

Annual Report 2020



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A photograph of two men, Christoph Lindenmeyer and Robert McGuire, smiling. Christoph is on the left, wearing glasses and a brown blazer over a white shirt. Robert is on the right, wearing a dark blue suit and a patterned tie.

Christoph Lindenmeyer
AO Foundation CEO

Robert McGuire
AO Foundation President

From the President and the CEO: a year out of the ordinary

In 2020, the world faced unprecedented challenges due to the global COVID-19 pandemic, which has impacted our lives and ways of working. Throughout the crisis, the AO has demonstrated, above all, its commitment to the health, safety, and well-being of our officers, faculty, course participants, and staff across the globe. The pandemic mobilized our organization into innovatively leveraging technology to facilitate online education and knowledge exchange, advancing our educational offerings, and expanding our reach to new audiences. It has also been a period of success in new and renewed partnerships, key innovations that improve patient care, and progress in diversity and inclusion.

In April we responded to the new reality of pandemic restrictions with the From the Frontline webinar series, focusing on topics related to COVID-19 for our surgeons. While our flagship, globally renowned event, the AO Davos Courses, which for 60 years has been held face-to-face, on-site, successfully migrated to a fully digital event, providing a great example of our organization's resilience in the face of challenges provided by COVID-19.

Key achievements in 2020 that moved the needle for the AO included AO Recon's contribution to the AO Davos Courses, covering new ground in the fields of total hip and knee arthroplasty, shoulder revision arthroplasty, and periprosthetic fracture management. AO CMF also expanded its digital offering with the Online Campus reaching as many as 30,000 participants during the year.

To meet the significant global need for comprehensive, outcome-based education in surgical treatment of sports injuries and other soft-tissue conditions around the joints, the AO Education Institute under the direction of the AO Sports Steering board, in its first year as a new initiative, began developing three distinct curricula, in collaboration with renowned experts from China, Germany and the United States. Under the umbrella of AO Sports, these three initial webinars, which focused on specific topics around the shoulder joint, were met with interest by orthopedic surgeons around the world. To continue to help surgeons achieve excellence in patient care in this growing field, the AO is planning new educational offerings for AO Sports in 2021.

In keeping with our mission to advance patient care, we launched the AO Innovation Translation Center powerhouse to realize innovative solutions for surgeons worldwide. And the AO Research Institute Davos (ARI) underscored its innovation legacy with the launch of OSapp, an interactive, virtual osteosynthesis software tool and learning platform.

In 2020, we renewed our cooperation agreement with DePuy Synthes, allowing both independent organizations to work collaboratively, based on mutual respect and a shared mission to improve patient care and outcomes. We also strengthened our organization through partnering with OBERD to launch the world's largest orthopedic outcomes database, AO Global Data. Moreover, we partnered with icotec to leverage its game-changing technology platform based on its unique nonmetallic material that provides unmatched strength and endurance for the joint development of a new spinal stabilization system.

We strongly believe in building a truly inclusive and supportive working environment which, in the end, will improve the care we provide for our patients. In June of last year, the AO Foundation Board approved the visionary project AO Access, that seeks to address existing inequalities to entry and advancement for surgeons within the AO network, to identify and overcome these barriers, and provide mentorship opportunities for future leaders in our organization. We are pleased with the early success of the program which has been embraced by our membership.

We are truly grateful to all who work with and for the AO for the impressive achievements we have seen in 2020. We take pride in our strong support for our community of health care practitioners, and we look forward to a future where we return to our face-to-face, on-site education as soon as it is safe to do so while continuing to add value in the virtual space.

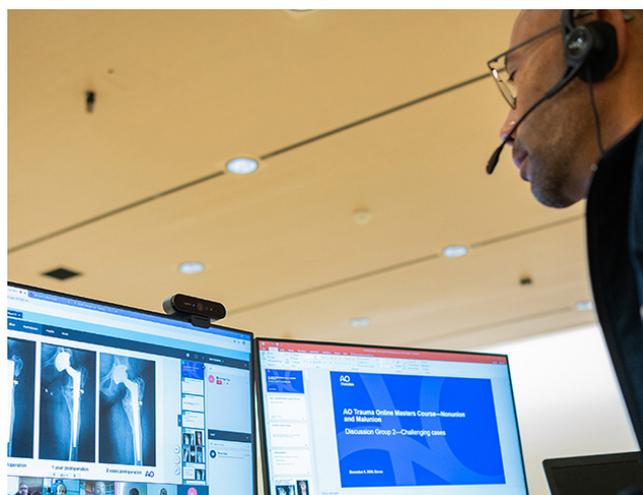
Education

Against the backdrop of the global COVID-19 pandemic and in line with its mission of promoting excellence in patient care and outcomes in trauma and musculoskeletal disorders, the AO in 2020 leveraged digital technology to underscore its position as the world's premier education provider to health care professionals working in these fields.

Innovative to the core, the AO—which typically educates more than 58,000 learners per year—in 2020 broke new ground in our response to pandemic-driven global demand for medical education. Across all our clinical divisions, we piloted—and mastered—new educational methods and modalities, we taught our educators to deliver engaging, evidence-based content, and we engaged 140,000–150,000 participants in online offerings in a variety of formats, including live (synchronous); self-directed (asynchronous); blended; and face-to-face, on-site events.

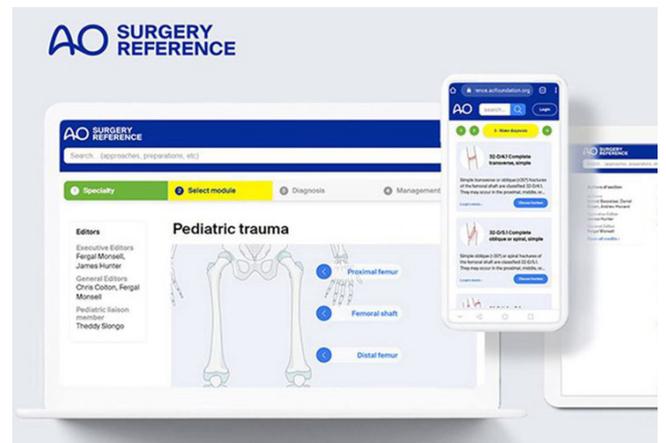
The AO Davos Courses are our flagship educational event, providing participants with opportunities to learn the newest approaches to education, training, and treatment; meet leaders in their fields; and share experiences and learn from one another. People around the world look to the AO Davos Courses and Davos, Switzerland, for an unforgettable experience that acts as a gateway to excellence in their fields, and the first-ever, fully online **AO Davos Courses 2020** were no exception. The 60th anniversary edition—with 20 courses and five webinars over four days—drew more than 7,300 participants from 158 countries and featured a new and highly engaging virtual event platform, several side events, and more than 80 surgeon interviews streamed live on **AO TV**. Participants also benefited from the continued expansion of the **myAO** secure, digital knowledge exchange platform: Dedicated chat groups enabled by the addition of the new myAO groups function paved the way to enhanced online interaction during courses.

Additionally, the AO in 2020 was distinguished in medical education research, publishing four peer-reviewed papers, contributing to eleven conferences and workshops, and presenting a conference poster at the Association for Medical Education in Europe. We took the first steps in creating the **AO Fellowship in Medical Education Research** in partnership with Maastricht University, the University of Toronto, and Ottawa University, and strengthened our collaboration with key organizations to promote medical education research, share best practices, and continuously improve medical education. Involving surgeons and education specialists from the entire AO network, we are preparing a fully AO-dedicated supplement issue on the AO way of providing medical education to be included in the *Journal of Orthopaedic Trauma*, which will be published in 2021.



