

AO

A resilient AO looks forward Annual Report 2021



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A photograph of two men, Christoph Lindenmeyer and Florian Gebhard, standing side-by-side against a dark purple background. Both are wearing dark suits and light blue shirts. Christoph is on the left, wearing glasses and smiling. Florian is on the right, also wearing glasses and smiling.

Christoph Lindenmeyer
AO Foundation CEO

Florian Gebhard
AO Foundation President

From the President and the CEO: a resilient AO looks forward

We began 2021 in the same uncertain way as 2020 concluded, with one difference: We were better prepared for the challenges and opportunities the pandemic presented. We learned in the previous year how to pivot to new ways of working and collaborating on short notice, while closely monitoring the global and local COVID-19 situation and taking all necessary precautions to minimize risks. The pandemic also proved to be a catalyst to drive positive change for the AO, our community of surgeons, and the patients they serve. We enhanced our online offerings and delivered new and innovative courses with state-of-the-art technology. Investments in research, artificial intelligence (AI), and strategic partnerships progressed as we focused on the future.

The AO Research Institute Davos (ARI) made history in September 2021, with the highly anticipated opening of Europe's first specific-pathogen-free (SPF) sheep facility that will fulfill an unmet need in Europe and beyond while maintaining the highest principles of animal welfare. It will achieve this using SPF sheep and careful breeding, which will, in turn, reduce and refine animal experiments.

Innovation grants and projects such as the AO Innovation Translation Center's AI@AO pilot project advanced. In this project, the AO leverages its unique position as a global community of expert surgeons to advance the use of AI to classify fractures. The aim is to create a data set of x-ray fracture images with high-quality annotations, to improve the training of AI algorithms.

In early 2021, the AO entered into a strategic partnership with Rimasys to develop high-fidelity solutions to educate surgeons. Rimasys' technological capabilities and disruptive product portfolio complement the state-of-the-art expertise in orthopedics and trauma surgery that the AO has built with global impact over the past 60 years. The partnership focuses on advancing the technology used to train practitioners worldwide in the surgical treatment of trauma and musculoskeletal disorders. In the future, the AO will also use Rimasys products and services globally in selected high-end surgical training formats.

The AO also continued to amplify its digital offerings to accelerate the professional development of surgeons. The new myAO and its app were released in 2021, and myAO is now the fastest growing, most relevant digital network of trauma and orthopedic surgeons worldwide. It is a platform where they can connect, securely exchange knowledge with peers, and access leading clinical and scientific expertise.

The year ended with the AO Davos Courses 2021, our flagship educational event where we were able to come together at on-site courses. Originally planned from November 18 to December 10, we made the difficult decision during week one to cancel the second week to ensure the health and safety of faculty, participants, and staff after the emergence of a new COVID-19 variant. Despite this, it was an extremely engaging week of first-class, hands-on education and in-person networking, a three-day virtual weekend, live surgery sessions from the Shard's 360-degree-view wet lab, the debut of our AO Sports course, and more.

In yet another highly challenging year, we continued to focus on where we add the most value. We are incredibly proud of how our family of surgeons and employees, who, through trying circumstances, came out of this difficult year stronger together.



Education

Even as the global COVID-19 pandemic continued into a second year, the AO—ever resilient and with education in our DNA—not only stayed the course but moved forward in 2021.

In line with our mission of promoting excellence in patient care and outcomes in trauma and musculoskeletal disorders, we underscored our commitment to excellence in education with engaging new educational methods as well as our proven mastery of a variety of formats: face-to-face, on-site; online; live; self-directed; and blended. Across all of our clinical divisions—AO Trauma, AO Spine, AO CMF, and AO VET—and our clinical unit, AO Recon, we engaged 98,000 participants in over 800 courses.

After a year-long break, we enthusiastically welcomed participants back to Davos for the **AO Davos Courses 2021**, reconfirming the AO's resilience and resolve to power through even challenging times. Our flagship annual event—hybrid in 2021—boasted eleven on-site courses (402 participants from 39 countries and 132 faculty from 29 countries). We had planned to run the in-person program from November 18 to December 10, but due to concerns about a new COVID-19 variant, we canceled the second week to safeguard the health and safety of all those who were to attend.

However, this did not stop us from bringing the spirit of Davos to the world, including those who could not be with us on-site, as we hosted a three-day **virtual weekend**. More than 900 unique users entered our online platform as avatars that they created themselves and were able to view AO TV and live surgery sessions in **the Shard**, a sophisticated mobile wet lab from Rimasys equipped with the latest technology. In parallel, 512 participants attended five online courses and three specially curated webinars. In total, we had around 3,500 booth visits, and 3,000 voice chats were initiated. The AO Davos Courses 2021 featured for the first time the **AO Sports** initiative with our course focusing on the knee as an organ. Entirely paperless, the event underscored the AO's commitment to sustainability.

[see more >](#)

AO TV pivot proves the AO's resilience



Supporting engagement at the AO Davos Courses 2021—while enhancing the AO's reach and reputation—was our proprietary educational web channel, **AO TV**. Available during the three-day virtual weekend at the AO Davos Courses 2021, AO TV garnered 3,239 viewers from 114 countries watching 650 hours of content produced under extremely challenging conditions. Due to travel restrictions imposed just two days before the courses started, the majority of surgeons and guests scheduled for AO TV interviews were unable to travel to Switzerland, requiring a fast and flexible pivot to a focus on remote interviews. In total, 37 sessions—including expert panel discussions, keynote lectures, and individual interviews—were produced. Available on demand, AO TV offers a closer look at the AO Davos Courses and greater insight into the international world of the AO.

myAO relaunched with new features



Originally launched in 2019 to support and connect the AO's global network of health care professionals, **myAO** was relaunched to extraordinary success in 2021, with an array of new features, including clinical case sharing, a built-in search function, a secure messenger function, and the integration of AO events. Between the June 2021 relaunch and late October, the network recorded double-digit growth worldwide and across all AO clinical divisions, with close to 40,000 users by the end of the year. As the world's fastest-growing, most relevant digital network of trauma and orthopedic surgeons, the free, web- and app-based myAO platform allows users to connect, securely exchange knowledge with peers, and access leading clinical and scientific expertise to advance their continuous professional development.

AO Sports responds to educational need



With our **AO Sports** initiative, which made its AO Davos Courses debut in 2021, the AO responded to the global need for unbiased education in sports medicine. The three-day, on-site **AO Sports Advanced Course—Knee Injuries and Deformities** in Davos focused on understanding the knee as an organ. With registrants from eleven countries, the course was rated highly by participants: 100 percent said they learned something new and plan to use it in their practice or that the course reconfirmed that what they do in their practice is appropriate. Ninety-four percent would recommend it to colleagues. Key to AO Sports' success is the curriculum development work carried out by clinical experts in three task forces along with the **AO Education Institute**, and the collaboration between these knee, shoulder, and principles task forces. AO Sports conducted a session on the principles of sports medicine as part of the **Rimasys World Surgery Tour 2021** and in October presented a cross-topic symposium at the German Congress of Orthopaedics and Traumatology 2021 (**DKOU**) in Berlin, Germany.

Medical education research milestones achieved

The AO in 2021 enrolled the first two recipients of the AO Fellowship in Medical Education Research. One fellow is from Ottawa University in Canada, and the other is from the University of Melbourne in Australia. Their research projects started in July 2021 and will continue for twelve months. In addition, the AO was distinguished in medical education research, publishing ten peer-reviewed papers, contributing to eleven conferences and workshops, and presenting two conference posters. Involving surgeons and education specialists from the entire AO network, we published a supplement issue in **Journal of Orthopaedic Trauma** on the AO way of providing medical education.

AO Trauma education

The largest global group of dedicated orthopedic and trauma surgeons, researchers, and operating room personnel (ORP) striving for excellence and volunteering for a common goal, AO Trauma demonstrated the AO's resilience in 2021. The clinical division piloted innovative new learning formats and methods, launched new courses closely simulating real-life operating room situations, expanded existing learning opportunities, and saw two of its books published in Chinese.

AO Grand Rounds answers demand for in-hospital training

Responding to hospitals' need to provide regular education to their surgical departments, the AO developed and piloted **AO Grand Rounds**, which comprises free, module-based content for AO faculty to deliver at their own hospitals. The **AO Education Institute** developed four modules and the program was piloted at hospitals in Saudi Arabia and Israel in 2021. The IT backbone necessary to automate the program is under construction and additional pilot events and a general rollout are planned for 2022.

