



AO
ALLIANCE

ANNUAL REPORT 2021



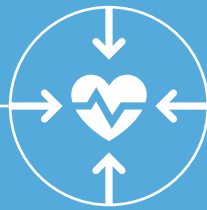
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THE FACTS

The burden of death and disability from injury exceeds that of communicable diseases

Health impact



4.4 MILLION DEATHS

from injuries globally per year, 30% more deaths than HIV/AIDS, TB and malaria combined

40 MILLION INJURY-RELATED DISABILITIES globally per year, of which 30 million are musculoskeletal

3.7 MILLION HEALTHCARE WORKERS are needed in Africa to provide universal health care by 2030¹

Demographic challenges



93 MILLION CHILDREN live with a disability from injuries and congenital conditions³

40% OF INJURIES OCCUR IN THE YOUTH (18–25)⁴

6% OF TRAUMA AND ORTHOPEDIC (T&O) SURGEONS ARE WOMEN⁵



Economic impact



US\$180 BILLION in productivity lost annually due to injury in LMICs

1% OF DEVELOPMENT ASSISTANCE FOR HEALTH GOES TO INJURY CARE

vs

40% TO COMMUNICABLE DISEASES

220 MILLION DISABILITY ADJUSTED LIFE YEARS (DALYs) lost each year in LMICs²

Local capacity challenges

WEAK infrastructure, equipment, and scarce implants

LACK OF sufficiently trained healthcare workers

Traditional bonesetters **NOT INTEGRATED** into local trauma care systems

THE ISSUE

Injuries have been considered the number one killer and a major cause of disability in children and young people for more than 20 years, and the neglected disease of modern society for over 50 years. The injured need timely and appropriate care, **now.**

Injuries



11%
of the total
global burden
of disease



90%
falls on
LMICs

Every year, 4.4 million people die from road traffic crashes, violence, and other causes of injury. Millions more suffer lifelong disability and lost economic productivity. Injury accounts for 11% of the total global burden of disease. Ninety percent of this burden, falls on low- and middle-income countries (LMICs) with an estimated 30 million injured remaining with musculoskeletal (MSK) disabilities annually.

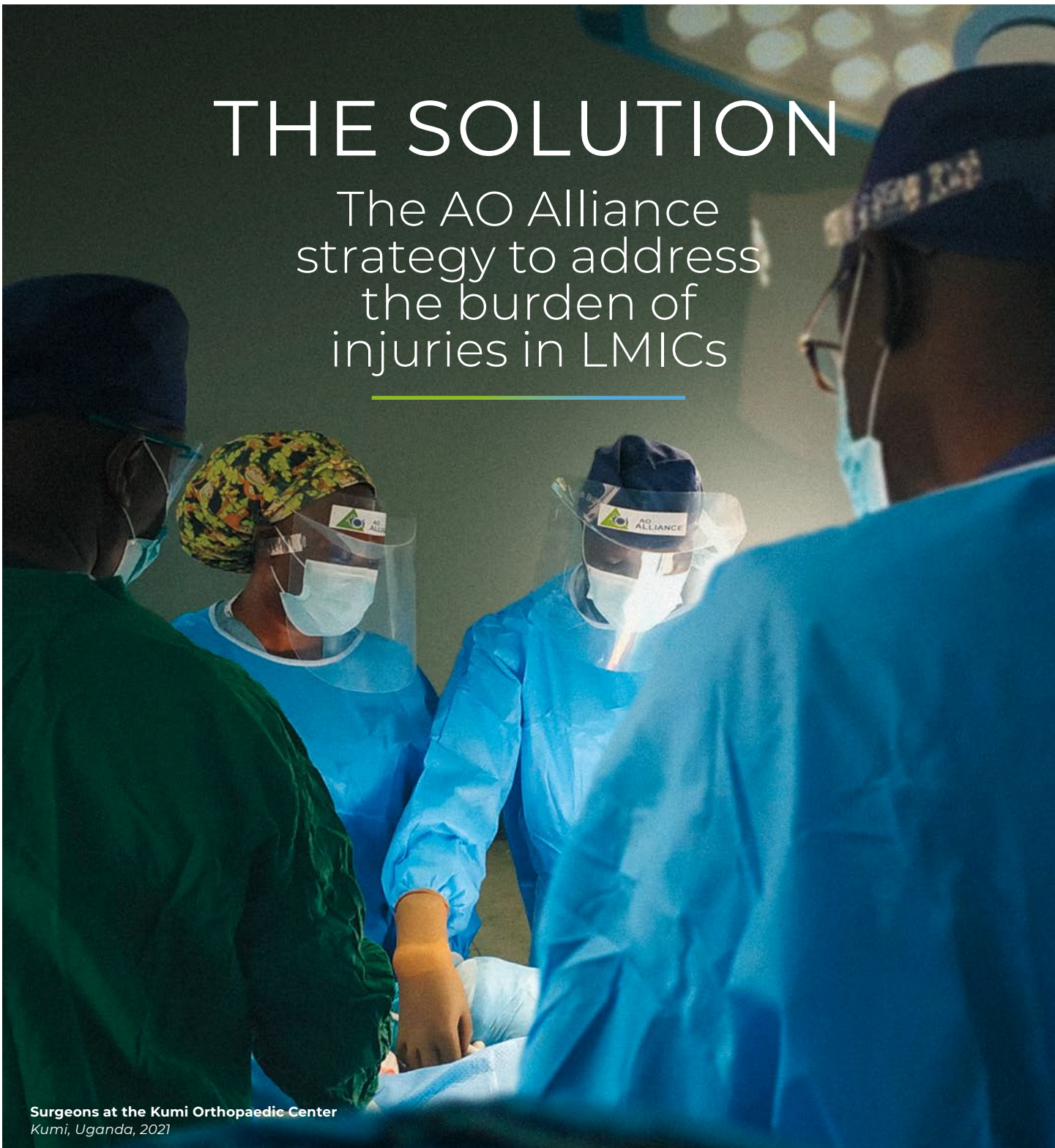
Preventing injuries is as important as access to and quality of trauma care. Disparities in prevention and treatment outcomes exist between LMICs and high-income countries. For example, people with life-threatening but survivable injuries are six times more likely to die in a low-income setting (36% mortality) than in a high-income setting (six percent mortality).

Robust trauma care systems are needed, including pre-hospital care and transport, initial care in emergency departments, hospital-based care, and rehabilitation (physical and social) back to active life. Across the spectrum, there is a need for greater attention to planning human resources (staffing and training), physical resources (equipment and supplies), and administration (monitoring and quality improvement programs).

The AO Alliance has been cultivating partnerships and initiatives to address this issue for seven years. However, a drive originating within nations through their health ministries to understand the short- and long-term benefits of providing safe and effective healthcare for everyone is critical.