Education

The year 2020 was also filled with milestones for the popular **AO Surgery Reference**, including the premiere of a new technology solution allowing for integration with other AO educational offerings, easier maintenance of both content and the user interface; the debut of five new AO Surgery Reference modules—adult trauma distal femur, pediatric trauma distal femur and femoral shaft, periprosthetic fracture management of the hip, and dog and cat patella—and receipt of **five top-tier awards**.



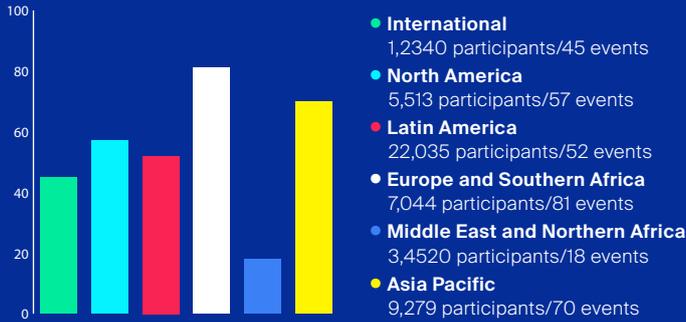
Furthermore, in 2020, the AO Education Institute collaborated online with expert surgeons to develop a curriculum for the new **AO Sports** initiative and developed a dedicated website for the online **AO Program for Excellence in Education and Research** (AO PEER). AO PEER premiered the self-directed, online version of its popular Principles of Clinical Research course at the AO Davos Courses 2020.



Explore the detail on AO education provision across our organization, in 2020.

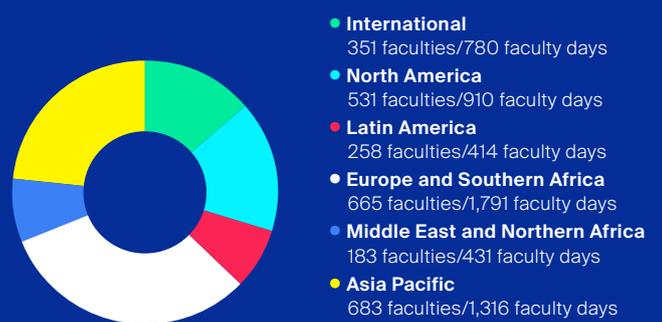
Events

59,663 participants/323 events



Faculty involvement

2,698 faculty/5642 faculty days



Education AO Trauma

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 intelligently harnessed digital technology in response to the pandemic-driven scarcity in on-site educational opportunities.

For example, the AO Trauma **upper extremity curriculum** was successfully piloted in an online format, achieving impressive results and enthusiastic responses from the faculty. The curriculum, which provides a robust and flexible educational framework, addresses the needs of practicing surgeons treating upper-extremity injuries.

Further evidence of AO Trauma's response to the overwhelming global demand for high-quality education in a globally accessible format in the face of COVID-19 was the new **AO Trauma Online Course—Basic Principles of Fracture Management Essentials**, launched in June 2020. The course, offered twice in 2020 and completed by 178 people, outpaced typical online course offerings.

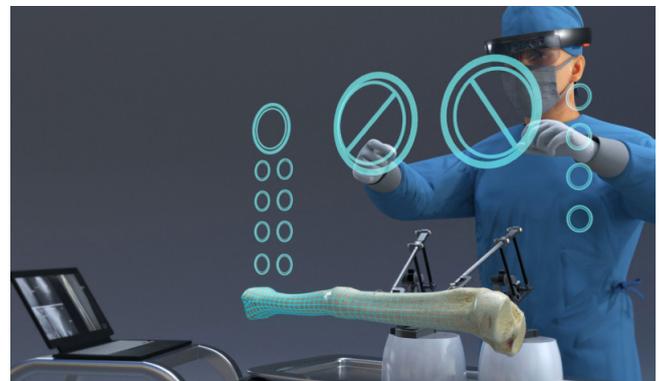
AO Trauma World Meeting 2020—online

AO Trauma pivoted to an online format with the AO Trauma World Meeting. Originally scheduled for April in Madrid, Spain, the meeting was convened as a fully online event with five purely online courses over three days. This gave the world its first glimpse of the AO's highly engaging and immersive virtual event platform employed at the AO Davos Courses 2020 in December.



Competency-based Training and Assessment Program (CTAP)

Further asserting its innovative nature, AO Trauma continued development of its new, digital Competency-based Training and Assessment Program (CTAP). The program aims to establish the AO as the globally recognized, trusted provider of a certificate of proficiency. It consolidates AO Trauma's leadership role in global surgical education by providing skills training and assessment in addition to knowledge transfer. It combines the latest digital teaching, training, and assessment tools—such as haptic virtual reality simulation—with online and immersive on-site learning experiences. Initially, CTAP will enable residents to complete the milestones needed for becoming certified orthopedic trauma surgeons.



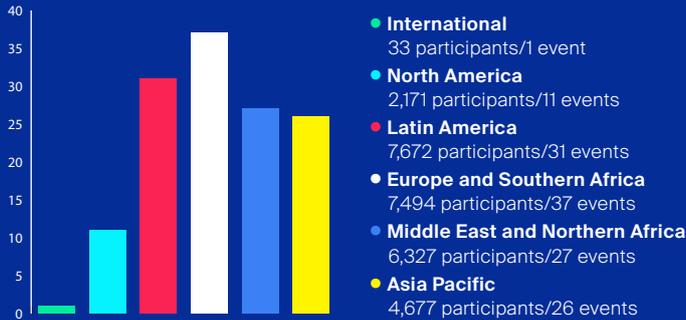
AO Global Data

Launched in 2020, AO Global Data is the world's most comprehensive musculoskeletal registry, with well over a billion data points. [Watch the video.](#)

Explore the detail on AO education provision across our organization, in 2020.

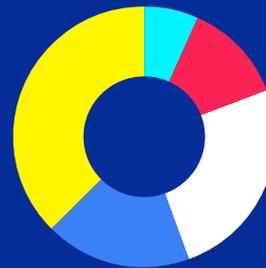
Events

28,371 participants/133 events



Faculty involvement

709 faculty/841 faculty days



Education AO CMF

True to its purpose statement—promoting excellence in patient care and outcomes in craniomaxillofacial surgery across all specialties—AO CMF in 2020 mounted an agile response to extraordinary challenges presented by the global pandemic.

From the Frontline

The AO clinical division in April 2020 successfully launched the **From the Frontline** webinar series—which evolved to become a cross-divisional effort attracting a global audience—focusing on topics related to COVID-19. Like a news program, the bimonthly online series featured moderators and experts tackling topics of immediate interest to the surgeon community. The latest AO CMF-hosted From the Frontline session focused on stress management and grief in times of crisis; this highlight session provided valuable insights and advice that were to come in useful in the following months.



AO CMF Online Campus

With the **AO CMF Online Campus**, launched in April 2020, pandemic-related travel restrictions and the shortage of on-site educational events were met head on: The program ensured delivery of high-quality, digital learning packages to a global audience of more than 30,000. Content includes everything from moderated online live expert case discussions to online live panel discussions, and opportunities to take part in AO CMF Study Clubs and special monthly events.



'Mastering the Nose': largest online CMF course ever

The **AO CMF Online Masters Course—Mastering the Nose: Advanced Midface Concepts** at the first-ever fully online AO Davos Courses advanced the AO's 60-year legacy of shaping the future of medical education. With an unusual topic, 95 faculty, and more than 400 participants, the event was likely the largest online craniomaxillofacial (CMF) course ever conducted.



