7%	-0.7	-1%
General & Administrative	15.7	12%	17.3	13%	15.2	11%	2.1	14%	1.7	11%
Global & Regional Boards	4.1	3%	4.1	3%	4.3	3%	-0.2	-6%	0.0	0%
Others	12.3	10%	14.7	11%	16.2	11%	-1.5	-9%	2.3	19%
Total Operating Expenses	127.3	100%	135.3	100%	142.8	100%	-7.6	-5%	7.9	6%
Operating Result	-29.0		-38.7		-41.8		3.1	-7%	-9.7	-33%
Financial Result	-98.4		213.2		35.0		178.2	509%	311.6	317%
Net Result	-127.4		174.5		-6.8		181.3	n/a	301.9	237%

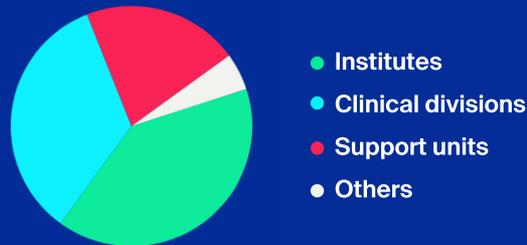
# Asset management

The asset management result of CHF 216.5 million reflects an actual return of 18.0% on the underlying financial assets, amounting to CHF 1,394 million by the end of 2019.

The performance of the portfolio in the current year was mainly driven by strong equity markets. Shares increased by 26.2 percent, with Swiss equities showing the best performance at 30.7 percent and emerging market equities showing the weakest performance at 16 percent. At the end of 2019, investments in equities comprised 61 percent of the portfolio. The underperformance relative to the benchmark was mainly due to the exposure to short-duration bonds and commodities. The cumulative performance of the portfolio since January 2008 was 81.6 percent at the end of December 2019, compared to 52.5 percent for the benchmark.

# Employees

The number of permanent staff increased from 276.5 to 291.5 full-time equivalents (FTEs), the percentages of their distribution across the AO is represented below.



## Governance overview 2019

**The AO Foundation in 2019 continued to review its operations to ensure it offers its network and key partners the value for which it is recognized and to guarantee its ability to continue to meet the standards of excellence with which it is synonymous in its fields.**

Several central organizational units of the AO have undergone changes to increase their flexibility and responsiveness. In 2019 this includes the new structure developed for the AO's innovation driver, the AO Technical Commission (AO TC), and the creation of two new expert groups within the AO TC: the Internal Distraction Task Force, and the Smart Digital Solutions Task Force.

The groundwork for changes to the AO's governance structure were made to reflect the AO's new, streamlined, approach to innovation. The creation of the AO Innovation Translation Center in 2020 as one powerhouse of talent driving innovation in research and development across all areas of AO activity is reflected in our new governance structure.

The AO Foundation Board granted AO Recon the status of a clinical unit that complements the AO's clinical divisions as an increasingly relevant specialty. The decision to grant this status to AO Recon is an important milestone for the AO, and greatly contributes to its future relevance. Five years after its start as an initiative, AO Recon has become an inherent part of the AO.

Responding to clear demand in the community, and recognizing the areas of significant expertise in corresponding fields within the AO, in 2019 we launched a new pilot initiative in sports medicine, which will see further development in 2020.

# Opportunity, diversity, and inclusion

The AO created the AO Opportunity, Diversity and Inclusion Initiative (ODII) to create transparency and awareness, and to assess whether bias and/or barriers exist either for entry and/or progression of women and other underrepresented minorities in the AO.

The overall goal was to identify and initiate measures to ensure that the AO is a diverse and inclusive organization with opportunity for all. A survey created by the ODII revealed several facts about the organization that provide opportunities for improvement. The initial analysis indicated that women and other underrepresented minorities are proportionally underrepresented within AO faculty and that this trend will continue if we do not make substantive changes to the recruiting and nominating practices that allow AO faculty members entry into, and advancement within, the organization.

This gives us the opportunity to improve the organization by adopting more structured recruitment and mentoring practices that provide equality of access and opportunity to everyone interested in participating in the work of the AO.

Reassessment and standardization of the faculty and governance selection process is one important step that the AO can take to ensure equal opportunity to talented new surgeons. Ongoing survey analysis will help identify additional challenges and inform future decisions on how the AO can evolve into a more diverse, inclusive, and transparent organization, providing access and ability to succeed for all.

## Transparency

According to its Transparency Policy, the AO Foundation publishes annually the total remuneration of the AO Foundation Board, international boards of the clinical divisions, and the AO Executive Management, in addition to disclosing all scientific grants to third parties.