THE SOLUTION

The AO Alliance strategy to address the burden of injuries in LMICs



Surgeons at the Kumi Orthopaedic Center
Kumi, Uganda, 2021

VISION



a world where timely and appropriate fracture care is accessible to everyone

MISSION



to reduce suffering, disability, and poverty in LMICs by enhancing fracture care

OBJECTIVE



to create sustainable local capacity for the care of the injured

VALUES



empowerment, partnership, sustainability

Alignment with the 2030 United Nations Sustainable Development Goals

The United Nations Sustainable Development Goals (SDGs) are a universal call to action to end poverty and ensure prosperity and well-being for all. The AO Alliance is aligned with SDG 3, 5, 10 and 17 to build service-delivery capacity in care of the injured in LMICs and support just and sustainable communities and institutions.

Goal 3

Ensure healthy lives and promote well-being for all at all ages.

The AO Alliance develops and trains healthcare workers in LMICs.



Goal 5

Achieve gender equality and empower all women and girls.

The AO Alliance is working to address the low representation of women T&O surgeons, currently 6%.



Goal 10

Reduce inequality within and among countries.

The AO Alliance works to develop fracture care programs in rural impoverished areas in LMICs.



Goal 17

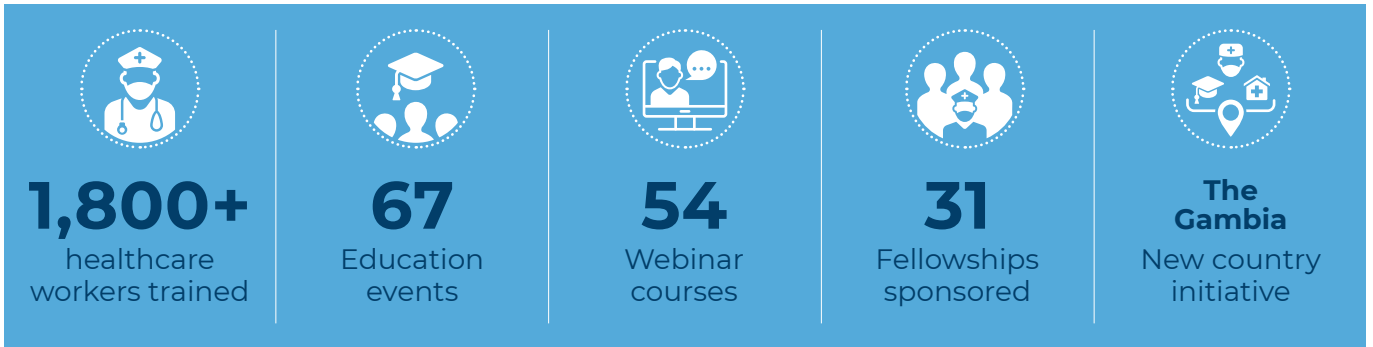
Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.

The AO Alliance partners to scale fracture care solutions and trauma services in LMICs.

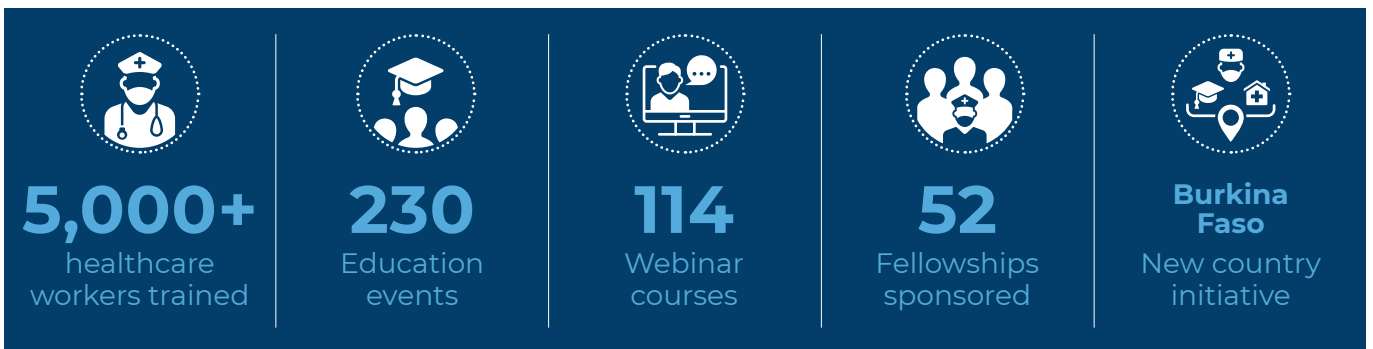


Highlights from 2021

2020



2021



Positive results

revealed by an independent external evaluation on the overall effectiveness and efficiency of the AO Alliance, and in-depth evaluation on education content and delivery under the Fracture Solutions Program

Claude Martin Jr awarded

the TKS Gold Medal (SICOT) for his work in advancing orthopedics in LMICs

Significant increase

in activities driven by local healthcare workers despite COVID-19

Sustained low overhead costs

ensuring funds were directed to achieving local impact

Innovative inroads

into health systems change by training traditional bonesetters

Publication

of AO Alliance: Partnering to strengthen care of the injured in low- and middle-income countries



WHAT SETS US APART

The AO Alliance is active in 26 low- and middle-income countries (LMICs) in Sub-Saharan Africa and eight in Asia, with country initiatives in Burkina Faso, Ethiopia, the Gambia, Ghana, and Malawi.

- 1.** Leader in needs-based fracture care education and training (operative and nonoperative) in LMICs
- 2.** Development of fracture management and faculty education (train-the-trainer) curricula
- 3.** Unparalleled network of local trauma and orthopedic (T&O) faculty in Sub-Saharan Africa (200+) and Asia (100+)
- 4.** Shaping the future of fracture care in LMICs to contribute to sustainable trauma care systems

Our approach

As a catalyst in knowledge development and transfer for T&O care, the AO Alliance:



Identifies local and regional gaps drawing on multistakeholder expertise through rigorous needs assessments and cooperative clinical research, and adapts offerings accordingly;



Partners with international, regional, and local institutions and organizations to build sustainable local capacity to care for the injured;



Enables trainees to apply their newly acquired knowledge, attitudes, and skills within their local healthcare facilities; and



Crafts health systems change programs for timely and appropriate care of injuries to prevent MSK disabilities.

Message from the Chair and Managing Director

Injuries have been considered the number one killer and major cause of disability in children and young people for more than 20 years and the neglected disease of modern society for over 50 years. In most countries, acute injuries (trauma) are still typically considered as “accidents” with little effort committed to reducing this burden. Considering injuries as a disease through a comprehensive approach in the global health agenda will allow countries to not only control but also prevent them.



**Dr Claude Martin jr, Managing Director,
and Dr Rolf Jeker, Chair of the Board of Directors**

If anything has come out of 2021, it is the resilience and perseverance of the healthcare workers tending to the injured in low- and middle-income countries (LMICs). December 2021 marked two years since the first concerning cases of a new respiratory disease began to emerge. The world ushered in a new disease of the 21st century: COVID-19.

Despite the ongoing pandemic crisis in 2021, the AO Alliance was able to execute 50% more activities than it did in 2020. Strategic AO Alliance investments in our network of local healthcare workers allowed us to be flexible and implement activities as soon as opportunities arose and before international travel resumed.