Explore the detail on AO education provision across our organization, in 2020.

Events

30,920 participants/256 events



Faculty involvement

1,097 faculty/1,111 faculty days



Education AO Spine

Agile turn to online education

The premier knowledge provider in spine surgery and at the forefront of education and research, AO Spine in 2020 underlined its leadership by introducing innovative formats in education, a formal assessment of competencies required to manage patients with spinal disorders, and Clinical Expert Advice Forums offering documented expert opinion where it matters.

In June 2020, AO Spine answered the pandemic-related shortage of medical education opportunities with its agile turn to cutting-edge online events, including the **AO Spine Asia Pacific First Virtual Conference**. The very successful two-day event comprised six 90-minute subspecialty sessions focusing on a range of highly relevant topics, from ossification of the posterior longitudinal ligament (OPLL), minimally invasive surgery (MIS) decompression techniques, and early onset scoliosis to MIS fusion techniques, rigid kyphotic deformities, and vertebral tumor resection.

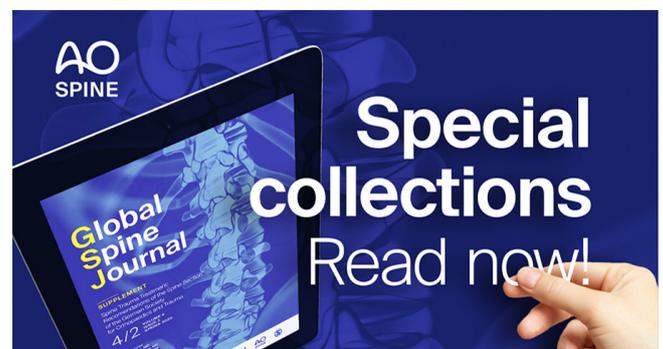
Documented expert opinion where it matters

Against the backdrop of COVID-19, the **AO Spine Clinical Expert Advice Forums** in 2020 filled a knowledge gap for thousands of surgeons through six dedicated webinars presenting experts' advice on various everyday clinical scenarios. While evidence-based medicine and randomized prospective controlled trials are the basis of clinical medicine today, the practicing surgeon frequently encounters clinical scenarios for which solutions from such trials are not possible; the AO Spine Clinical Expert Advice Forums fill that void.



Global Spine Journal milestone

AO Spine leadership's foresight and vision were reaffirmed in 2020 when its **Global Spine Journal** (GSJ) became the first and only truly open access journal in spine surgery to **receive an impact factor**. The journal is ranked in Clarivate's *Journal Citations Report* (JCR—in both the orthopedic and clinical neurology indices) with a score of 2.68, making the GSJ the second-highest ranked spine journal overall and establishing it as the pioneer among open access spine journals. AO Spine celebrated the achievement by launching a new cover design aligned with the AO brand.



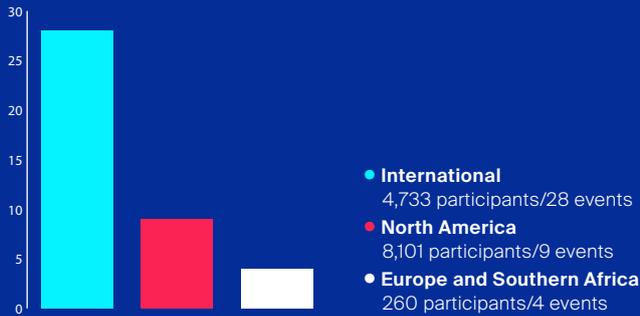
Certifying knowledge, advancing careers

The year 2020 also marked the launch of the **AO Spine Global Diploma Exam**, designed for experienced spine surgeons who want to certify their knowledge. The exam enables candidates to demonstrate that they have attained the level of knowledge expected of a specialist spine surgeon after five years of practical experience.

Explore the detail on AO education provision across our organization, in 2020.

Events

13,094 participants/41 events



Faculty involvement

146 faculty/262 faculty days



Education AO VET

Skyrocketing social media engagement, a successful myAO launch, and innovative responses to booming demand for veterinary orthopedics education were among AO VET's standout educational achievements in 2020.

myAO groups launched

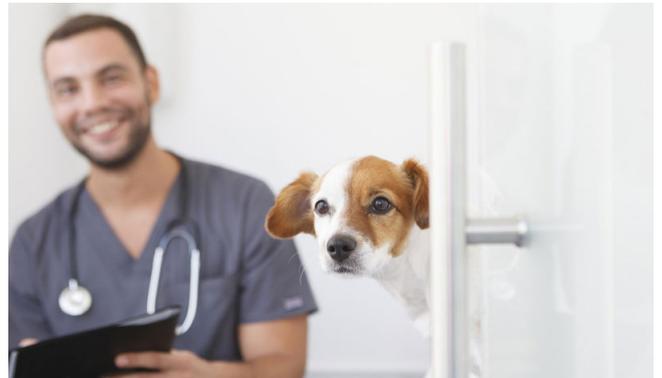
AO VET members benefited from the continued expansion of the **myAO** secure, digital knowledge exchange platform. For example, dedicated chat groups enabled by the addition of the new myAO groups function paved the way to enhanced online interaction during the AO VET courses at the flagship AO Davos Courses 2020.

Answering the network's demands

AO VET also saw skyrocketing social media engagement in 2020 and successfully answered a booming demand for high-quality education during the global pandemic. For example, the clinical division had planned ten webinars for 2020, but far exceeded expectations by delivering 80 webinars—reaching 13,000 participants—on a wide range of topics. At the same time, in another first, AO North America made its popular small animal and equine basic and advanced principles courses available as webinars.

Gearing up for AO Global Data

Additionally, AO VET responded to the current lack of veterinary-focused patient-reported outcome (PRO) registries by conducting a feasibility study and beginning development of veterinary patient-reported outcome measures (PROMs) that can be included in the foundation's **AO Global Data** initiative in 2021. Launched in 2020, AO Global Data is the world's most comprehensive musculoskeletal registry, with well over a billion data points



Explore the detail on AO education provision across our organization, in 2020.

Events

4,547 participants/28 events



Faculty involvement

176 faculty/305 faculty days



Education AO Recon

AO Recon reconfirmed its innovative orientation in 2020 with a deft pivot to digital learning, a spotlight on robotic surgery, introduction of joint arthroplasty groups via myAO, and live, fully online demonstrations on prepared anatomical specimens.

AO Recon at the AO Davos Courses 2020

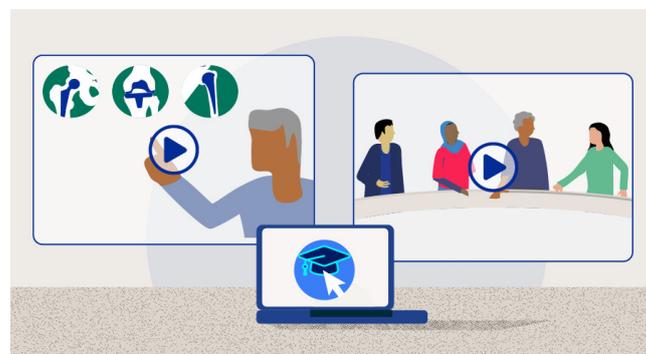
AO Recon proved its commitment to best-in-class education in joint preservation and replacement with **three educational events** at the first fully online AO Davos Courses 2020.

A total of 224 participants extended their knowledge in the fields of total hip and knee arthroplasty, shoulder revision arthroplasty, and periprosthetic fracture management.