AO Milestones: learning, training, assessment



AO Milestones, AO Trauma's competency-based training and assessment programs, piloted its new adaptive learning module in August 2021 for feedback to around 40 residents at hospitals linked to AO Milestones Task Force members in the United States and Canada. AO Milestones aims to establish the AO as a global leader in surgical education, with AO Trauma as the provider of globally trusted certificates of proficiency in key areas of trauma surgery. The program is the AO's direct response to learners' demand for personalized, just-in-time learning; the need for additional opportunities for skills training and practice; and the existing lack of validated, robust systems for performance assessment. Launch of the adaptive learning component of the hip program is planned for autumn 2022 in North America.

Explore the details of AO Trauma's educational reach in 2021.

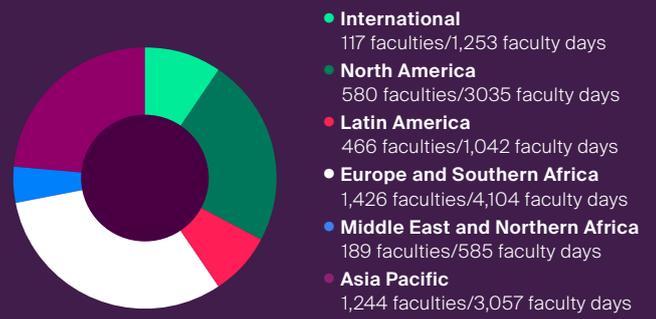
Events

42,664 participants/322 events



Faculty involvement

4,022 faculty/13,075 faculty days



Fracture challenge: new, one-of-a-kind course format



Orthopedic trauma surgeons in 2021 got their first impression of AO Trauma's **fracture challenge courses**, a one-of-a-kind opportunity to take their fracture management skills to the next level under the guidance of master surgeons leading practical exercises using prefabricated anatomical specimens and simulating challenging, real-life operating room (OR) situations. Post-event feedback from participants at the 2021 event in Madrid, Spain, indicated a high level of satisfaction: 100 percent of participants said they would recommend it to colleagues and 86 percent said they learned something new and plan to use that new knowledge in their practices. 2022 and 2023 fracture challenge courses will support the continuing professional development of orthopedic trauma surgeons across a range of fracture management topics—**tibial plateau**; knee, foot and ankle; and elbow and upper extremity.

AO START acetabulum module added



The AO continued to expand its gold-standard educational offering in 2021 with the addition of an acetabulum learning module to the **AO Trauma Surgical Training and Assessment for Residents** (AO Trauma START) program. Content—available in basic, intermediate, and complex categories and aligned with learning objectives defined by the AO Trauma Residents Education Program—includes several interactive, video-based case discussions, quizzes, multiple-choice questions, and self-assessment activities.

Two books published in Chinese

Shandong Science & Technology Press in 2021 published Chinese-language editions of two AO Trauma books, **Osteoporotic Fracture Care—Medical and Surgical Management** (originally published in English in 2018) and **Osteotomies Around the Knee** (originally published in English in 2008). Publication of the two books in Chinese is a promising sign of demand for AO educational materials in the Chinese market.

AO Spine education

The premier knowledge provider in spine surgery and at the forefront of education and research, AO Spine underlined its leadership in 2021 with—for example—a program and exam to certify spine surgeons' knowledge, the return of one of the world's most important gatherings of spine surgeons, the launch of a tool to optimize the treatment of adult spinal deformity, and a new concept employing Swiss Air Force pilots and a flight simulator to help educate spine surgeons.

Certifying knowledge, advancing careers



The **Global Spine Diploma** (GSD) Program, designed for surgeons interested in developing their knowledge within all areas of spine, picked up steam in 2021, together with the worldwide expansion of the **Global Spine Diploma Exam**. The program is the first globally developed, ultimate, and systematic spine surgery training pathway for recently graduated orthopedic surgeons and neurosurgeons. The exam enables experienced candidates to demonstrate that they have attained the level of knowledge expected of a specialist spine surgeon after five years of practical experience. The GSD program, which began with 15 pilot participants from India in 2021, was expected to grow to 120 international participants in 2022. The program recruited 40 more online educators across all areas of spine in addition to its six module chairpersons, underpinning its training aspect.

Global Spine Congress 2021 premieres first hybrid format



Canceled in 2020 due to the COVID-19 pandemic and postponed from its original 2021 date, the **Global Spine Congress** (GSC) returned in November in, for the first time in its history, a hybrid format with on-site activities taking place in Paris, France. As the only truly international spine congress, the GSC brought together spine surgeons, health-care professionals, and industry representatives for four days of exchanging ideas, networking with peers, and learning the latest research, techniques, and technologies in spine surgery. Highlights included studio talks, a new feature with a surgeon running live interviews throughout the congress.

Explore the details of AO Spine's educational reach in 2021.

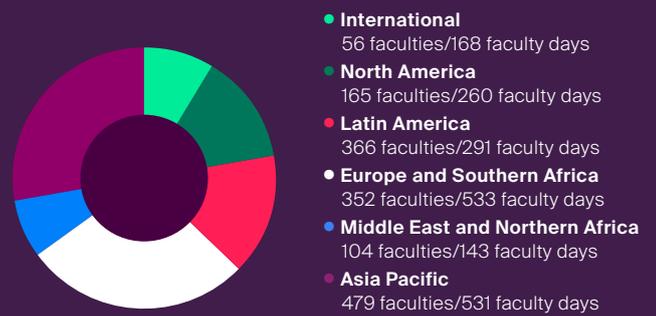
Events

32,040 participants/270 events



Faculty involvement

1,522 faculty/1,925 faculty days



Creating a culture of safety



In a unique approach to nontechnical skills training for surgeons, in June 2021 AO Spine **enlisted Swiss Air Force pilots** to teach basic safety concepts during the AO Spine Masters Level Specimen Course—Improving Technical and Nontechnical Skills for Complication Prevention in Complex Situations, conducted in June at the Swiss Institute for Translational and Entrepreneurial Medicine (SITEM) in Bern, Switzerland. Post-event feedback evidenced the value of the training: 86 percent of respondents said they “learned something new and plan to use it” in their practice and 100 percent said they would recommend the event to colleagues.

Innovation in education: 3D bone model courses

Two innovative, hybrid courses focusing on customized, patient-specific 3D-printed bone models conducted by AO Spine Asia Pacific attracted 419 participants from 70 countries around the world. The **AO Spine Live Demonstration with Case-Based 3D Bone Model Hybrid Course** focused on cervical spine deformity (May 29) and adolescent idiopathic scoliosis (December 4). Using the adaptive learning tool, 13 faculty members demonstrated surgical techniques. Throughout the two events, participants interacted directly with faculty online. Practical exercises were conducted in various satellite sites, extending the learning experience.

AO CMF education

In 2021, AO CMF—a global community of clinicians with different backgrounds and areas of expertise across the craniomaxillofacial (CMF) specialties—continued to fortify its educational offering with a new initiative targeting young surgeons in low- and middle-income countries (LMICs), the launch of an e-learning program to improve the quality of residents' interpretation of computed tomography (CT) scans and identification of facial fractures, and successful deployment of the CMF world's first 24-hour, nonstop educational event.

Bringing a vision to life



The clinical division's achievements in 2021 are in line with the vision outlined by AO CMF International Board Chairperson **Gregorio "Goyo" Sánchez Aniceto**, who began his second term in July. Key to his vision is a commitment to keeping AO CMF's momentum going across the specialties by retaining both young and mid-career surgeons, providing them with what they need, and being there for them throughout their whole careers.

AO College graduates its first class

Young surgeons in LMICs in the Middle East and Northern Africa (MENA) are going back to college—**AO College**—thanks to a cross-divisional initiative launched in 2021. Open to highly motivated and enthusiastic young trauma, spine, and CMF surgeons who have graduated from medical or dental school and are within two to five years of their residency/training program, AO College is an intensive, six-month program focusing on helping them develop globally recognized excellence in surgical, research, teaching, and leadership skills. Seventy-two people—24 each from AO Trauma, AO CMF, and AO Spine—participated in 2021.