Injuries did not take a break in 2021:

- Injuries – both intentional and unintentional – take the lives of 4.4 million people around the world each year and constitute eight percent of all deaths.
- For people aged five to 29 years, three of the top five causes of death are injury-related, namely road traffic injuries, homicide, and suicide.
- Injuries and violence are responsible for an estimated 10% of all years lived with disability (DALYs).
- Injuries and violence place a massive burden on national economies, costing countries billions of US dollars each year in healthcare, lost productivity, and law enforcement.

Providing quality care for victims of injury and violence can prevent fatalities, reduce the amount of short- and long-term disability, and help those affected to cope physically, emotionally, and financially with the impact of the injury or violence in their lives. This is what the AO Alliance strives to achieve with its networks of local implementation partners.

2021 saw further capacity-building projects being implemented: A new country initiative in Burkina Faso with emphasis on strengthening trauma care coordination between university and district hospitals; further growth in the number of trauma and orthopedic surgeons working in the Gambia; 230 face-to-face education events with over 5,000 healthcare workers trained in fracture management; catastrophic complications from fracture treatments by over 100 traditional healers in Ghana avoided through training on best practices; and the deployment of open fracture treatment guidelines adapted for low-resource settings in Malawi. The AO Alliance also invested in its national networks of faculty (trainers) in Sub-Saharan Africa and Asia, empowering them to deliver without relying on external contributors.

Driven by a desire to understand whether it is “doing the right things (effectiveness) in the right way (efficiency),” the AO Alliance partnered with an international group of healthcare evaluation experts (Burundi, Canada, and USA), selected after a rigorous procurement process, to conduct an in-depth evaluation of its strategy, instruments, and certain core programs. The results were positive, indicating levels of satisfaction and consistency rarely seen by the three evaluators (Dr Amardeep Thind, Dr Richard Gosselin, and Dr Théophile Bigirimana). The independent evaluation confirms the excellence of the AO Alliance’s

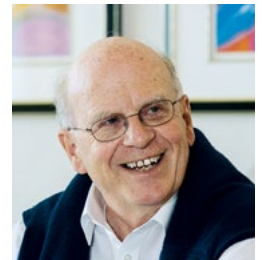
value proposition and implementation achievements. The executive summary can be found in the annex. The [full report](#) is published on the AO Alliance website. [A separate evaluation](#) of the Fracture Solutions Program in which over 3,000 surgeons participated demonstrated the effectiveness of AO Alliance education delivery.

Overhead costs remained low in 2021 (10.6%) thanks to participation of all involved in our activities, from board and steering committee members forgoing their per diems, to the shift to virtual meetings and events, and the efficiency of our staff and consultants.

Looking to 2022, we remind ourselves that much can be gained from challenges. With issues identified, gaps in care of the injured in low-resource settings better defined, and tough lessons learned, we can help lessen disability and its collateral consequences. We can also lay the foundation for better health for the years ahead as we invest in healthcare and those who deliver it. Health systems change programs will be the driving theme, leveraging our experienced and dedicated network of healthcare workers in Sub-Saharan Africa and Asia.

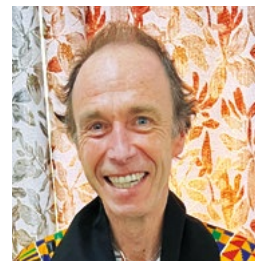
For those seeking a more in-depth look into the AO Alliance, the book, [AO Alliance: Partnering to strengthen care of the injured in low- and middle-income countries](#) is available online.

We thank our funders, implementation partners, Board of Directors, advisors and the global AO Alliance team for their support and dedication. We look forward to contributing to another decade of transformation in care of the injured with our stakeholders.



R. Jeker

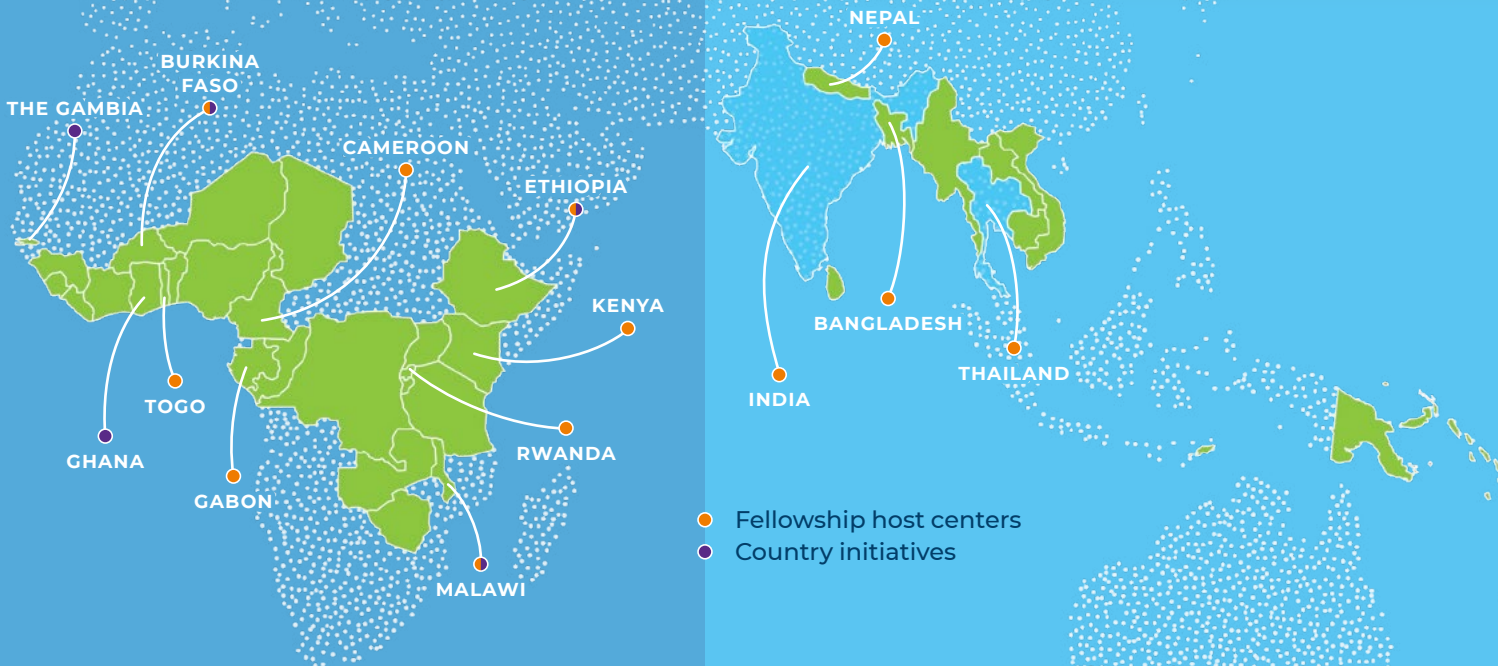
Rolf M Jeker
Chair of the Board of Directors



C. MARTIN

Claude Martin Jr
Managing Director

2021 AO Alliance GLOBAL FOOTPRINT



**Sub-Saharan
Africa**

**Countries
where AO Alliance
is active**

Asia

26

34

8

English-speaking

Cameroon*
Ethiopia
The Gambia
Ghana
Kenya
Liberia
Malawi
Nigeria
Rwanda
Sierra Leone
Tanzania
Uganda
Zambia
Zimbabwe