More than 500 visitors stopped by the virtual AO Recon booth in the online exhibition area during the AO's flagship event.

Digital learning hub launched

Support for arthroplastic surgeons' continuous development—wherever they are in the world—lies at the heart of the **AO Recon digital learning** hub, launched in 2020. The hub features an online event finder, videos, articles on specific clinical topics, and the myAO app.



Robotic surgery in the spotlight

AO Recon in 2020 published a **three-part series** on computer-assisted surgery. Robotic surgery, computer-assisted navigation, and personalized instrumentation and implants are no longer science fiction, and this series details their current use in arthroplasty and future concepts.

Joint arthroplasty groups introduced

Additionally, AO Recon introduced two new myAO joint arthroplasty groups exclusively accessible by verified surgeons: **Osteotomy around the knee** and **Robotic joint replacement**. These groups on myAO, the AO's community knowledge exchange platform, provide AO Recon users the opportunity to connect with each other and provide a new way of accessing dependable, verified content that is tailored to their needs.

Teaming up with AO Trauma

AO Recon and **AO Trauma** teamed up in October 2020, taking part in a live, avatar-based 3D interaction platform, **Surgical Island's fully online Treatment Week broadcast**, comprising demonstrations on prepared anatomical specimens, including lifelike pathologies with closed soft tissue. Treatment Week is a digital congress for basic and advanced training in trauma, sports, orthopedics, and the spine. The event, which attracted nearly 500 participants during two demonstrations, concluded with a live broadcast battle between arthroplasty experts discussing the best surgical solutions for periprosthetic fractures around the knee.





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.

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. In 2020, an extraordinary year due to global travel restrictions limiting on-site collaboration, it continued to play a crucial role in quality control and product development and acted as an essential link between AO clinical divisions, the other institutes, and the AO's global network.



Highlights

Numerous implants and instruments addressing clinical problems have resulted from the long-standing cooperation between the AO Technical Commission 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 Technical Commission approvals in 2020

In 2020, the AO Technical Commission approved a suite of products that will benefit patient outcomes across all areas in which the AO is active.

3.5 mm LCP Distal Femoral Osteotomy Plate

This veterinary solution is indicated for treatment of distal femoral angular deformities and distal femoral fractures in medium- and large-size canine patients.

[Learn more](#)



Reamer Irrigator Aspirator System (RIA II)

The next generation RIA 2 offers several new device features to improve reaming and bone harvesting procedures.

[Learn more](#)



Advanced Retrograde Femoral Nailing System (RFN-A)

The enhanced fixation options of the RFN-A will be beneficial to expand the retrograde nailing indications toward far distal fractures, to improve implant anchorage in poor bone quality, and to support early patient mobilization.

[Learn more](#)



Highlights

Tibial Nailing-Advanced System (TN-A)

This new system addresses the challenge of fixing short bone fragments with adequate stability.

[Learn more](#)



Self-retaining screws

This solution supplements the latest lower extremity nail and is incorporated in the Tibial Nailing-Advanced (TN-A) system.

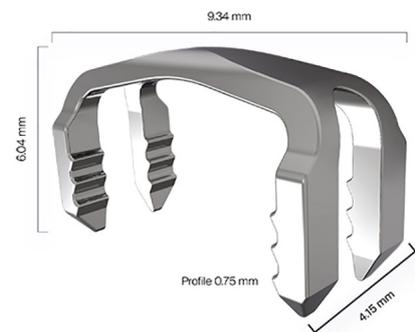
[Learn more](#)



DePuy Synthes Hammertoe Continuous Compression Implant

This extramedullary implant for hammertoe fixation is designed with Nitinol to provide continuous compression and superior rotational stability with greater distraction resistance.

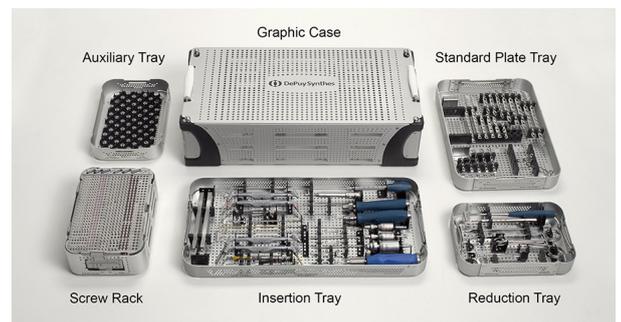
[Learn more](#)



Universal Small Fragment System 3D Line Extension

Manufactured using 3D printing technology and utilizing non-implantable stainless steel, the templates provide an economical, effective complement to all USF plate types.

[Learn more](#)



In addition, the AO Technical Commission in 2020 approved the Patella Plate, FibuLink, and the Monobloc reamer for trauma; the 1.3 LCP System for veterinary; and line extensions to the MatrixMidface 1.3 and MatrixMandible 2.0 systems for craniomaxillofacial (CMF). Detailed information about these solutions will be made available within the upcoming months on the [Innovations microsite](#).

Highlights

AO Innovation Translation Center officially launched

A year out of the ordinary, 2020 opened with the launch of the **AO Innovation Translation Center (AO ITC)** with a completely new operating model creating a streamlined process for prioritization and validation of all sources' innovative responses to clinic needs and funneling these solutions into surgeons' hands. The AO ITC creates pathways for ideas to become innovative solutions and better positions the AO to identify and apply digital technology for all its solutions.

Innovation at the AO was further demonstrated by the launch of **AO Global Data**. The world's most comprehensive musculoskeletal outcomes repository, AO Global Data offers insights and guidance to help members optimize their practices for patient outcomes management, payer negotiations, marketing, and more. [Learn more.](#)

Moreover, the AO ITC's Technology Transfer submitted two projects—**the small bone external fixator** and the **biphasic plate** for CE marking. Required for products manufactured anywhere in the world that are then marketed in the European Union, CE marking indicates that a product has been assessed by the manufacturer and deemed to meet EU safety, health, and environmental protection requirements. Approval for both projects is expected in 2021.

Additionally, the AO released a new round of strategy fund resources and approved three new projects in 2020. The strategy fund supports inventors with early-stage ideas to reach proof of concept, focusing on clinical tools and technologies for any element of the entire patient journey in musculoskeletal disorders, as well as educational tools, platforms, or channels for lifelong training of surgeons. [Learn more.](#)



“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, AO Foundation President

More from the AO Technical Commission

AO Technical Commission meetings 2020

The AO Technical Commission (AO TC) maintained its momentum even against the backdrop of COVID-19 by employing digital technology to finalize development of several new projects. AO TC members generally met twice as many times in 2020 compared to the previous year and demonstrated the dedication and flexibility to drive projects forward through numerous videoconferences, time zones notwithstanding.

Industrial partners supported the effort by shipping the necessary materials, such as prototypes and bone models, to members in advance of meetings. Anatomy labs—fundamental to the AO ITC’s development—were organized on short notice by identifying regional solutions under the constraints of ever-changing travel restrictions. The AO Research Institute Davos (ARI) provided an environment in which to realize such labs, several of which were streamed in real time worldwide for those unable to join on-site. In one exceptional case, two wet labs—one in the United States and one in Europe—were conducted simultaneously with the moderating chairperson joining by videoconference.

| AO TC meetings | 2019 | 2020 |
|-----------------------|-----------|------------|
| Europe | 28 | 11 |
| North America | 22 | 6 |
| Asia | 6 | 0 |
| Australia and Oceania | 1 | 0 |
| Videoconferences | 3 | 95 |
| Total | 60 | 112 |

Explore more of the achievements from the AO Technical Commission in 2020 below and [here](#).