[see more >](#)

CTRead software pilot



Facial trauma can lead to many functional, cosmetic, and emotional consequences, and proper diagnosis is imperative to improve patient outcomes and avoid unnecessary complications. In 2021, AO CMF successfully integrated **CTRead**, a revolutionary approach to training residents in computed tomography (CT) facial bone interpretation, into the AO learning management system. By the end of 2021, 20 pilot participants were able to access the formal, ten-module training course, which includes videos, quizzes, and unique CT scans. The **CTRead** software was developed by McGill University oral and maxillofacial surgery resident Wendall Mascarenhas with support from an **AO CMF Start-up Grant**.

Traveling Mandible: around the world in 24 hours

Post-event numbers told the story: The CMF world's first-ever nonstop, 24-hour-educational event—the **Traveling Mandible** on May 29, 2021—was a global success. Responding to regional needs and covering all aspects of the mandible, the AO CMF event attracted 348 participants from 75 countries. Featuring 45 international faculty, 20 presentations, and more than 50 cases in a single day, the Traveling Mandible addressed a wide range of mandibular topics and successfully rotated through eight hubs: Palo Alto, United States; Hong Kong; New Delhi, India; Cairo, Egypt; Zurich, Switzerland; Rio de Janeiro, Brazil; Bogotá, Colombia; and Buenos Aires, Argentina.

AO VET education

Ever advancing the practice of veterinary surgery to improve patient outcomes, AO VET in 2021 extended its reach, with more than 3,500 participants taking part in 17 webinars conducted in a wide range of languages, including Chinese, English, Japanese, Portuguese, and Spanish. Additionally, new educational formats were tested or further deployed; these included the AO VET Symposium—Bridging the Gap: Translating Clinical Research to Clinical Practice—Small Animal Clinical Translation and the AO VET Online Symposium—Interactive Case-Based Approach to Fracture Management: Achieving the “Sleep Factor.”

New leaders inaugurated



New chairpersons took the reins of the AO VET International Board (AO VIB) and the AO VET Education Commission (AO VEC) in July 2021. AO VIB Chairperson **Jeffrey P Watkins** (United States) is committed to keeping AO VET at the forefront of veterinary orthopedics and maintaining its position as the best-in-class education provider, while AO VEC Chairperson **Mark Glyde** (Australia) has a vision of leading and inspiring the AO VET education team to contribute to the clinical division's global leadership in the management of animal musculoskeletal disorders.

The myAO success story continues

myAO proved to be an excellent tool for AO VET engagement and interaction. The vet community grew to over 3,000 users on the platform, with many of them joining the AO VET faculty-moderated groups Small Animal Fracture Care (700-plus participants) and Complications (400-plus participants). Due to the high case volume, the AO VET Community Development Commission, which initiated the groups and moderated them early on, called for AO VET faculty volunteers.

By the end of 2021, numerous cases were posted and the groups proved to be a great way to engage faculty and to digitalize the AO VET spirit. The myAO team also sent out regular expert roundups to the veterinary community, such as “Meet with Julien and Jean-Pierre Cabassu: A father and son story.” Additional expert roundups were in the pipeline for 2022, including discussions with Bruno Peirone and Mike Kowaleski about March 2022 AO VET masters courses in Cremona, Italy.

New monthly newsletter launched

Ramping up its community engagement in 2021, AO VET launched a new monthly newsletter, **AO VET News and Events**, to provide members timely, relevant information as well as an improved overview of ongoing AO VET activities. The new e-newsletter brings together important news and upcoming regional educational activities all in one place. Each edition includes a calendar with the most relevant upcoming dates and events and links for further information.

AO Recon education

From AO Recon's beginning, many of the most respected and sought-after key opinion leaders in arthroplasty have contributed to the clinical unit's success. In March 2021, the AO Foundation Board unanimously **elected** Carsten Perka, professor and medical director at the Center for Musculoskeletal Surgery, University Hospital Charité, Berlin, Germany, as the next chairperson of the AO Recon Steering Board. Bas Masri, professor of orthopedics at the University of British Columbia and head of orthopedics at Vancouver Acute Health Services, Vancouver, Canada, was elected as the next chairperson of the AO Recon Education Forum.

Powering through the pandemic



Despite the ongoing challenges presented by the COVID-19 pandemic in 2021, AO Recon **powered on**, keeping surgeons' skills and knowledge in arthroplasty up to the latest standards by organizing successful and highly impactful face-to-face courses wherever and whenever possible. The clinical unit also expanded its reach to such new countries as Lithuania, Mexico, South Africa, and Spain. In addition, AO Recon contributed to the success of the first-ever **Rimasys World Surgery Tour**.

Scientific newsletter among the most viewed content

In 2021, AO Recon published three new issues of its scientific newsletter, ***Surgical Insights***, with each issue reaching around 30,000 subscribers. The articles continued to be extremely well received, providing a blend of clinical tips and a literature digest to help surgeons keep pace with the current best practice and research landscape. The newsletter has some of the best opening and click-through rates in the field, and the articles are among the most accessed editorial content on the AO's website.

Enhanced, broadened curricula



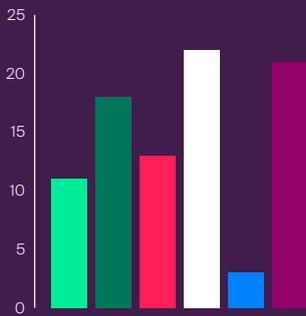
AO Recon's **curricula** were further enhanced, and educational offerings broadened in 2021. Among the highlights were first-ever hospital-based introductory courses on hip and knee arthroplasty for residents. New online courses and webinars were created and delivered for hip and knee joint preservation, and programs for face-to-face, on-site courses were finalized for these new curricula. Several online courses were enhanced through the addition of digital planning.

Explore the details of AO CMF, AO VET, and AO Recon's educational reach in 2021.

AO CMF

Events

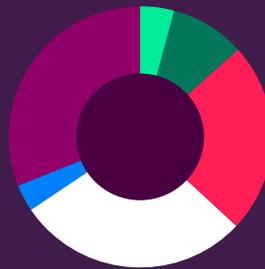
9,671 participants/88 events



- International**
975 participants/1 event
- North America**
2,384 participants/18 events
- Latin America**
971 participants/13 events
- Europe and Southern Africa**
1,372 participants/22 events
- Middle East and Northern Africa**
174 participants/3 events
- Asia Pacific**
3,741 participants/21 events

Faculty involvement

834 faculty/11,611 faculty days

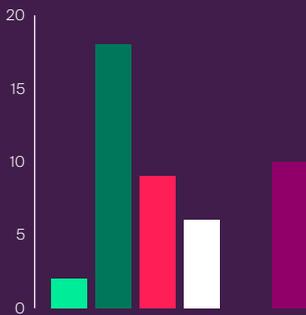


- International**
84 faculties/666 faculty days
- North America**
82 faculties/148 faculty days
- Latin America**
139 faculties/383 faculty days
- Europe and Southern Africa**
211 faculties/461 faculty days
- Middle East and Northern Africa**
33 faculties/54 faculty days
- Asia Pacific**
285 faculties/497 faculty days

AO VET

Events

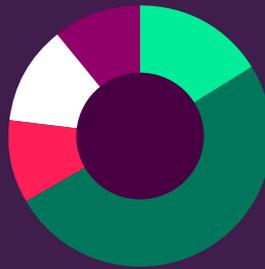
5,452 participants/54 events



- International**
57 participants/2 events
- North America**
1,323 participants/18 events
- Latin America**
1,278 participants/9 events
- Europe and Southern Africa**
1,067 participants/6 events
- Middle East and Northern Africa**
0 participants/0 events
- Asia Pacific**
1,727 participants/10 events

Faculty involvement

274 faculty/619 faculty days

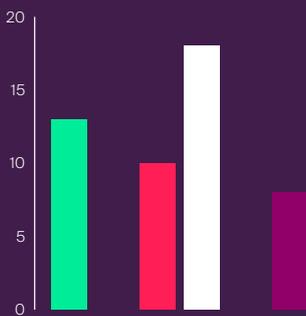


- International**
25 faculties/100 faculty days
- North America**
136 faculties/313 faculty days
- Latin America**
38 faculties/64 faculty days
- Europe and Southern Africa**
30 faculties/76 faculty days
- Middle East and Northern Africa**
0 faculties/0 faculty days
- Asia Pacific**
45 faculties/66 faculty days

AO Recon

Events

8,324 participants/49 events



- International**
1,821 participants/13 events
- North America**
0 participants/0 events
- Latin America**
1,398 participants/10 events
- Europe and Southern Africa**
2,596 participants/18 events
- Middle East and Northern Africa**
0 participants/0 events
- Asia Pacific**
2,509 participants/8 events

Faculty involvement

388 faculty/786 faculty days



- International**
25 faculties/98 faculty days
- North America**
0 faculties/0 faculty days
- Latin America**
102 faculties/244 faculty days
- Europe and Southern Africa**
178 faculties/361 faculty days
- Middle East and Northern Africa**
0 faculties/0 faculty days
- Asia Pacific**
52 faculties/103 faculty days



Innovation

From basic research to product development and clinical validation, innovation is a key AO pillar, advancing our work to promote excellence in patient care and outcomes in trauma and musculoskeletal disorders.