French-speaking

Benin
Burkina Faso
Burundi
Cameroon*
Central African Republic
Chad
Congo-Brazzaville
Democratic Republic
of the Congo
Gabon
Guinea
Republic of Côte d'Ivoire
Niger
Togo

Bangladesh
Cambodia
Laos
Myanmar
Nepal
Pacific Islands
Sri Lanka
Vietnam

OUR STORIES

Liberia
Sierra Leone
Malawi
COSECSA
Ethiopia
Vietnam
Zambia
Ghana
Nepal



Expanding our footprint

Nonoperative courses in Liberia and Sierra Leone

Liberia and Sierra Leone are two of the poorest West African nations that have suffered healthcare challenges. As preparations for the first AO Alliance nonoperative fracture care courses were being finalized, an oil tanker exploded on the outskirts of Sierra Leone's capital Freetown, on November 5, 2021, killing at least 99 people, and severely injuring 100 others after large crowds gathered to collect leaking fuel. Despite existing pressures on the healthcare system, and with only three T&O surgeons for the entire country, local healthcare workers felt the course should proceed as planned on November 9–11, 2021.

These two courses had been long in the making. In 2019, USD 50,000 was raised to fund the courses in the two countries. The COVID-19 pandemic halted our efforts deliver the courses in 2020. In November and December 2021, both courses could take place.

“Opening the door to development”

is how Prof. William Harrison, AO Alliance Director for Africa, reflected on his teaching experience in Freetown, Sierra Leone. This first nonoperative fracture management course attracted 29 participants. The AO Alliance also invested in a young woman trainee from Sierra Leone who is enrolled in the Master of Medicine program in Orthopedic Surgery at the Faculty of Health Sciences of the University of Nairobi. After her training, she will return to Freetown and join the workforce caring for the injured.

The nonoperative course on the most common fractures held in Monrovia, Liberia was attended by 34 participants.



Practical exercise during the nonoperative fracture care course
Freetown, Sierra Leone, November 2021

Equipment for trauma and orthopedic care delivered to hospitals in Malawi

Under the Malawi Country Initiative, we have donated much-needed equipment to Kamuzu Central Hospital (Lilongwe) and Mzuzu Central Hospital (Mzuzu) to facilitate the treatment of T&O patients.

With the fight against the pandemic in Malawi absorbing public health funds meant for trauma care, the AO Alliance contribution is helping to ensure the continuation of healthcare services to the injured and patients suffering from MSK injuries.

Donated IT equipment included large LED x-ray monitors for the display of x-rays in operating theatres. Locally made skeletal traction weights, traction frames, surgical equipment, instrument trolleys, reusable surgical gowns, drapes, and masks were also part of the donated items.

“The equipment is revitalizing the lives of the injured while everyone else is focusing their programs on infectious diseases.”

Dr Boston Munthali,
T&O surgeon, Mzuzu Central Hospital and
Chief Medical Officer, Lilongwe Institute of
Orthopaedics and Neurosurgery (LION) Hospital.



Donated equipment
Mzuzu Central Hospital, Mzuzu, Malawi, January 2021

AO Alliance and COSECSA sign MOU

COSECSA countries



The AO Alliance and the College of Surgeons of East, Central, and Southern Africa (COSECSA) have been collaborating over the last seven years to advance post-graduate fracture care education in Sub-Saharan Africa. The fruitful partnership was formalized with a memorandum of understanding (MOU) between the two organizations.

COSECSA is an independent, nonprofit body that fosters post-graduate education in surgery and provides surgical training, including in trauma and orthopedics, in 14 countries across East, Central and Southern Africa.

The collaboration has led to the creation of a scholarship program to support T&O surgeons in surgical residency and advance T&O surgery capacity in COSECSA member countries.

C-arm for better operative fracture care in Hawassa, Ethiopia

Since 2015, the AO Alliance and its partners have been supporting young T&O surgeons to develop a high-performance trauma team at the Hawassa University Comprehensive Specialized Hospital (HUCSH) under the broader Ethiopia Country Initiative – a comprehensive capacity building program. This team now conducts over 1,500 surgical fracture fixation cases per year. In addition, the hospital has two dedicated operating theatres for trauma and orthopedics, with two T&O wards – one for adults and one for children.

A c-arm (image intensifier) is one of the most essential pieces of equipment for T&O surgeons, giving them the capacity to see their work in real-time in the operating room, reducing surgical time, and the need for invasive approaches.

The AO Alliance, Hawassa University Comprehensive Specialized Hospital, Australian Doctors for Africa, and the Northwest Orthopaedic Trauma Alliance for Africa joined forces to purchase a c-arm for the hospital.

The Johnson and Johnson Foundation and private donors, including AO Alliance board members and staff, generously contributed to the AO Alliance's share of the cost.

The new c-arm is helping enhance surgical capacity of a key hospital serving a catchment area of 18 million people. The AO Alliance developed a commitment policy to ensure maximum longevity of the machine.

“The c-arm has transformed our department, and myself and my colleagues as surgeons. We are now operating daily on complex surgeries with less invasive approaches.”

Dr Ephrem Gebrehana
Trauma & Orthopedic Division Chief at HUCSH.



The T&O surgical team in Hawassa are presented with the c-arm
Hawassa, Ethiopia, 2021

Back to school: The Ethiopia Country Initiative

After 16 months of limited in-person events, the AO Alliance was able to resume delivering fracture care education in Ethiopia. Five back-to-back events were held in October 2021, with 218 senior and junior residents and ORPs gathered in Addis Ababa for operative fracture management courses, and a faculty education training course designed to sharpen the teaching skills of AO Alliance faculty.



Practical exercise, AO Alliance course on Basic Principles of Fracture Management for Operating Room Personnel
Addis Ababa, Ethiopia, October 2021. Image by Steffen Kruse (AO)

Launch of online case study webinars in Vietnam and Zambia

Realizing that maintaining contact and discussing cases with colleagues during the pandemic was challenging, Prof. Heiner Winker, a retired T&O surgeon from Germany and long-time AO Alliance and AO Trauma faculty, developed a web-based pilot project for trauma case studies. During the online events, participants analyzed cases by applying AO principles and suggesting treatments according to local resources.

The first two pilot events for surgeons were held in Vietnam and Zambia and comprised case presentations followed by discussions on treatment options and treatment.

“The local cases were well selected. They were fraught with problems, so we were able to discuss them in detail. We all had lessons to learn from.”

Prof. Winker



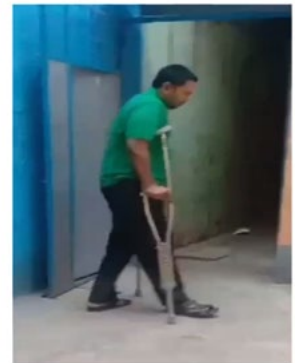
Knee Rt Extension/Flexion 0-10-70°



Screenshot
Webinar in Vietnam



After 12th weeks



First AO Alliance seminar on spine fracture management in Accra, Ghana

The AO Alliance organized a seminar on spine fracture management for the first time in Ghana on August 26–27, 2021. The event drew 22 trauma and orthopedic (T&O) and neurosurgery residents in their third- and final-years of residency, with local faculty teaching in person, and regional faculty joining via videoconference for group discussions.