Meet the Experts

Despite COVID-19, excellence in innovation was on display in a live, interactive webinar in 2020. [Learn more.](#)



Experts Symposia

Expert minds came together in Brazil to improve available treatments. [Learn more.](#)



Innovation Awards

The AO Technical Commission recognized outstanding achievements in development and innovation. [Learn more.](#)



Smart Digital Solutions Task Force

The group published its first white paper, giving an overview of how digital solutions can match orthopedic trauma surgery needs. [Learn more.](#)



Research

In its work to further the AO mission, the AO Research Institute Davos (ARI) advances orthopedic patient care through innovative research and development.

Preclinical research

Extraordinary achievements

Against the backdrop of the COVID-19 pandemic, ARI contributed significantly to an extraordinary 2020 for the AO, with a new record high of 116 publications (compared to around 70 in a typical year). At the same time, its publications' average impact factor increased to 4.5, compared to 3.5–3.6 in a normal year, and the institute received CHF 3.2 million in extramural funding in 2020.

In parallel, the institute licensed its groundbreaking tissue engineering technology, Sound-Wave Induced Morphogenesis (3D SIM), to the newly created mimiX biotherapeutics from Switzerland. SIM is a gentle, fast, and easy method used to generate multi-cellular, spatially orchestrated tissue constructs using sound waves. It has excellent potential for use in operation rooms in the future due to its speed, and as no needles are involved in the printing process, there is no fluid stress on the cells printed and consequently no cell damage or death.

Further proof of ARI's groundbreaking work was a [study](#) published in *eCM Journal*, showing that ARI's thermoresponsive, bioresorbable hydrogel—used in combination with systemic antibiotics—cleared MRSA in 100 percent of sheep studied, compared to 50 percent with conventional IV therapy and cement releasing antibiotics. Moreover, ARI in 2020 underscored its innovation legacy with the launch of **OSapp**, an interactive, virtual osteosynthesis software tool and learning platform. The app is aimed at surgeons, helping them understand the biomechanical concepts underlying the principles of fracture fixation.



Honoring a research pioneer

Seventeen papers of 64 submitted were accepted for publication in a special *“In Tribute”* edition of *Injury*, honoring the late Prof **Stephan M Perren**, an AO founding father and senior scientific advisor. The special edition was published in January 2021. Perren, who was globally renowned for his strain theory explaining tissue deformation as a critical mechanical factor that controls bone healing, died on November 21, 2019. A mentor of ARI Director Geoff Richards, Perren was a strong advocate for the freedom to explore in research in order to discover true novelties that could be developed and translated.



“In research, questioning generally accepted theorems allows and unleashes creativity.”

Stephan M Perren (October 7, 1932–November 21, 2019),
Director, AO Research Institute Davos (ARI), 1967-1996

Preclinical research

AO Research Institute Davos: research with impact

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 notable research published in 2020.

Smart implants in fracture care—only buzzword or real opportunity?

Injury. 2020; epub Sep 17.

Ernst M, Richards RG, Windolf M.

[See more](#)



Bacteriophage therapy as a treatment strategy for orthopaedic-device-related infections: where do we stand?

Eur Cell Mater. 2020 May 5;39:193-210.

Onsea J, Wagemans J, Pirnay JP, Di Luca M, Gonzalez-Moreno M, Lavigne R, Trampuz A, Moriarty TF, Metsemakers WJ.

[See more](#)



Biphasic Plating - In vivo study of a novel fixation concept to enhance mechanobiological fracture healing

Injury. 2020 Aug;51(8):1751-1758.

Hofmann-Fliri L, Epari DR, Schwyn R, Zeiter S, Windolf M.

[See more](#)

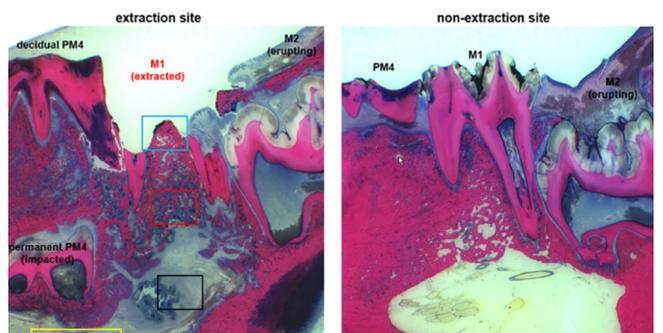


A Drug Holiday Reduces the Frequency and Severity of Medication-Related Osteonecrosis of the Jaw in a Minipig Model

J Bone Miner Res. 2020 Nov;35(11):2179-2192.

Otto S, Pautke C, Arens D, Poxleitner P, Eberli E, Nehrass D, Zeiter S, Stoddart M.

[See more](#)



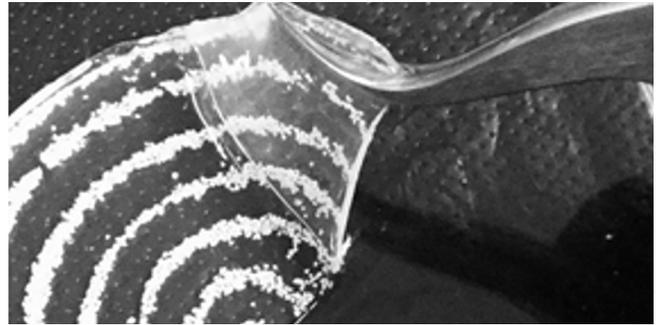
Preclinical research

Sound-induced morphogenesis of multicellular systems for rapid orchestration of vascular networks

Biofabrication. 2020;epub Sep 25.

Petta D, Basoli V, Pellicciotta D, Tognato R, Barcik JP, Arrigoni C, Della Bella E, Armiento AR, Candrian C, Richards GR, Alini M, Moretti M, Eglin D, Serra T.

[See more](#)



Orbital floor repair using patient specific osteoinductive implant made by stereolithography

Biomaterials. 2020 Mar;233:119721.

Guillaume O, Geven MA, Varjas V, Varga P, Gehweiler D, Stadelmann VA, Smidt T, Zeiter S, Sprecher C, Bos RRM, Grijpma DW, Alini M, Yuan H, Richards GR, Tang T, Qin L, Yuxiao L, Jiang P, Eglin D.

[See more](#)

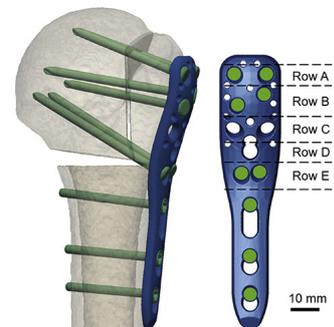


Computational optimisation of screw orientations for improved locking plate fixation of proximal humerus fractures

J OrthTrans. 2020 Nov;25, 96-104.

Mischler D, Markus Windolf M, Gueorguiev B, Nijs S, Varga P.

[See more](#)



Transdermal Fentanyl Uptake at Two Different Patch Locations in Swiss White Alpine Sheep

Animals (Basel). 2020 Sep 17;10(9):1675.

Buchholz T, Hildebrand M, Heider A, Stenger V, Arens D, Spadavecchia C, Zeiter S.

[See more](#)



AO Trauma

Leading the way in research

Learn more about the latest research from AO Trauma in 2020 and find out more about what AO Trauma research opportunities could offer you.

Promoting excellence and shaping the future of patient care

The AO Trauma Clinical Priority Program (CPP) Bone Infection is shaping the future of patient care and inspiring a new generation of researchers.