The AO Innovation Translation Center (AO ITC) streamlines and drives innovation projects with its competence areas: AO Technical Commission (AO TC), Clinical Evidence, and Technology Transfer.

At the core of the AO's innovations and approvals process is the AO TC. A key part of developing and bringing innovations to market, the AO TC is central to the AO landscape. In 2021, with the global COVID-19 pandemic in its second year, the AO TC continued to play a crucial role in quality control and product development and acted as an essential link between the AO clinical divisions, the other institutes, and the AO's global network.



Approved products

Countless implants and instruments addressing clinical problems have resulted from the long-standing cooperation between the AO TC and DePuy Synthes. This collaboration has, over the past decade, resulted in more than 200 innovative solutions contributing to the AO's mission: promoting excellence in patient care and outcomes in trauma and musculoskeletal disorders.

AO TC approvals in 2021

In 2021, the AO TC approved a suite of clinical solutions that will benefit patient outcomes across all areas of AO activity.



Variable Angle Patella Locking Plating System

These two plating solutions were developed to reduce complication rates associated with tension band wiring using K-wire or cannulated screws.

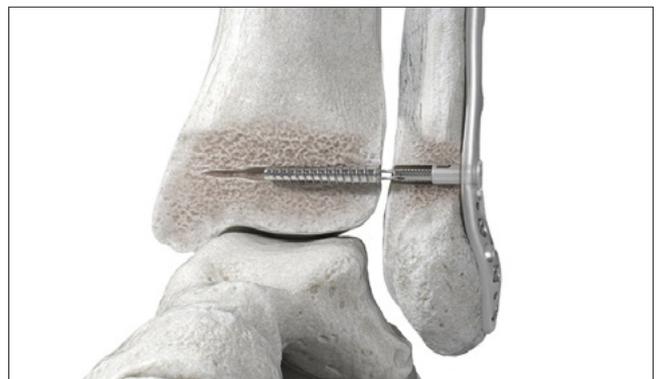
[Learn more](#)



FIBULINK Syndesmosis Repair System

The first adjustable syndesmotic repair system to enable precise, anatomical syndesmotic fixation, this solution is available in both stainless steel and titanium.

[Learn more](#)



Variable Angle LCP Lateral Distal Fibula Plates in titanium

Previously available only in stainless steel, this low-profile plating system is now available in titanium and is complemented by a new anatomic tray which can be stocked with stainless steel or titanium VA-LCP Lateral Distal Fibula plates

[Learn more](#)



Variable Angle LCP Periprosthetic Proximal Femur Plating System

This solution is specifically designed to meet several requirements in the treatment of Vancouver types A and B fractures.

[Learn more](#)



Flexible Monobloc Reamers

Delivering simplicity and enhanced usability, this solution is designed for reaming an intramedullary bone canal in preparation for implant insertion.

[Learn more](#)



UNIUM Small Bone and Trauma Power Tool

Compact and lightweight for precise handling, this solution is designed to meet evolving and increasingly complex small bone surgery requirements.

[Learn more](#)



MAXFRAME update

A new software release and additional hardware enhance the user friendliness and versatility of MAXFRAME Multi-Axial Correction System.

[Learn more](#)



VA-LCP Clavicle Plate 2.7 and VA-LCP Clavicle Hook Plate 2.7 Systems

The new clavicle system represents the next generation of internal fixation for medial, lateral, and shaft fractures of the clavicle. The new hook plate system's enhanced hook geometry reduces pin-point contact of the hook on the underside of the acromion.

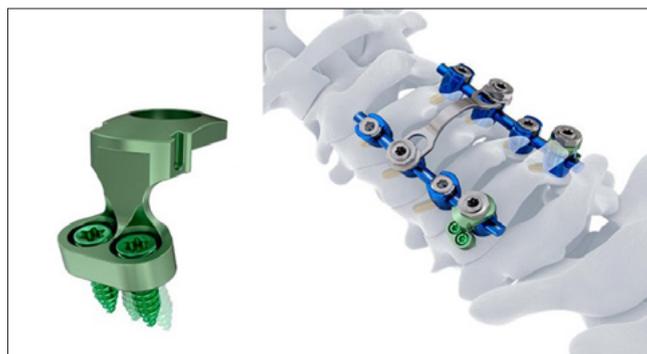
[Learn more](#)



SYMPHONY-OCT System—Compartment 2

This system comprises an enhanced set of instruments and implants for posterior fixation of the occipital-cervical junction, subaxial spine, and cervicothoracic junction.

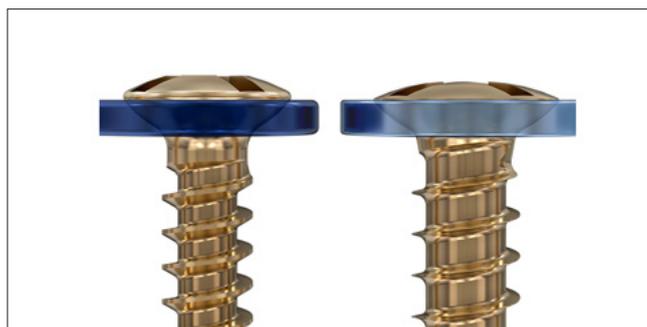
[Learn more](#)



MatrixMIDFACE 1.3 line extension

New plates 1.3 and 1.3 mm screws expand the MatrixMIDFACE line and are aligned with the Matrix concept of providing low-profile plates and screws in a modular system with a wide range of plate shapes and screw options for fracture fixation.

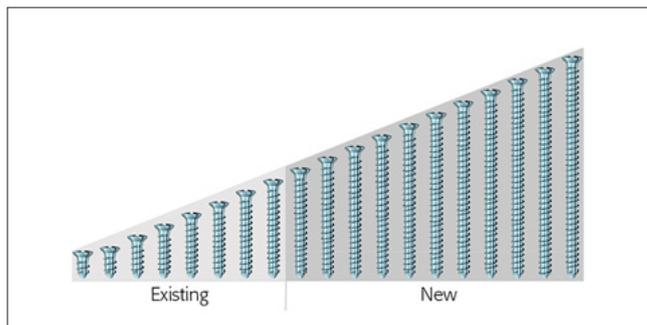
[Learn more](#)



Matrix MANDIBLE 2.4 Cortex Screw line extension

The new 2.4 mm Titanium MatrixMANDIBLE Cortex Screw offers better flexibility for craniomaxillofacial surgeons in the treatment of mandibular fractures.

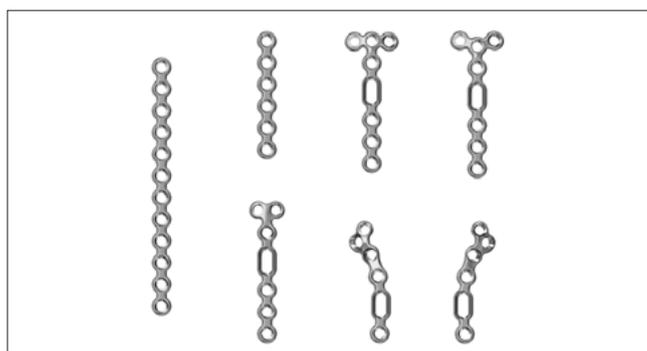
[Learn more](#)



1.3 Locking System

This new system is for the treatment of fractures and arthrodesis in smaller-breed dogs and cats for which the 1.5 LCP System is too large.