Patients with spinal injuries in Ghana face the challenges of only being able to receive treatment in teaching hospitals, and limited access to a small number of spine surgeons. The seminar enabled more doctors to provide basic treatment in regional and district hospitals – thereby broadening access to care for rural patients.



Spine fracture management seminar
Accra, Ghana, 2021

Partnering with AO CMF for facial injury care

Among the injuries devastating livelihoods in LMICs is craniomaxillofacial (CMF) trauma. The AO Alliance has been working with three of the AO specialties (AO Trauma, AO Spine, and AO CMF) to advance care of the injured where geographically, they would normally not be active. After six months of preparation, 32 oral and maxillofacial surgeons from the major cities in Ghana attended the first AO Alliance/AO CMF course on the management of facial trauma in November 2021. DePuy Synthes generously donated equipment for the practical sessions.

“We ended up with seven surgeons from around the country receiving faculty education, and they were then faculty with us at the subsequent trauma course. Our reach in Ghana has been tremendous because the 32 participants were most of the surgeons in training in the country,”

says Sánchez Aniceto, AO CMF International Board Chair and course faculty.

“Sustaining that momentum is essential,”

AO Alliance Managing Director, Claude Martin Jr adds.

“We were able to run a train-the-trainers program to teach doctors how to be better teachers before the course. They were able to immediately apply what they learned in the course. The curriculum was designed to meet daily practical needs of participants,” he says.

In Rwanda, surgeons trained through the AO Alliance/AO CMF are not only teaching in Kigali, but also in satellite hospitals around the country.

“That’s part of the beauty of the AO Alliance: It’s not a top-down organization. It’s a grassroots organization, which allows the AO Alliance and AO CMF to work together and improve outcomes,”

Travis Tollefson (AO CMF) says.



Management of facial fractures – AO Alliance/AO CMF course
Accra, Ghana, October 2021

The Clinical Teaching Module Program in Nepal

The Clinical Teaching Module (CTM) Program made significant headway in Nepal in 2021, rolling out more face-to-face trainings on the basic principles of common musculoskeletal injuries and fractures. Each program, consisting of four modules, is designed to develop the knowledge and skills of T&O surgeons over the course of four weeks. Greatly constrained by the pandemic when it was first launched in 2020,

the program was able to be scaled up in 2021, in a strategic effort to make up for lost time and provide much-needed T&O education in a country that, like many others, has been challenged by the rising burden of injuries. The difference in impact between the two years is striking: 19 CTM programs delivered, and 210 healthcare workers trained in 2021, versus five programs and 53 participants in 2020.



Clinical Teaching Module
Kathmandu, Nepal, 2021

The Online Resident Program in Nepal

The Online Resident Program was launched in Nepal in 2021 for T&O residents from Kathmandu University and the National Academy for Medical Sciences. Using curricula from both institutions and the AO Alliance hybrid model for operative and nonoperative fracture management education,

48 online sessions were held over a six-month period for the 79 residents enrolled. The sessions were led by AO Alliance faculty and involved live lectures, case presentations and discussions, as well as video demonstrations on appropriate fracture care.

Effectiveness of the Fracture Solutions Program

Striving for excellence is part of the AO Alliance essence. As such, an evaluation of the effectiveness and utility of our education activities was commissioned in 2021 and conducted as an online survey, distributed to our stakeholders – course participants and faculty. The results were encouraging and informative and allowed us to identify areas

for improvement. As was hoped, most participants found the course objectives were met, the content was useful, and the teaching methods were effective. Course chairs have begun implementing suggestions from the participants – increasing time allotted to discussions and further adapting content to local settings.

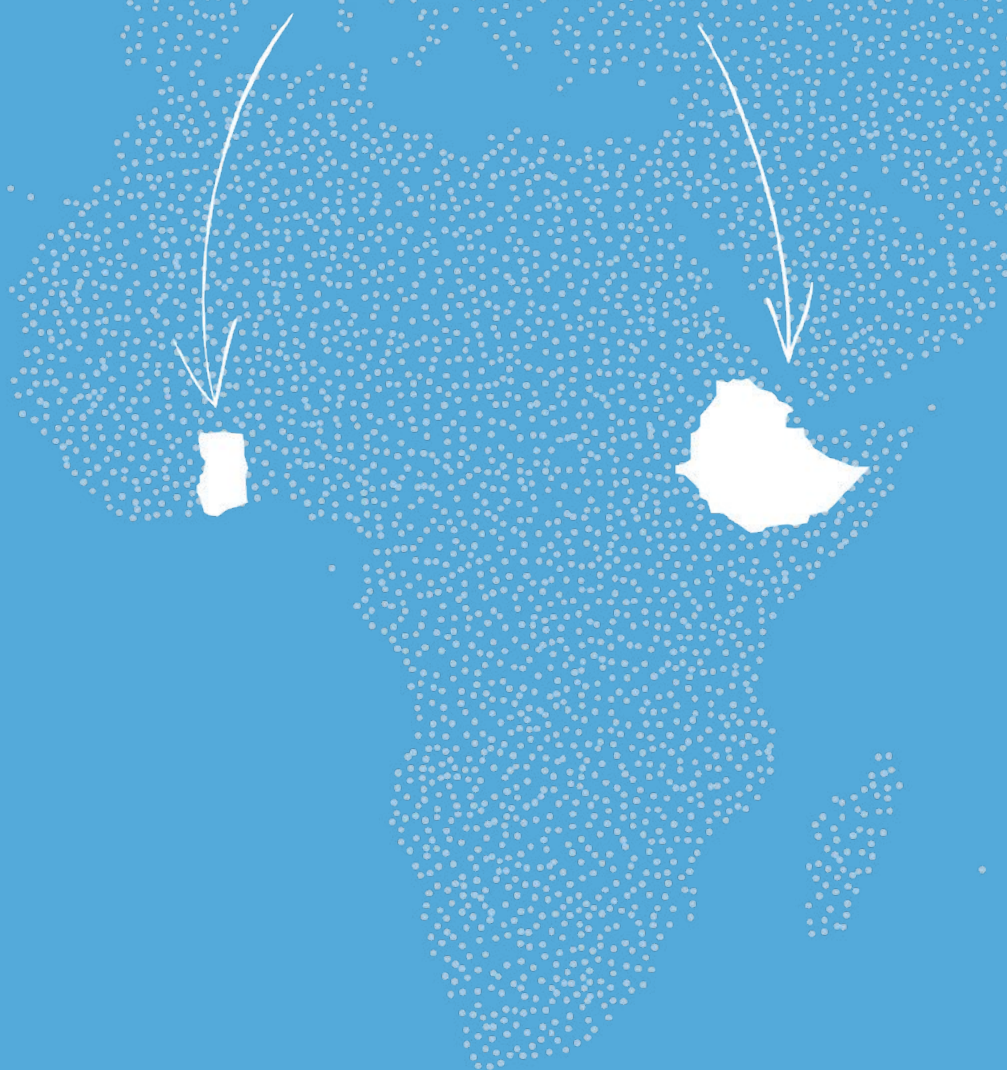
Current position of respondents (2018–2019)