[See more](#)



Improving clinical outcome measurements of fracture treatment

The six-project AO Trauma Clinical Priority Program (CPP) Patient Outcome brings together orthopedic surgeons and scientists to produce a comprehensive body of patient outcome research.

[See more](#)



AO POSSI multicenter intervention trial focuses on prevention

Prevention of infection is the most humane and cost-effective intervention and this study evaluates the effectiveness of the AO Trauma surgical site infection prevention bundle (AO POSSI).

[See more](#)



Leveraging technology to bring scientists together

While the pandemic slowed many research activities around the world due to physicians' increased focus on COVID-19 patients in 2020, obstacles to recruiting patients for clinical studies, and the scarcity of face-to-face meetings due to travel restrictions, AO Trauma leveraged technology to conduct the Ninth Annual Meeting of AO Trauma Clinical Priority Program (CPP) Bone Infection entirely online on September 17, 2020. Under the leadership of Prof Steven Kates, MD (principal investigator, Richmond, Virginia, United States) and Prof Edward Schwarz, PhD (coprincipal investigator, Rochester, New York, United States), CPP project leaders presented the latest updates.

Kates reported that the CPP has produced a large number of publications and attracted extramural follow-on funding, and he presented his new study on the prevention of surgical site infection after trauma (AO POSSI). Participants also heard from several other scientists—including researchers from the AO Research Institute Davos (ARI)—about their research on topics relevant to the CPP.

The latest research in craniomaxillofacial surgery

Learn more about the latest research for AO CMF in 2020 and how AO CMF is at the forefront of personalization and innovation in its field.

AO CMF 3D printing



MRONJ: evaluating treatment patterns of patients and their outcomes

This international, multicenter, prospective registry is collecting the treatment pattern data of approximately 500 patients with medication-related osteonecrosis of the jaw (MRONJ).

OFx fracture registry: documenting current practice patterns

This international, multicenter, prospective registry addresses the prevailing lack of true consensus and guidelines on the treatment of orbital fractures (OFx).

TMJ study: evaluating a treatment of last resort

This 200-patient, international, multicenter, prospective registry is collecting data on patients treated with alloplastic temporomandibular joint (TMJ) replacement, a relatively rare procedure.

BCFx: looking at bilateral condylar fractures of the mandible

Prospective data on fracture and treatment details, functional and patient-reported outcomes, and complications is being collected in approximately 250 patients with bilateral condylar fractures (BCFx) of the mandible.

MFx60: mandibular fractures registry continues

This international, multicenter, prospective registry is collecting data in around 200 patients over the age of 60 suffering from mandibular fracture (MFx60).

DMFx: investigating double mandibular fractures

This recently completed multicenter, randomized, controlled clinical investigation collected data from patients suffering from bilateral (double) mandibular fracture (DMFx).

Learn more about all the above AO CMF clinical studies [here](#).

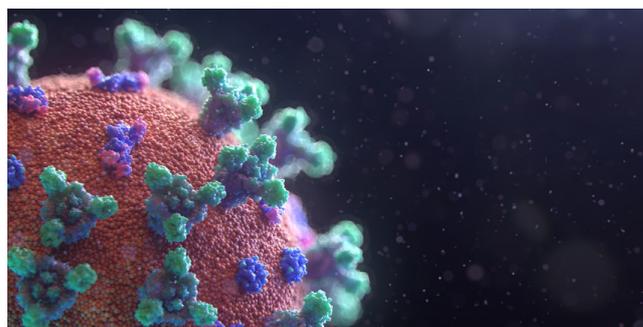
Research milestones

Learn more about the latest research from AO Spine in 2020 and its comprehensive approach involving surgeons, health care professionals, and patients.

Assessing COVID-19's impact on health care professionals

As COVID-19 gripped the world in 2020, AO Spine surveyed over 900 spine surgeons worldwide to assess the impact of the virus on spine care professionals as well as variations that may exist geographically. The World Health Organization has requested outcomes of the study for future planning.

[Learn more](#)



Telemedicine: evaluating spine surgeons' perspectives, practices

With telemedicine adoption accelerating worldwide in 2020, AO Spine's global online survey of nearly 500 spine surgeons spotlighted the value of an international

spine organization in describing and responding to changes in practice patterns and how we might establish "best practices" as a field moving forward.

[Learn more](#)

The cutting edge: artificial intelligence and machine learning

Spine surgeons and researchers in 2020 took part in the first-ever AO Spine event focusing exclusively on spine applications for artificial intelligence and machine learning. The webinar showcased AO Spine's dedication to harnessing the power of big data in spine surgery.

[Learn more](#)

AO Spine publishes first-ever spinal-trauma-specific outcome tool

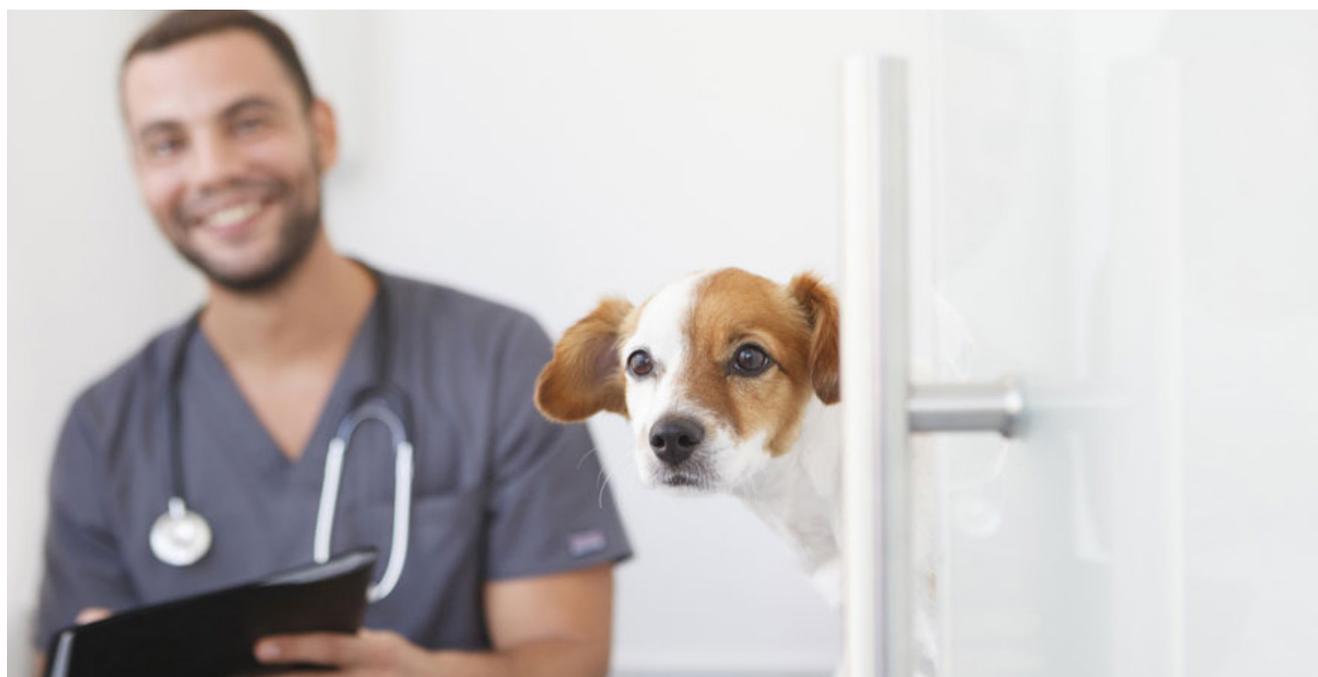
The AO Spine Knowledge Forum Trauma in 2020 published the first universal outcome instrument specifically for spinal trauma patients. The AO Spine patient-reported spine trauma outcome measure (PROST) allows measuring and comparing different treatment options and is already available in English, Dutch, Slovak, Portuguese, German, French, Nepalese, and Arabic.