[Learn more](#)



AO Innovation Translation Center (AO ITC)

As the AO's innovation hub, the **AO ITC** streamlines and drives innovation projects, with activities ranging from development of clinical solutions with industrial partners, innovation gathering, and proof-of-concept studies with innovators to strategic investments in intellectual property (IP), technologies, or companies, and evidence creation through clinical research. Explore excellence in innovation: Watch our **Meet the Experts** video series.

AO Technical Commission marks 60th anniversary

At the heart of the AO ITC is the **AO Technical Commission (AO TC)**, which in 2021 marked its 60th anniversary. Established by the AO founders in 1961 and known for years as the "AO Technische Kommission" (AOTK), the body was responsible for the development and approval of surgical techniques, implants, and instruments. The AO ITC streamlines and drives innovation projects ranging from the development of clinical solutions and innovation gathering to strategic investments in IP and evidence creation through clinical research. Learn more about the AO TC's history in the video [here](#).

AO TC welcomes new chairperson

Maarten Spruit, elected **AO TC chairperson** in June 2021, perceives several opportunities to further strengthen the AO TC's innovative output and aims to promote the AO TC as a global expert think tank that will drive disruptive innovation. He took over AO TC leadership during a challenging time as travel restrictions imposed by the COVID-19 pandemic forced activities typically carried out on-site to be conducted differently.

AO Global Data expansion continues

The AO's innovative nature was further evidenced by the continued expansion of **AO Global Data**, the world's most comprehensive musculoskeletal outcomes repository. In June 2021, **spine-specific protocols were introduced**. Covering deformity, degenerative disease, trauma, and tumor, the protocols endorsed by the new **AO Spine Knowledge Forums** provide both highly specialized and more general access to comply with data collection standards and precisely track an array of pertinent spine conditions. The first veterinary module was developed, and work began on modules for pediatric long bone fractures and reconstructive surgery. Additionally, AO Global Data conducted a successful **webinar** addressing the value of patient data for surgeons, health care delivery teams, and patients.

AI@AO: advancing AI to improve patient care

In collaboration with the University of Turin and with **AO ITC Innovation Fund** resources, the AO in 2021 undertook the **AI@AO** pilot project, leveraging its unique position as a global community of expert surgeons to advance the use of artificial intelligence (AI) to classify fractures. The aim of the project is to create a data set of x-ray fracture images with high-quality annotations to improve training of AI algorithms.

Highlights

AO TC Innovation Prize

The Cervical Spine Expert Group was honored for advancements in posterior cervical fusion (PCF) and development of the SYMPHONY-OCT System.

[Learn more](#)

Biphasic Plate earns CE mark

Supported by Development Incubator resources, the Biphasic Plate DF (Distal Femur) earned CE certification as a class IIB medical device.

[Learn more](#)

AO Small External Fixator

This CE-marked, soft-tissue protecting, less bulky, and more efficient solution—developed with Development Incubator resources—is now being used to treat patients.

[Learn more](#)

3D SIM

This technology uses sound waves to generate a network of cells within seconds and is poised to transform tissue engineering.

[Learn more](#)

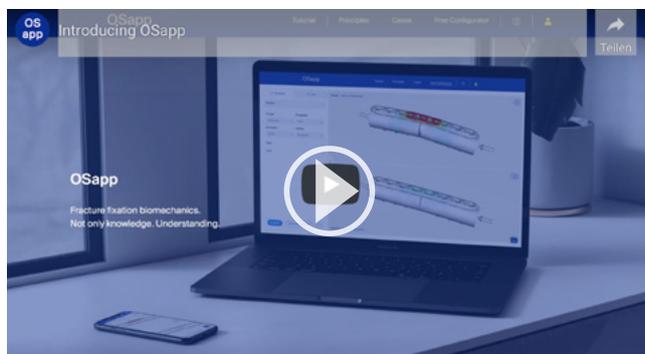


Research

The AO is home to a full-cycle research hub, running from preclinical research to ongoing studies on new treatments that solve clinical problems. Research and innovation at the AO work together to improve available treatments and outcomes in human and animal patients. Resilience in research means ensuring it can continue at the same excellent standards, whatever the changing external factors, and the AO clearly demonstrated this in 2021.

Preclinical research

OSapp expansion continues



In 2021, the virtual osteosynthesis software tool and interactive online learning platform, **OSapp**, expanded the range of virtual biomechanical models that it features and established several internal AO collaborations. OSapp meets a **real need among surgeons in training** and their mentors for support in learning, exploring, and understanding biomechanical principles of implant fixations and bone healing.

Free to use, it includes **guided and unsupervised learning** experiences that offer an interactive, visual way of understanding the biomechanical principles behind multiple basic fixation concepts, based on Stephan Perren's strain theory. It can be integrated further into AO educational offerings—especially those with a hybrid component, as AO President Florian Gebhard explained on AO TV during the AO Davos Courses 2021.

OSapp is being **developed to integrate** with other AO platforms such as AO Milestones, where it will be incorporated through the fundamentals module. Pilot projects hyperlinking with the AO Surgery Reference (for the cortical lag screw module) and supplementing the AO Skills Lab (for the station on plate mechanics) have demonstrated OSapp's potential to enhance the impact and value of existing AO educational offerings.

Officially launched at the AO Davos Courses 2020, OSapp sparked intense worldwide interest online, was showcased at the German Congress of Orthopaedics and Traumatology (DKOU) 2021, and had a dedicated booth at the AO Davos Courses 2021. OSapp is developed at the AO Research Institute Davos (ARI) with resources from the Strategy Fund within the AO Innovation Translation Center (AO ITC).

ARI strengthens cooperation with BBCE



International cooperation between institutes and universities plays an essential role in scientific research. At the AO, research is by its very nature both cross-border and interdisciplinary. The AO Research Institute Davos (ARI) in 2021 continued to strengthen its research cooperation with the **Baltic Biomaterials Centre of Excellence (BBCE)**, with which it is working to establish a joint center for advanced biomaterials development in Latvia.

Working with the BBCE gives ARI the opportunity to contribute to the establishment of a biomaterials center of excellence in Europe. Founded on a principle of sharing best practices in research, the BBCE's primary objective is to build research capacity in the Baltic area.

The project has a wide variety of subject-specific topics, such as biomaterials research, drug delivery, and 3D biomaterials printing, and includes general research-relevant areas such as lab management, quality control systems, intellectual property (IP) management, and knowledge transfer.

Due to the COVID-19 pandemic in 2020 and for much of 2021, this joint work was carried out online.

In August 2021, the first visit was possible: ARI hosted five students and two supervisors, who were the winners of the BBCE BIO-GO-HIGHER Latvian High School National Science Competition. They were awarded the opportunity to travel to Davos and participate in ARI laboratory activities for three days.

An additional two visits took place in November and December when members from the different BBCE Riga Institutes shared expertise in biomaterials research excellence and best practices in research more broadly.

Longer planned visits, of three to six months, by students and postdocs from Latvia coming to work alongside ARI researchers was also finally possible. These visits are at the core of this cooperation and are an opportunity for both partners to learn from each other in laboratory settings and discussion groups.

While ARI is at the heart of this joint work, the Development Incubator and the AO's Clinical Evidence unit under the AO Innovation Translation Center (AO ITC) also gave lectures to BBCE participants. Health care professionals from Riga also attended the AO Davos Courses last year.

Find out more about the latest visit as part of this initiative [here](#).

SPF sheep facility delivers lasting investment in research excellence



In 2021, ARI's preclinical research facility **opened** the doors to its highly anticipated specific-pathogen-free (SPF) sheep facility, directly adjacent to the AO center in Davos. This state-of-the-art, 6,575-square-meter zone expansion houses the first SPF sheep flock outside North America.

It is a particular achievement that this vital contribution to the city's position as a leading global research and innovation hub was completed during such challenging times. An investment on this scale demonstrates the AO's commitment to the highest animal welfare standards in research, and patient-outcome-focused R&D.

The **facility** also has a built-in biogas project to reduce methane output and produce renewable green energy and heat.

Research with impact



Six scientists from ARI rank among the **most-cited researchers** in the world across all scientific fields, according to **researchers** at Stanford University.