POSITION	n (%)	
	Participants	Faculty
Surgeon	561 (16.7)	543 (65.5)
Surgical resident	673 (20)	34 (4.1)
Operating room personnel (ORP)	586 (17.5)	162 (19.5)
Nurse	362 (10.8)	41 (4.9)
Physiotherapist	74 (2.2)	5 (0.6)
Orthopaedic surgeon	50 (1.5)	32 (3.9)
Emergency physician	26 (0.8)	0 (0)
Paramedic	78 (2.3)	0 (0)
Casting technician	27 (0.8)	1 (0.1)
General practitioner	412 (12.3)	5 (0.6)
Medical student	184 (5.5)	0 (0)
Other	322 (9.6)	6 (0.7)
TOTAL	3355 (100)	829 (100)

Looking ahead

HEALTH SYSTEMS CHANGE PROGRAMS

Traditional bonesetters
in Sub-Saharan Africa:
Approaches in
Ghana and **Ethiopia**



Training traditional bonesetters in Ghana

Few hospitals in Ghana, other than teaching hospitals, offer T&O care. For a population of over 30 million, there are only 52 T&O surgeons, and 50% of them are in the greater Accra area. Traditional bonesetters (TBS) play a significant role in caring for the injured, especially in rural areas.

“The rate of traditional bonesetter-related limb gangrene, infections, and deaths in Ghana is alarming, particularly among children,” says Dr Dominic Konadu-Yeboah, who serves as AO Alliance faculty, and head of the T&O department at Komfo Anokye Teaching Hospital (KATH) in Kumasi, Ghana.

As part of a broader program – co-funded by the AO Alliance and the AO Strategy Fund – a local team of surgeons and educators has begun training bonesetters. In 2021, five courses were organized, and 160 bonesetters were trained in Kumasi and Tamale through lectures, group discussions and practical exercises using tools (rafters, cardboard, wooden slabs, sticks, and ropes) used by bonesetters. The tools were adapted to better meet modern clinical care standards.

The courses were so successful that participants formed two bonesetters' associations: one for the Ashanti region (Kumasi) and the other for Northern Ghana (Tamale). Both associations have identified the need for more courses.

“These are life- and limb-saving initiatives.”

Dr Dominic Konadu-Yeboah



Traditional bonesetter practical exercise
Tamale, Ghana, May 2021

BOSAD Ethiopia: Mapping traditional bonesetters

Ethiopia has a long history with the practice of traditional bone setting, though the prevalence of the practice and associated complications until recently had not been documented at a national level.

The national study on **B**one **S**etters **A**ssociated **D**isability (BOSAD) was designed to map and determine the prevalence of complications from the practice of bone setting. The study is the first of its kind.

A national study kick-off meeting was arranged by the host center of the study, the Department of Orthopedics and Traumatology, Hawassa University Comprehensive Specialized Hospital in Hawassa in July 2021. There are now eight participating hospitals taking part in the study.

No more disability accepted from traditional bone setting



BOSAD kick-off training
Hawassa, Ethiopia, July 2021

PUBLICATIONS

Our network of faculty are experts in the T&O field in LMICs, who not only serve as active healthcare professionals and teachers, but also conduct research that may guide effective fracture care and inform policy for robust care of the injured.

Below is a selection of research publications from our network:

1. Shah, R. K., Markus, A. F., & Shah, N. K. (2022). **Tackling the challenges of providing surgical services in low resource LMICs: Shortcomings in surgical healthcare in Nepal.** *Journal of oral biology and craniofacial research*, 12(1), 63–67. <https://doi.org/10.1016/j.jobocr.2021.09.019>
2. Schade, A. T., Khatri, C., Nwankwo, H., Carlos, W., Harrison, W. J., & Metcalfe, A. J. (2021). **The economic burden of open tibia fractures: A systematic review.** *Injury*, 52(6), 1251–1259. <https://doi.org/10.1016/j.injury.2021.02.022>
3. Schade, A. T., Mbowuwa, F., Chidothi, P., MacPherson, P., Graham, S. M., Martin, C., Jr, Harrison, W. J., & Chokocho, L. (2021). **Epidemiology of fractures and their treatment in Malawi: Results of a multicentre prospective registry study to guide orthopaedic care planning.** *PloS one*, 16(8), e0255052. <https://doi.org/10.1371/journal.pone.0255052>
4. Graham, S. M., Render, L., Moffat, C., Lubega, N., Mkandawire, N., Young, S., & Harrison, W. J. (2021). **Total Joint Arthroplasty in HIV-Positive Patients in Malawi: Outcomes from the National Arthroplasty Registry of the Malawi Orthopaedic Association.** *JB & JS open access*, 6(4), e21.00022. <https://doi.org/10.2106/JBJS.OA.21.00022>
5. Schade A.T., Nyamulani N., Banza L.N. et al. **Protocol for a prospective cohort study of open tibia fractures in Malawi with a nested implementation of open fracture guidelines** [version 1; peer review: 1 approved]. *Wellcome Open Res* 2021, 6:228 <https://doi.org/10.12688/wellcomeopenres.17145.1>
6. Musonda, W., Freitas, D., Yamba, K., Harrison, W. J., & Munthali, J. (2022). **Prognostic factors for surgical site infection following intramedullary nailing of diaphyseal fractures of the femur and tibia in adult patients at a tertiary hospital in Lusaka, Zambia.** *Tropical doctor*, 52(1), 15–22. <https://doi.org/10.1177/00494755211064657>
7. Bonhomme E., Addo W., Lekina F.A., Singh R.P., Harrison W.J., Martin C. **Analysis and recommendations based on evaluation data from AO Alliance educational events in sub-Saharan Africa and Asia.** *ECAJS* 2021;26(3):1-10
8. Graham, S. M., Maqungo, S., Laubscher, M., Ferreira, N., Held, M., Harrison, W. J., Simpson, A. H., MacPherson, P., & Laloo, D. G. (2021). **Fracture Healing in Patients With HIV in South Africa: A Prospective Cohort Study.** *Journal of acquired immune deficiency syndromes (1999)*, 87(5), 1214–1220. <https://doi.org/10.1097/QAI.0000000000002720>



David Shearer (IGOT), Simon Graham (Liverpool), Saam Morshed (IGOT), Grace Le (Oxford), Maritz Laubscher (Cape Town)

AO Alliance external evaluation – SYNTHESIS

Introduction

Driven by a desire to understand whether it is ‘doing the right things (**effectiveness**) in the right way (**efficiency**),’ the AO Alliance (AOA) partnered with an international group of healthcare evaluation experts (Burundi, Canada, and USA), to conduct an in-depth evaluation of its strategy, instruments, and selected core programs. This was not an impact evaluation of individual projects. The results were positive, indicating levels of satisfaction and consistency rarely seen by the three evaluators (Dr Amardeep Thind, Dr Richard Gosselin, and Dr Théophile Bigirimana).