[Learn more](#)



Research in 2020

Learn more about the 2020 research activities of AO VET, a key driver of cross-pollination in the AO by leveraging innovation from human implants to improve patient care in veterinary surgery.



AO Global Data

AO VET in 2020 underscored its support for AO Global Data—the world’s most prestigious musculoskeletal data repository, with an abstract and a systematic review examining the available patient-reported outcome measures (PROMs) in small animal orthopedics.

[Learn more](#)

Advancing canine orthopedics

Additionally, AO VET provided funding to the AO Innovation Translation Center (AO ITC) to support development of PROMS for fracture repair in dogs, cats, and horses, and conducted a survey advancing canine orthopedics.

[Learn more](#)

AO VET Seed Fund Awards support research

True to its legacy of advancing veterinary surgery to improve patient outcomes, AO VET launched its new, 12-month AO VET Seed Fund Awards to support members pursuing research in musculoskeletal science.

[Learn more](#)

AO VET symposium bridges the gap

The AO VET Symposium—Bridging the Gap: Translating Clinical Research to Clinical Practice offered researchers the chance to present their clinical research to a wide audience.

[Learn more](#)

Also in 2020, AO VET advanced the Fracture Research Animal Models Database (FRAMD), awarding AO VET Research and Development funding to support final-stage rollout.

Clinical evidence

The **AO Innovation Translation Center (AO ITC)** conducts in-house clinical research, through its Clinical Operations and Clinical Science units.

Publications

The Clinical Science unit provides medical and scientific support for internal and external clients and delivers scientifically sound clinical evidence to serve the medical community. Peer-reviewed publications in 2020 according to ePub date are:

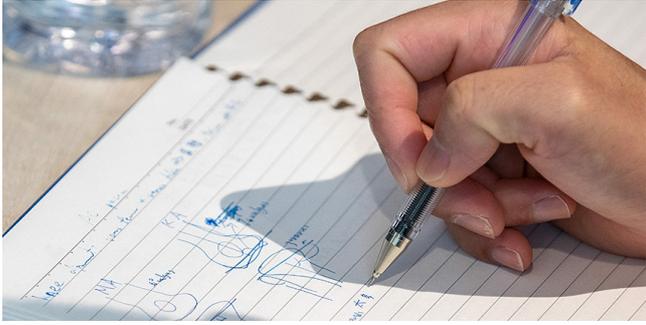
[Find out more](#)



Ongoing studies

With a team of clinical research operation specialists, the Clinical Operations unit conducts clinical studies according to the current regulatory and ethics standards. In 2020, the Clinical Operations team was running about 80 studies in 40 countries.

[Find out more](#)



Finance and governance

As a global organization, the AO Foundation was impacted in a profound manner by the COVID-19 pandemic. Due to travel restrictions, many face-to-face events were cancelled and whenever practicable were replaced with online events, which accelerated the adoption of an online format. Despite a very challenging year, the net result reached record levels boosted by the financial performance of our portfolio thanks to the market recovery in the second half of 2020.

The Asset Management Result in the current year was CHF 74.6 million.

Compared to the previous year, third party income declined by 64 percent due to the COVID-19 pandemic and the related shift to online events. Compared to the budget, third party income was down by 67 percent. Total operating expenses declined by 30 percent in the current year with the biggest driver, educational expenses, which declined by 50 percent compared to the prior year. The net operating result for the year was -26.7 million.



Operating income

97 million

CHF



Financial result

213 million

CHF



Foundation equity

1,420 million

CHF

Finance and governance

Financial overview

The Financial Result of CHF 73 million was the result of the strong recovery of the global financial market in the second half of 2020, following the initial decline. As a result, the Foundation's Equity increased to CHF 1,466 million by the end of 2020.

| AO financial overview | 2019 | 2020 | Variance A20/A19 | |
|-----------------------|------|------|------------------|------|
| in million CHF | abs | abs | abs | % |
| Operating Income | 97 | 68 | -29 | -30% |
| Operating Expenses | 135 | 95 | -40 | -30% |
| Operating Results | -38 | -27 | 11 | 29% |
| Financial Results | 213 | 73 | -140 | 66% |
| Net Results | 175 | 46 | -129 | 74% |
| Equity pre 31.12. | 1420 | 1466 | 46 | 3% |

Income statement

The 2020 income statement is as follows in comparison to the previous year and budget:

| Income Statement Consolidated | 2019 Actual | | 2020 Actual | | 2020 Budget | | Variance A20/B20 | | Variance A20/A19 | |
|---------------------------------|--------------|-------------|--------------|-------------|--------------|-------------|------------------|-------------|------------------|-------------|
| | abs | % | abs | % | abs | % | abs | % | abs | % |
| in CHF million | | | | | | | | | | |
| Cooperation Agreements | 62.9 | 65% | 56.2 | 82% | 62.5 | 63% | -6.3 | -10% | -6.7 | -11% |
| 3rd Party Income | 33.6 | 35% | 12.1 | 18% | 36.9 | 37% | -24.8 | -67% | -21.5 | -64% |
| Total Operating Income | 96.5 | 100% | 68.3 | 100% | 99.4 | 100% | -31.1 | -31% | -28.2 | -29% |
| R&D | 28.2 | 21% | 24.2 | 26% | 29.3 | 21% | -5.1 | -17% | -4.0 | -14% |
| AO Technical Commission | 4.6 | 3% | 2.2 | 2% | 4.3 | 3% | -2.0 | -47% | -2.4 | -51% |
| Community Development | 7.1 | 5% | 5.4 | 6% | 6.9 | 5% | -1.5 | -22% | -1.7 | -24% |
| Education | 59.2 | 44% | 29.4 | 31% | 64.3 | 45% | -34.8 | -54% | -29.8 | -50% |
| General & Administrative | 17.3 | 13% | 20.6 | 22% | 20.1 | 14% | 0.5 | 2% | 3.3 | 19% |
| Global & Regional Boards | 4.1 | 3% | 2.2 | 2% | 4.1 | 3% | -1.9 | -46% | -1.8 | -45% |
| Others | 14.7 | 11% | 10.8 | 11% | 12.9 | 9% | -2.1 | -16% | -3.9 | -26% |
| Total Operating Expenses | 135.3 | 100% | 95.0 | 100% | 141.9 | 100% | -47.0 | -33% | -40.3 | -30% |
| Operating Result | -38.7 | | -26.7 | | -42.5 | | 15.9 | -37% | 12.1 | 31% |
| Financial Result | 213.2 | | 72.7 | | 35.0 | | 37.7 | 108% | -140.5 | 66% |
| Net result | 174.5 | | 46.0 | | -7.5 | | 53.6 | n/a | -128.4 | 74% |

Asset management

The Asset Management Result of CHF 74.6 million reflects an actual return of 5.5 percent on the underlying financial assets amounting to CHF 1,435 million by the end of 2020.