Research quality can be difficult to assess, but this ranking demonstrates that ARI research is high quality and high impact. This means that ARI research kick-starts lines of inquiry later picked up by researchers elsewhere and makes ARI a prime choice for inclusion in consortia that achieve successful applications for grant-based funding.

In October 2021, Stanford published a database of over 100,000 of the most-cited authors from around the world in all scientific fields in 2020, based on Scopus citation metrics. ARI Director Professor Geoff Richards, Vice Director Professor Mauro Alini, ARI Program Leader Regenerative Orthopaedics Professor Martin Stoddart, Deputy Program Leader Regenerative Orthopaedics Dr Sibylle Grad, Focus Area Leader Infection Biology Dr Fintan Moriarty, and Focus Area Leader Polymers and Surfaces Dr David Eglin, were all recognized.

One example of this research excellence is the **publication** in **Nature Reviews Disease Primers** on non-union bone fractures, which achieved an impact factor of 53, well above the usual range for orthopedic research publications which is around 2.5 or 3. These rankings indicate that ARI is able to achieve clinically relevant results while also attaining globally recognized academic excellence.

Explore a selection of ARI's notable research published in 2021

Bone infection: a clinical priority for clinicians, scientists and educators

Eur Cell Mater. 2021 Oct 18;42:312-333.

Moriarty TF, Muthukrishnan G, Daiss J L, et al.

[see more >](#)

Butyrate Inhibits Osteoclast Activity In Vitro and Regulates Systemic Inflammation and Bone Healing in a Murine Osteotomy Model Compared to Antibiotic-Treated Mice

Alexandra Wallimann, Walker Magrath, Brenna Pugliese, et al

[see more >](#)

Angular stable locking in a novel intramedullary nail improves construct stability in a distal tibia fracture model

Injury accepted 2 November 2021, Available online 6 November 2021

Ivan Zderic, Boyko Gueorguiev, Michael Blauth, et al

[see more >](#)

Uncovering the secretome of mesenchymal stromal cells exposed to healthy, traumatic, and degenerative intervertebral discs: a proteomic analysis

Stem Cell Res Ther. 2021 Jan 7;12(1):11. doi: 10.1186/s13287-020-02062-2. PMID: 33413584

Wangler S, Kamali A, Wapp C et al

[see more >](#)

The waves that make the pattern: a review on acoustic manipulation in biomedical research alternatives

Nat Rev Dis Primers. 2021 Aug 5;7(1):57. doi: 10.1038/s41572-021-00289-8.

Wildemann B, Ignatius A, Leung F, et al

[see more >](#)

The influence of biomechanical stability on bone healing and fracture-related infection: the legacy of Stephan Perren

Injury. 2021 Jan;52(1):43-52. doi: 10.1016/j.injury.2020.06.044. Epub 2020 Jun 26.

Foster AL, Moriarty TF, Zalavras C, et al.

[see more >](#)

Biomechanical analysis of recently released cephalomedullary nails for trochanteric femoral fracture fixation in a human cadaveric model

Arch Orthop Trauma Surg. 2021 Nov 8.

Torsten Pastor, Ivan Zderic, Dominic Gehweiler, et al.

[see more >](#)

Dexamethasone Induces Changes in Osteogenic Differentiation of Human Mesenchymal Stromal Cells via SOX9 and PPARG, but Not RUNX2

Int J Mol Sci. 2021 Apr 30;22(9):4785. doi: 10.3390/ijms22094785.

Della Bella E, Buetti-Dinh A, Licandro G, et al.

[see more >](#)

A Hyaluronic Acid Hydrogel Loaded with Gentamicin and Vancomycin Successfully Eradicates Chronic Methicillin-Resistant Staphylococcus aureus Orthopedic Infection in a Sheep Model

Antimicrob Agents Chemother. 2021 Mar 18;65(4):e01840-20. doi: 10.1128/AAC.01840-20. Print 2021 Mar 18.

Willemijn Boot, Tanja Schmid, Matteo D'Este et al

[see more >](#)

Bacteriophage Therapy for the Prevention and Treatment of Fracture-Related Infection Caused by Staphylococcus aureus: a Preclinical Study

Microbiol Spectr . 2021 Dec 22;9(3):e0173621. doi: 10.1128/spectrum.01736-21. Epub 2021 Dec 15.

Jolien Onsea, Virginia Post, Tim Buchholz, et al

[see more >](#)

Trauma research

At the AO, research in the field of trauma has two main pillars: research to generate scientific knowledge, and individual support for surgeons who are interested or involved in research through activities such as AO PEER events and research grants.

Injury journal Stephan Perren tribute edition research awards announced

In 2021, AO Trauma **announced** the winners of the two best publications in the *Injury* journal special edition: Tribute to Stephan Perren. The panel of experts selected two articles that were most in keeping with Perren's passion for real freedom to explore in research.

First prize was awarded to Y Dai, et al, who investigated whether the identification of a specific miRNA expression profile can facilitate the diagnosis of infected tibial nonunion.

Second prize went to S Halvachizadeh, et al, who investigated in an acute porcine trauma model (moderate blunt chest trauma, abdominal injury, and femoral shaft fracture) with a standardized femur fracture the impact of the unreamed nailing technique and reaming on pulmonary and systemic effects.



Clinical Priority Program

Bone Infection publications push knowledge boundaries

The **AO Trauma Clinical Priority Program (CPP) Bone Infection** is tackling a highly relevant problem in the treatment of musculoskeletal disorders. Infection is one of the most challenging problems to resolve—for researchers, clinicians, and patients. In fact, antimicrobial resistance is one of the most important global public health challenges of the twenty-first century.

The work the CPP does toward finding solutions to this problem is of fundamental importance. In 2021, the following publications pushed the boundaries of our knowledge in this area further.

Emerging electron microscopy and 3D methodologies to interrogate *Staphylococcus aureus* osteomyelitis in murine models.

J Orthop Res. 2021 Feb;39(2):376-88. Epub 2020/12/31. doi: 10.1002/jor.24968.

de Mesy Bentley KL, Galloway CA, Muthukrishnan G, et al

[Find out more >](#)

Distinct expression trend of signature antigens of *Staphylococcus aureus* osteomyelitis correlated with clinical outcomes.

(2021) J Orthop Res. 2021 Feb;39(2):265-73. Epub 2020/12/19. doi: 10.1002/jor.24961.

Fu W, He W, Ren Yet al

[Find out more >](#)

Distinct vasculotropic versus osteotropic features of *S. agalactiae* versus *S. aureus* implant-associated bone infection in mice.

(2021) J Orthop Res. 2021 Feb;39(2):389-401. Epub 2020/12/19. doi: 10.1002/jor.24962.

Masters EA, Hao SP, Kenney HM et al

[Find out more >](#)

Antimicrobial Resistance, the COVID-19 pandemic, and lessons for the orthopaedic community.

J Bone Joint Surg Am. 2021 Jan 6;103(1):4-9. Epub 2020/12/02. doi: 10.2106/JBJS.20.01214.

Metsemakers WJ, Zalavras C, Schwarz EM et al

[Find out more >](#)

Interleukin-27 and its diverse effects on bacterial infections.

Front Immunol. 2021;12: 678515. Epub 2021/06/04. doi: 10.3389/fimmu.2021.678515.

Morita Y, Masters EA, Schwarz EM, Muthukrishnan G et al

[Find out more >](#)

The AO trauma CPP bone infection registry: Epidemiology and outcomes of *Staphylococcus aureus* bone infection.

J Orthop Res. 2021 Jan;39(1):136-46. Epub 2020/07/29. doi: 10.1002/jor.24804.

Morgenstern M, Erichsen C, Millitz M et al

[Find out more >](#)

Humanized mice exhibit exacerbated abscess formation and osteolysis during the establishment of implant-associated *Staphylococcus aureus* osteomyelitis.

Front Immunol. 2021;12:651515. Epub 2021/04/06. doi: 10.3389/fimmu.2021.651515.

Muthukrishnan G, Wallimann A, Rangel-Moreno J et al

[Find out more >](#)

Spine research

Knowledge Forums mark ten-year anniversary



In 2021, AO Spine Knowledge Forums (five expert-driven global study groups focused on **spine tumor**, **deformity**, **trauma**, **spinal cord injury**, and **degenerative disease**) celebrated their **tenth anniversary**. They **started by involving** the right experts and have evolved into powerful generators of research and new knowledge that translates into education and community awareness.