# Remunerations per board

The total remunerations summarized for all governance activities of the International Funding Boards in 2019 were CHF 1,294,500 (2018: CHF 1,344,500) which is 1.0 percent (2018: 1.1 percent ) of the total Operating Expenses of the AO Foundation and its institutions. The table below shows the total remuneration of each individual International Board in absolute amounts (CHF) and as a percent of the total amount of individual Operational Expenses, as well as the absolute amount of the highest individual remuneration amount within each board in 2019:

	2018	2019
<b>AO Foundation Board</b>	10 members	10 members
Total AO Foundation Board	355,000	352,500
% of total Operating Expenses AO Foundation	0.3%	0.3%
Highest remuneration AO Foundation Board	75,000*	110,000
<b>AO Trauma International Board</b>	<b>9 members</b>	<b>10 members</b>
Total AO TIB	337,500	325,000
% of total Operating Expenses AO Trauma	0.9%	0.9%
Highest remuneration AO TIB	75,000	75,000
<b>AO Spine International Board</b>	<b>11 members</b>	<b>11 members</b>
Total AO SIB	337,500	312,500
% of total Operating Expenses AO Spine	1.6%	1.4%
Highest remuneration AO SIB	75,000	75,000
<b>AO CMF International Board</b>	<b>9 members</b>	<b>9 members</b>
Total AO CMFIB	262,500	250,000
% of total Operating Expenses AO CMF	3.0%	2.7%
Highest remuneration AO CMFIB	75,000	75,000
<b>AO VET International Board</b>	<b>9 members</b>	<b>9 members</b>
Total AO VETIB	52,000	54,500
% of total Operating Expenses AO VET	1.4%	1.5%
Highest remuneration AO VETIB	30,000	30,000
<b>Grand Total</b>	<b>1,344,500</b>	<b>1,294,500</b>

\* - for six months

## **Remuneration of the AO's Executive Management**

The total annual compensation of ten members of the AO's Executive Management in 2019 was CHF 2,784,570 (2018: CHF 2,773,288). The highest individual compensation was CHF 331,600 resulting in a 1:6.1 relative ratio between the highest and the lowest paid individual compensation (permanent employees).

## **Assignment of scientific and other grants to third-party organizations**

In 2019, AO Foundation funded research projects with scientific and other grants to a total of CHF 2,462,458 for 56 different third-party organizations (2018: CHF 1,741,819).

AO

# 6

## Corporate Social Responsibility (CSR)

The AO is proud to be a good corporate citizen in all geographies where it has a presence. Locally, and globally, the AO has a positive impact on patients, the health care sector, and communities. From energy-saving initiatives at its headquarters in Davos (Switzerland), to projects in Malawi, and targeted initiatives in key locations across the world, the AO remains driven by its founders' passion for improving lives.

In 2019 we received a total of CHF 20,100 in renounced per diems from international faculty from the different clinical divisions. Funds are allocated: 50 percent to AO Alliance, 25 percent to the carbon offsetting projects in Malawi, and 25 percent to our local charity ARGO.



AO center, Davos, Switzerland

## AO Alliance

AO Alliance is the AO's largest CSR contribution. Trauma victims in high-income countries (HIC) usually get medical help within minutes of an accident. Trauma victims in low-income countries can wait hours, or days, for adequate treatment, due to local infrastructure and the availability of qualified health care.

Health care professionals in these countries face particular challenges, including lack of equipment (C-arms, surgical instruments, and implants), patients who reach hospitals after the golden hour for optimum treatment, insufficient time in the operating room, and lack of continuing education opportunities. AO Alliance works to address these needs.



AO Alliance, Bangladesh

# Local engagement

The AO is a fundamental part of Davos, and Davos is an essential part of the AO's identity. We are proud of the local engagement we enjoy with partners in the region.

Central to this is our support for ARGO, an assisted living facility offering pathways to work for people with different abilities, and we enable comprehensive sports medical care for the Hockey Club Davos (HCD) Juniors.

At our headquarters, we have adopted extensive measures in heating, lighting, server virtualization, and heat pump optimization in our quest to reduce energy use. This puts the AO ahead of its peers, and delivers a saving of CHF 25,000 per year.

The AO is a significant contributor to the economy and research hub status of the Canton of Graubunden.



AO headquarters, the AO center, Davos, Switzerland

# Malawi

In 2019 the AO continued its CSR project in Malawi, in conjunction with First Climate and the Malawi-based partner United Purpose. During this third phase of cooperation, work was carried out to address critical needs at Nalunga Health Centre and maternity ward.

A new kitchen was built for guardians (people who accompany patients admitted to the health center), the solar pump was rehabilitated, a new water tank was installed, the maternity ward and outpatient department (OPD) were connected to the water supply, and the maternity ward was enhanced with solar lighting. Other work included general infrastructure improvements to the maternity ward, OPD, and guardian shelter. New beds and mattresses were also provided for the maternity ward.

The provision of reliable electricity supply has a significant impact on safety of mother, baby, and health care professionals when births take place at night. The newly complete water system provides access to 5,000 liters of safe running water. The additional connection of the guardian shelter to a safe water supply is beneficial for the pregnant women admitted to the facility, and those accompanying them. The addition of new cooking facilities make it easier to ensure patients receive adequate nutrition, and offer the additional benefit of being more environmentally friendly than their predecessors.

Previously, Nalunga did not have a safe water supply. The new borehole provides this vital resource, enabling the health center to continue to provide much-needed services to the population.



Solar panels at Nalunga Health Centre