The external evaluation, mandated by the AOA Board of Directors, covered the organization’s seven years of activity, the last 22 months occurring during the COVID-19 pandemic. The evaluation relies on a conceptual framework of interviews, desk review of documents, and a field visit to Ghana. The data was analyzed by triangulation across the data collection tools and interviews. This enabled the uncovering of substantive findings and the approximate degree of certainty to validate them. This methodology helps foundations and nonprofits better understand their performance and gain actionable insights. Speaking with 18 key interviewees involved with the AOA and partner organizations, the evaluators asked broadly:

- Is the AOA building local capacity with its implementation partners to improve care of the injured in LMICs through its programs?
- Are stakeholders (funders and partners) satisfied with their involvement with the AOA?
- Is the AOA’s approach to improving the clinical outcomes of musculoskeletal injuries in low- and middle-income countries (LMICs) correct?

Summary of findings

There is **uniform agreement** on the continued relevance of the AOA’s vision, **mission, and objectives**, given the burden of injuries, and a sense of satisfaction at being one of the few organizations working in this space in LMICs. No other organization is active in as many LMICs in the field of comprehensive fracture care programs. There is strong evidence progress has taken place in achieving many of the goals, although health impact data is difficult to measure. **Securing funding** to ensure operations beyond 2024 is the immediate challenge.

The **Fracture Solutions Program in Africa and Asia (FSP)** (32 countries) and the **capacity-building Country Initiatives (CIs)** (5 countries) are highly regarded, appreciated, perceived to be necessary, and are successful. The **FSP** is the entry point to a country, especially with its mix of fracture management courses geared towards non-clinicians, other healthcare workers, operating room personnel (ORP), residents, and surgeons. The **CIs** offer a more comprehensive approach based on local needs to care for musculoskeletal injuries.

The **administrative structures, processes, and functioning** of the organization are lean and responsive. Improvements are recommended **in monitoring and evaluation (M&E)**, especially in documenting health outcomes and impacts of the programs.

The **AOA Board of Directors** is committed and competent.

The **Ghana Country Initiative** is making an impact with its support of the plaster technician school, the National Trauma Registry, the creation of two new residency programs (total four), and training of traditional bone setters (TBS).


Recommendations

Based on the findings, the evaluation team formulated the following recommendations, not in order of priority:

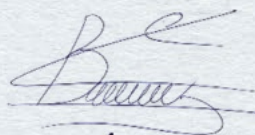
- **Secure long-term funding** to ensure operations beyond 2024. Focused outreach beyond the current anchor donors is needed, as well as strengthening links to other foundations.
- **Develop a M&E plan** to capture program outcomes and impacts. To develop the culture of M&E and to better understand what works and what does not, all new programs/projects going forward should have funding allocated for M&E activities. If capacity does not exist within the AOA network, external experts should be contracted. The results will help shape the 'story' (narrative) for stakeholder and funder outreach.
- **Re-examine and rationalize the geographic reach in the Fracture Solutions Program.** There are activity discrepancies between English-speaking Africa (ESA), French-speaking Africa (FSA) and Asia; the COVID-19 pandemic provided an opportunity to rationalize and focus programs, and where the organization wishes to focus its activities.
- **Re-evaluate where along the continuum of trauma care the AOA wishes to focus its activities.** If additional resources are available, sharpen focus and activities on improving facility-based care (low-cost implants, supporting optimal operating theatre functioning, etc.). Expanding activities to include prevention and rehabilitation is not recommended at this stage.
- **There is strong buy-in for the three pillar concept (care, awareness, and policy),** along with increasing support for MSK clinical research in LMICs. Consideration should be given to stepping up AOA's clinical research activities and support and facilitate research linkages between its international network of surgeons and researchers and LMIC stakeholders.
- If funding constraints occur, focus should be on **preserving quality of programming.** Recommended actions include consolidating the number of Fracture Solution Program course offerings, making greater use of national faculty, and halting country initiative expansion.
- **The Board should consider succession planning and a future refresh,** ensure there is adequate LMIC, gender, and non-clinical representation.

About the AO Alliance

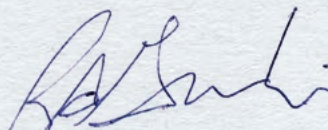
The AO Alliance (AOA) is an international development healthcare NGO working in over 30 low- and middle-income countries (LMICs) across Sub-Saharan Africa and Asia to improve care of the injured, specifically musculoskeletal trauma. For over seven years, the AOA has strived to build sustainable fracture care management solutions by working with frontline healthcare workers, partners, and civil society organizations. Headquartered in Switzerland, with field offices in Ghana, Cameroon, Ethiopia, Malawi, and Nepal, it designs and implements multifaceted programs to improve fracture care and prevent musculoskeletal disabilities.



Dr Amardeep Thind



Dr Théophile Bigirimana



Dr Richard Gosselin



PARTNER WITH US

“Hopefully, the AO Alliance can scale up its activities over the coming years. My foundation is happy to continue its involvement with this noble cause of promoting and developing solutions for better care of the injured in low-income settings.”

Hansjörg Wyss
Global philanthropist
Founder of the Hansjörg Wyss Medical Foundation

“The AO Foundation is honored to have been involved in the creation of the AO Alliance. As musculoskeletal trauma and disorders continue to increase in LMIC, the need for state-of-the-art education and techniques becomes paramount. The AO Alliance fills this void in helping advance care of the injured in these countries.”

Dr Robert McGuire
President of the AO Foundation

“The West Africa Trauma Education Program (WATEP), in collaboration with the Johnson & Johnson Foundation has provided frontline healthcare workers with added knowledge and skills to better care for the injured. Working in partnership, we continue to impact underserved communities and provide access to safe, essential, and timely surgical care.”

Ian B. L. Walker
Global Program Lead – Essential Surgery at
Johnson & Johnson

“The AO Alliance’s work is a huge undertaking, life changing and pioneering!”

Christopher A. Holder
Philanthropist
Board member of Medicor Foundation

Our supporters and partners are the heart of the AO Alliance

We would like to especially thank **AO Foundation**,
the **Hansjörg Wyss Medical Foundation**,
Medicor Foundation,
the **Johnson & Johnson Foundation**,
and all our other partners and donors,
who make our work possible.

Strong governance

Fiscal responsibility, rigorous monitoring and reporting are critical aspects of the AO Alliance's stewardship model. BDO Ltd. Chur audits AO Alliance financial statements annually, and the Société Générale de Surveillance (SGS) is an independent verification partner.