A particular strength of the Knowledge Forums is their reach: Truly global, each group has four out of five regions represented. This is especially important in emerging areas such as personalized medicine. Knowledge Forums are responsible for the unique academic status of AO Spine, setting it apart from other spine societies.

AO Spine publishes Adult Spinal Deformity Patient Profile



Adult spinal deformity (ASD) is highly complex. Rather than being a single disease, it is a broad spectrum of pathology in an inherently heterogeneous patient population. Published in August 2021, AO Spine's **ASD Patient Profile** aims to help clinicians navigate the treatment options available—to select the best one in each case.

Spine surgeons across the world expressed a clear need for a systematic and holistic approach to treating these patients, and this project aimed to develop a comprehensive classification to help clinicians optimize treatment.

Based on a systematic **literature review**, the **AO Spine ASD Patient Profile** helps physicians treating ASD patients to systematically consider the factors that could contribute to the most efficient management of the condition. This promising project responds to clinical needs and is the first step in developing a classification system.

AO Spine Research Needs Assessment results

In 2021, AO Spine **published** the results of its 2020 global research practices and needs assessment. This anonymous survey sought to gain insights into a wide range of issues including: research registries, training, education, mentorship, grants, financial support, and future directions. Surgeons from all geographic regions took part, over half were affiliated with an academic/university hospital, over 90 percent carried out clinical research, and over 60 percent had five or more years' experience.

Despite the heterogeneity among research practices and needs across regions, surgeons in all regions shared the same challenges in carrying out research, and there was global support for research registries, training, and education. In conclusion, spine societies should tailor programs to local and regional needs, and work to establish guidelines, study pain management, and support predictive analytic modeling.

AO Spine Upper Cervical and Sacral Injury Classification Systems are now validated

In 2021, the AO Spine **Subaxial Cervical Spine Injury Classification System** was validated as a tool for patient management. Found to be substantially generalizable by region and surgeon experience, it supports surgeons by giving them consistency in communications about subaxial cervical spine traumatic injuries.

The AO Spine **Sacral Classification System** was also recognized internationally as reliable. Classification systems are vital to providing patient care, because when fracture severity is not correctly identified, the patient is vulnerable to inappropriate surgical management. Improved outcomes rely to a great extent on correct and validated classification systems. AO Spine's work in this vital area will continue.

Craniomaxillofacial research

Experimental and clinical research into disorders of the craniomaxillofacial (CMF) skeleton is at the core of what AO CMF does. At AO CMF, research and development aim to produce new findings and develop them into practice so that they impact clinical care in this field. In 2021, AO CMF focused on facial fracture outcome studies and studies related to bone inflammation and infection, such as osteonecrosis.

Investing in the future



In April 2021, AO CMF's new R&D Junior Reviewers program completed its first edition. The program gave young researchers (aged 40 or younger) the opportunity to hone their grant proposal reviewing and writing skills, by playing an active role in reviewing AO CMF Start-Up Grant applications. Find out more [here](#).

AO CMF also supports future generations of researchers through its **Start-Up Grants** for projects related to basic, preclinical, and clinical research in the fields of trauma and reconstruction in CMF surgery. The 2021 call for proposals generated a host of interesting applications, from all over the world. Researchers applied from Australia, Germany, India, Nepal, the Netherlands, Switzerland, and the United States.

Current research programs developed together with the AO Innovation Translation Center (AO ITC)

International, multicenter, prospective registry to collect data of patients treated with alloplastic temporomandibular joint (TMJ) replacements

[Find out more >](#)

International, multicenter, prospective registry to collect data on orbital fractures (OFx), their treatment and outcome

[Find out more >](#)

International, multicenter, prospective registry to collect data in patients > 60 years suffering from mandibular fractures

[Find out more >](#)

An international, multicenter, prospective registry to collect data of treatment patterns of patients with medication-related osteonecrosis of the jaw (MRONJ) and their outcome

[Find out more >](#)

International, multicenter, prospective registry to collect data of treatment patterns in patients with bilateral condylar fracture (BCFx) of the mandible

[Find out more >](#)

Veterinary research

Fracture Research Animal Models Database rollout complete

AO VET's **Fracture Research Animal Models Database** (FRAMD) completed its final-stage rollout in 2021 ahead of its scheduled go-live in 2022.

Cofinanced by the Strategy Fund and AO VET Research and Development commission, it benefits the broader research community by enabling scientists to choose fracture research models more effectively.

With over 4,000 journal papers from the 1970s to the present day, it offers researchers a hub that brings together all relevant research in this field.

This in turn supports the development of new treatments and furthers the AO mission. Critically, in line with the AO's commitment to best practice in this area, it minimizes the need for the use of animals in research.

AO VET Seed Grants support research



In 2021, AO VET continued its Seed Grant program to support members pursuing research in musculoskeletal science.

Launched in 2020, this Seed Grant program aims to help train future leaders in veterinary orthopedics and offers funding of up to CHF 7,500 for a twelve-month period. Currently, four projects from Germany, the United States, and Uruguay are in the review phase.

Clinical Evidence research

The **AO Innovation Translation Center (AO ITC)** conducts in-house clinical research with the goal to improve outcomes and patient care. Through the diverse experience brought together by the AO network surgeons across different orthopedic areas, the Clinical Operations and Clinical Science units turn ideas into clinical evidence.

Clinical Evidence launches CSAC

The new AO ITC Clinical Science Advisory Commission (CSAC) met for the first time in June 2021. The CSAC provides strategic advice around clinical science related to the AO ITC's work.

[Learn more >](#)

Publications

The Clinical Science unit provides medical, statistical, and medical literature and writing support for internal and external clients. The resulting peer-reviewed publications are an integral part of Clinical Evidence that serves the orthopedics community.

[Find out more >](#)

Ongoing studies

The Clinical Operations unit conducts clinical studies according to the current regulatory and ethics standards. With a team of clinical research specialists, we deliver high quality data, which are the foundation of our publications. In 2021, the Clinical Operations unit ran 45 studies in 40 countries.

[Find out more >](#)



Finance and governance

The COVID-19 pandemic continued to affect AO Foundation activities considerably. Due to repeated global travel restrictions in all regions, many on-site events were either canceled or replaced by online meetings and offerings.

Compared to 2020, the number of educational events increased slightly, although still substantially below 2019 results. Given the unprecedented level of uncertainty, the net result achieved was extremely satisfactory, boosted by the financial performance of our portfolio thanks to the surprising strength of the financial markets in 2021. The asset management result realized in the current year was an increase of CHF 189.4 million.

Compared to the previous year, third-party income increased by +68 percent (CHF +8.2 million) to CHF 20.3 million but remains -53 percent below the budget due to the continued pandemic situation and restrictions mainly impacting the educational events activities (CHF -21.8 million versus budget). Total operating expenses increased by +29 percent in the current year, with the biggest driver being educational expenses, which increased by +35 percent compared to the prior year. The net operating result for the year was CHF -28.7 million.



Operating income

94 million

CHF



Financial result

181 million

CHF



Foundation equity

1,618 million

CHF

Financial Overview and income statement

The financial result of CHF 180.6 million was the result of the strong global financial markets in 2021. As a result, the AO Foundation's Equity increased to CHF 1,618 million by the end of 2021.