Finance and governance

Transparency section

According to its transparency policy, the AO Foundation publishes annually the total remuneration of the AO Foundation Board (AOFB), 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 2020 were CHF 1,309,950 (2019: CHF 1,294,500) which is 1.4 percent (2019: 1.0 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 2020:

| | 2019 | 2020 |
|---|-------------------|-------------------|
| AO Foundation Board | 10 members | 10 members |
| Total AO Foundation Board | 352,500 | 352,500 |
| % of total Operating Expenses AO Foundation | 0.3% | 0,4% |
| Highest remuneration AO Foundation Board | 110,000* | 110,000 |
| AO Trauma International Board | 10 members | 10 members |
| Total AO TIB | 325,000 | 331,250 |
| % of total Operating Expenses AO Trauma | 0.9% | 1.9% |
| Highest remuneration AO TIB | 75,000 | 56,250 |
| AO Spine International Board | 11 members | 11 members |
| Total AO SIB | 312,500 | 312,500 |
| % of total Operating Expenses AO Spine | 1,4% | 2,4% |
| Highest remuneration AO SIB | 75,000 | 75,000 |
| AO CMF International Board | 9 members | 9 members |
| Total AO CMFIB | 250,000 | 262,500 |
| % of total Operating Expenses AO CMF | 2,7% | 5,6% |
| Highest remuneration AO CMFIB | 75,000 | 75,000 |
| AO VET International Board | 9 members | 9 members |
| Total AO VETTIB | 54,500 | 51,200 |
| % of total Operating Expenses AO VET | 1,5% | 2,7% |
| Highest remuneration AO VETIB | 30,000 | 30,000 |
| Grand Total | 1,294,500 | 1,309,950 |

Remuneration of the AO's Executive Management

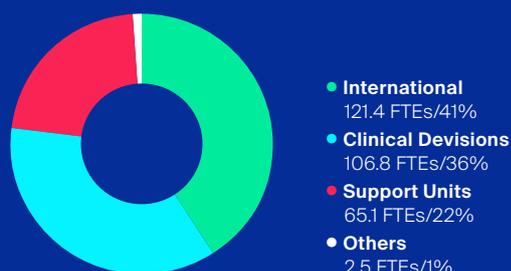
The total annual compensation of ten members of the AO Executive Management (pro-rata January until July 2020) and the six members of the AO Executive Committee (pro-rata August until December 2020) in 2020 was CHF 2,248,621 (2019: CHF 2,784,570). The highest individual compensation was CHF 331,600 resulting in a 1/6.58 relative ratio between the highest and the lowest paid individual compensation (permanent employees).

Assignment of scientific and other grants to third party organizations

In 2020, AO Foundation funded research projects with scientific and other grants in a total of CHF 2,515,328 in 33 different third-party organizations (2019: CHF 2,462,458).

Employees

The number of permanent staff increased from 291.5 to 295.8 full-time equivalents (FTEs), the percentages of their distribution across the AO is represented.



Finance and governance

Governance overview

To continue to improve the agility and efficiency of its operations, reduce management complexity, and successfully support the AO clinical networks in an era of rapid change, digitization, and fast-emerging disruptive technologies, the AO Foundation Board approved replacing the AO's former executive management body, AOEM, with a new grouping—the AO Executive Committee (AOEC).

The new structure, which came into effect in September, reflects the key AO strategic priorities and creates cross-organizational areas of activity, instead of reflecting purely organizational units or structures. It fosters cross-divisional management collaboration, while maintaining the governance structures of the AO's clinical divisions and unit—AO Trauma, AO Spine, AO CMF, AO VET, and AO Recon—unchanged. The AOEC is structured into the five key areas of AO activity: Education Development, Global Networks, Innovation Translation, Operations and Finance, and Research and Development.

The new structure enables the AO management to respond to the needs of the global surgeon network we serve more effectively and faster and provides greater transparency and accountability in decision-making. Designed to increase agility for the benefit of all areas of the organization, the AOEC focuses on strategic development and streamlining the management discussion and decision-making processes.

Finance and governance

Opportunity, diversity, and inclusion

The AO is committed to building a truly inclusive and supportive working environment, which in the end will improve the care we provide for our patients. In June, following results from a comprehensive survey launched by the AO's Opportunity, Diversity, and Inclusion Initiative (ODII) in late 2019, the AO Foundation Board approved the visionary project **AO Access** that seeks to address existing inequalities to entry and advancement within the AO, and to identify and overcome barriers.

Based on a concept of task forces, recruited through open calls with representatives from all AO regions and across all the AO's clinical divisions, clinical unit, and institutes, and involving surgeons and staff alike, AO Access is driving change through the implementation of pro-diversity initiatives that have already been evaluated and shown to be effective in other workplaces.

AO Access' interventions focus on expanding people's perceptions of what is normative and enhancing opportunities to strengthen the AO with more diverse representation across our organization. The project's success is tied to the engagement of people, as well as mentorship, a critical component to making the AO more diverse and inclusive.





CSR

Corporate social responsibility (CSR)

In the face of a global crisis, the AO responded by ensuring that both locally and globally we continue with our dedication to positively impacting patients, the health sector, and communities.

Good corporate citizenship is interwoven in the AO's identity, where we continue to give back to our local community of Davos (Switzerland) and on a global scale, we commit to activities related to carbon compensation. From energy-saving initiatives at its headquarters in Davos, to projects in India, and targeted initiatives in key locations across the world, the AO remains driven by its founders' passion for improving patient lives.

Our international faculty from the different clinical divisions and board members demonstrated their commitment to CSR by donating a percentage of their per diems to support the AO's CSR activities. With COVID-19 restrictions and event cancellations affecting donations which were significantly reduced compared to previous years, the AO received a total of CHF 12,192 in renounced per diems.

With continued dedication to improving fracture care in low- and middle-income countries, 50 percent of the funds were allocated to AO Alliance, 25 percent to our new initiative to support renewable energy projects in India and focus on reducing greenhouse gas emissions, and 25 percent to our long-standing social programs supporting our local charity, ARGO, an assisted living facility for people with different abilities.



AO center, Davos, Switzerland

AO Alliance

The estimated 40 million people worldwide who survive trauma suffer preventable disabilities due to a lack of access to timely and appropriate care. Since 2015, the AO Alliance has trained 20,042 health care workers (HCWs) through 486 education events across 23 countries in sub-Saharan Africa and eight countries in Asia, trained 229 HCWs as faculty, and sponsored 276 fellowships.

In 2020, the pandemic forced the AO Alliance to pivot many of its activities to online learning and keep our faculty network safe through personal protective equipment donations, and inspired a systems change project to improve the supply chain of orthopedic equipment through the OrthoAccess platform.



AO Alliance course, Bangladesh

Local engagement

In a year when COVID-19 did not allow for much local engagement, we ensured that we keep giving back to our local community of Davos. We continued our long-standing social programs supporting ARGO, an assisted living facility offering pathways to work for people with different abilities, and sponsorship of sports medical care for Hockey Club Davos (HCD) Juniors.

In 2020, we continued to reduce our energy consumption by more than 11 percent compared to the previous year and are proud that all the measures we put in place throughout the years to reduce our energy consumption have had a significant result this year. It was, of course, a year out of the ordinary due to the pandemic, with reduced operations on-site positively affecting the energy consumption results in 2020. However, the 15 percent decline in energy consumption compared to the previous year was also due to measures such as LED lighting replacement and implementing a new ventilation system in the AO center auditorium.

India organic waste project

In 2020, the AO continued its commitment to sustainable development and renewable energy. Together with First Climate and local partners, we are supporting projects in India aimed at reducing greenhouse gas emissions by replacing fuelwood, grid electricity, and other fossil fuels with clean biogas, and in so doing, we are also benefiting the United Nations Sustainable Development Goals.



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