AO Financial Overview	2020	2021	Variance A21/A20	
in million CHF	abs	abs	abs	%
Operating Income	68.3	93.8	25.5	37%
Operating Expenses	-95.0	-122.5	-27.4	29%
Operating Results	-26.7	-28.7	-2.0	7%
Financial Results	72.7	180.6	107.9	148%
Net Results	46.1	152.0	105.9	230%
Equity pre 31.12.	1,466	1,618	151.6	10%

Income statement

The 2021 income statement is as follows in comparison to the previous year and budget:

Income Statement Consolidated	2020 Actual		2021 Actual		2021 Budget		Variance A21/B21		Variance A21/A20	
	abs	%	abs	%	abs	%	abs	%	abs	%
in CHF million	abs	%	abs	%	abs	%	abs	%	abs	%
Cooperation Agreements	56.2	82%	73.5	78%	74.0	63%	-0.5	-1%	17.3	31%
3rd Party Income	12.1	18%	20.3	22%	43.6	37%	-23.3	-53%	8.2	68%
Total Operating Income	68.3	100%	93.8	100%	117.6	100%	-23.8	-20%	25.5	37%
Research	-19.7	21%	-18.9	15%	-21.7	13%	2.8	-13%	0.9	-4%
Development	-4.5	5%	-5.5	5%	-11.7	7%	6.2	-53%	-1.0	22%
Education	-29.3	31%	-39.6	32%	-77.6	46%	38.0	-49%	-10.4	35%
Network Management	-3.2	3%	-11.0	9%	-4.0	2%	-7.0	177%	-7.8	245%
Boards	-2.3	2%	-2.4	2%	-4.9	3%	2.5	-51%	-0.1	5%
General & Administrative	-25.4	27%	-37.0	30%	-35.3	21%	-1.7	5%	-11.6	46%
Others	-10.7	11%	-8.0	7%	-12.4	7%	4.3	-35%	2.6	-25%
Total Operating Expenses	-95.0	100%	-122.5	100%	-167.6	100%	45.1	-27%	-27.4	29%
Operating Result	-26.7		-28.7		-49.9		21.3	-43%	-2.0	7%
Financial Result	72.7		180.6		35.0		145.6	416%	107.9	148%
Net Result	46.1		152.0		-14.9		166.9	-1117%	105.9	230%

Asset management

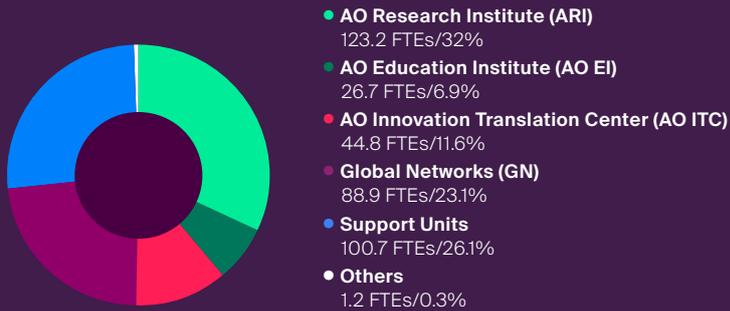
The asset management result of CHF 189.4 million reflects an actual return of 13.2% on the underlying financial assets amounting to CHF 1,611 million by the end of 2021.

Employees

The number of permanent staff increased from 295.8 to 385.5 full-time equivalents (FTEs), the percentages of their distribution across the AO is represented below.

FTE overview by area

385.5 FTEs



Governance overview

At an organizational level we launched, midyear, a new structure called Global Networks bringing together our four clinical divisions and one clinical unit teams under one roof. This allows us to better respond to our constantly changing environment and better address future developments in the AO networks. Global Networks is driven by a clear mission and follows AO strategic priorities, and it facilitates access to central AO infrastructures, systems, and resources for all specialties. The new cross-functional structure has established purpose-driven teams and facilitates the fast and efficient sharing of best practice and expertise, for the benefit of our surgeon network.

AO Access

With its **AO Access** initiative, the AO took decisive steps in 2021 toward establishing diversity, inclusion, and mentorship firmly within the organization and demonstrated our commitment to addressing existing inequalities to entry and advancement, and identifying and overcoming barriers. In 2021, AO Access piloted its **mentorship platform**, bringing together mentees and mentors, enabling collaborative learning and facilitating personal and professional growth in an inclusive and sustainable way. Additionally, AO Access created a suite of freely available resources, ranging from the **Voices for change** web series celebrating diversity within the AO to the **Access to success** podcast. Learn more about AO Access [here](#) and discover the AO Access Task Forces [discussions](#) on AO TV.

Transparency

According to its Transparency Policy, the AO Foundation annually publishes the total remuneration of the AO Foundation Board, international boards of the clinical divisions, and the AO Executive Committee, 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 2021 were CHF1,363,450 (2020: CHF 1,309,950), which is 1.1 percent (2020: 1.4 percent) of the total operating expenses of the AO Foundation and its institutions. The table below shows the total remuneration of each individual AO 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 2021:

	2020	2021
AO Foundation Board (AOFB)	10 members	9 members
Total AFB	352,500	360,000
% of total operating expenses AO Foundation	0.4%	0.3%
Highest remuneration AFB	110,000	93,750
AO Trauma International Board (AO TIB)	10 members	9 members
Total AO TIB	331,250	343,750
% of total operating expenses AO Trauma	1.9%	1.9%
Highest remuneration AO TIB	56,250*)	75,000
AO Spine International Board (AO SIB)	11 members	10 members
Total AO SIB	312,500	312,500
% of total operating expenses AO Spine	2.4%	2.7%
Highest remuneration AO SIB	75,000	37,500*)
AO CMF International Board (AO CMFIB)	9 members	9 members
Total AO CMFIB	262,500	275,000
% of total operating expenses AO CMF	5.6%	7.0%
Highest remuneration AO CMFIB	75,000	75,000
AO VET International Board (AO VETIB)	9 members	9 members
Total AO VETTIB	51,200	72,200
% of total operating expenses AO VET	2.7%	2.7%
Highest remuneration AO VETIB	30,000	16,200*)
Grand Total	1,309,950	1,363,450

*) only 6 months, as Chair changed mid-year

Remuneration of the AO Executive Committee

The total annual compensation of the six members of the AO Executive Committee 2021 was CHF 1,871,850 (2020: CHF 2,248,621 with ten members until July 2020). The highest individual compensation was CHF 331,600, resulting in a 1/7.47 relative ratio between the highest and the lowest paid individual compensation (permanent employees).

Assignment of scientific and other grants to third party organizations

In 2021, AO Foundation funded research projects with scientific and other grants totaling CHF 2,524,152 in 49 different third-party organizations (2020: CHF 2,515,328).



Corporate social responsibility (CSR)

The AO is proud to be a good corporate citizen in all geographies where it has a presence. In 2021 we found new ways to engage with our local community in Davos, Switzerland, and reduce our carbon footprint.

AO Alliance



The AO's greatest CSR contribution is its continuing support for the **AO Alliance**, a developmental non-profit organization dedicated to strengthening fracture care in low- and middle-income countries in Sub-Saharan Africa and Asia since 2015. In 2021, the AO Alliance expanded its global footprint from 32 to 34 countries, with nonoperative courses in Liberia and Sierra Leone. Despite the pandemic, the AO Alliance trained over 5,000 health-care workers through face-to-face education events (233) and webinars (114). Burkina Faso also joined the ranks of Ethiopia, the Gambia, **Ghana**, and Malawi, as a new country initiative.

The AO—in the community

Davos is at the heart of all we do, and we are proud to be part of this active mountain community.

Healthy bones, healthy kids

Our new initiative supports local kids and youth sports clubs by promoting exercise and a healthy lifestyle from a young age. This lays the groundwork for improved well-being and healthier habits as they grow up and is fully in keeping with our mission and our positive engagement with our home city of Davos.

Biogas

The AO's pioneering **specific-pathogen-free (SPF) sheep facility** in Davos is also home to a biogas project that will reduce the volume of methane released into the atmosphere while producing renewable green energy and heat for AO buildings. This investment in improving our sustainability replaces previous years' carbon offsetting projects.

HCD juniors and ARGO

The AO supports **Hockey Club Davos** (HCD) with comprehensive sports medicine care for HCD juniors, and works with **ARGO**, a foundation with commercial workshops and residential homes for adults with different abilities in Davos.

Faculty donations

Our international faculty and board members contribute to the AO's CSR activities by donating a percentage of their per diems. The AO received a total of CHF 81,157 in renounced per diems in 2021.

Conscious consumption

In 2021, we continued to optimize energy use and actively reduce our CO₂ emissions. The AO was recognized by the **Energy Agency of the Swiss Private Sector** (EnAW) for its active contribution to reducing CO₂ emissions and increasing energy efficiency. The AO also recycled 69 kg of polyethylene terephthalate (PET), saving around 207 kg of greenhouse gas and about 66 liters of crude oil.

AO Foundation | Clavadelerstrasse 8 | 7270 Davos | Switzerland
Phone +41 81 414 21 11 | Fax +41 81 414 22 80 | info@aofoundation.org

www.aofoundation.org