Partnership opportunities, programs and initiatives

Fracture Solutions Program (Africa & Asia)
Country Initiatives: Burkina Faso, Ethiopia, Ghana, Malawi
National trauma & orthopedic fellowships
Health systems change programs:
· Traditional Bonesetter Training Program
· Women in T&O Surgery Scholarship Program

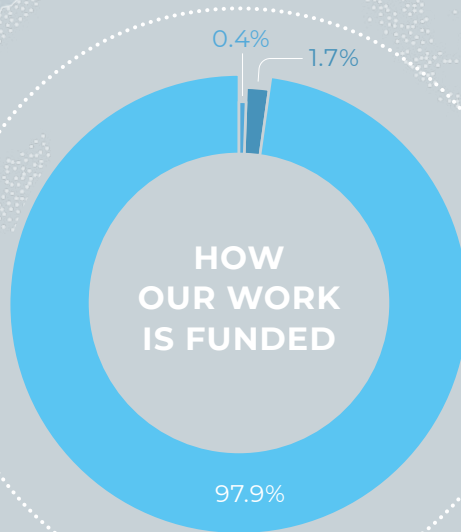


DONATE

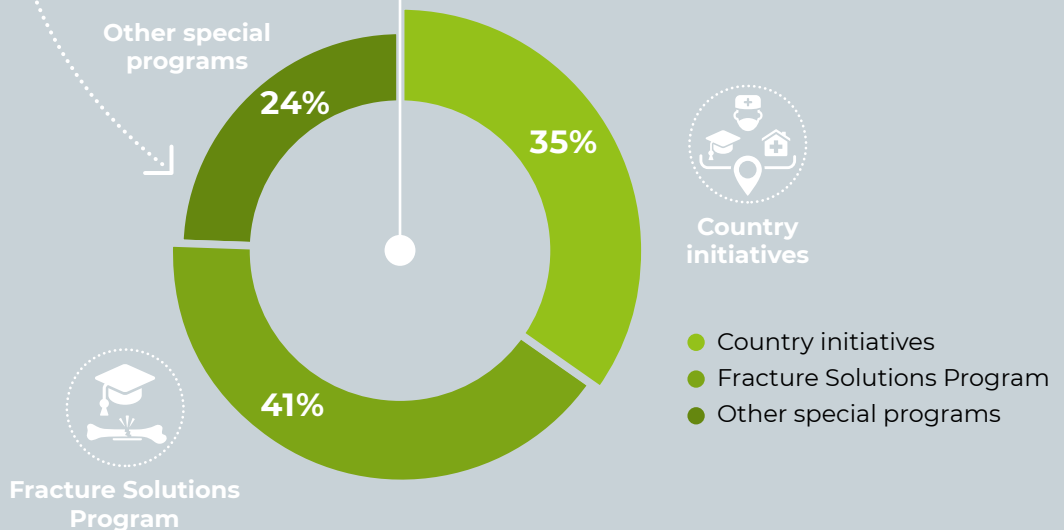
Partner with us to care for the injured.
IBAN code: CH33 0483 5114 9458 6100 0
ao-alliance.org/donate/

KEY FINANCIALS

- Foundations ●
- Corporations ●
- Individuals ●



HOW YOUR GIVING HELPS



Fracture Solutions Program



Country initiatives

- Country initiatives
- Fracture Solutions Program
- Other special programs

2021

FINANCIAL STATEMENTS

The annual audit is conducted according to Swiss GAAP FER by BDO Ltd. Chur.





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Report of the statutory auditor on the limited statutory examination

To the Board of Foundation of

AO Alliance Foundation, Davos

As statutory auditor, we have examined the financial statements (balance sheet, income statement, cash flow statement, statement of changes in equity and notes) of AO Alliance Foundation for the financial year ended 31 December 2021.

These financial statements in accordance with Swiss GAAP FER and the requirements of Swiss law and the articles of foundation, foundation deed and regulations are the responsibility of the Board of Foundation. Our responsibility is to perform a limited statutory examination on these financial statements. We confirm that we meet the licensing and independence requirements as stipulated by Swiss law.

We conducted our examination in accordance with the Swiss Standard on the Limited Statutory Examination. This standard requires that we plan and perform a limited statutory examination to identify material misstatements in the financial statements. A limited statutory examination consists primarily of inquiries of company personnel and analytical procedures as well as detailed tests of company documents as considered necessary in the circumstances. However, the testing of operational processes and the internal control system, as well as inquiries and further testing procedures to detect fraud or other legal violations, are not within the scope of this examination.

Based on our limited statutory examination, nothing has come to our attention that causes us to believe that the financial statements do not give a true and fair view of the financial position, the results of operations and the cash flows in accordance with Swiss GAAP FER and do not comply with Swiss law and the articles of foundation, foundation deed and regulations.

Chur, 17 March 2022

BDO AG

Paul Kumin
Auditor in Charge
Licensed Audit Expert

ppa. Natalie Gamper
Licensed Auditor

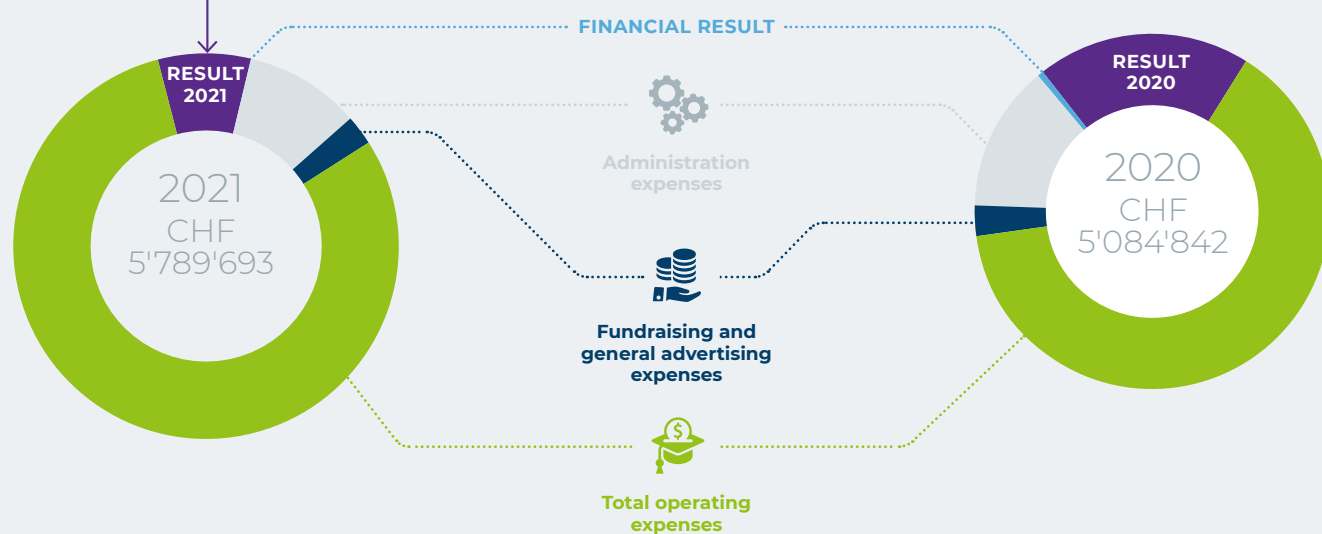
Enclosure
Financial statements

1 Balance Sheet

	Notes	31.12.2021		31.12.2020	
		CHF	%	CHF	%
ASSETS					
CURRENT ASSETS					
Cash	6.1	6'094'410	96.7	5'601'258	98.3
Receivables	6.2			50'179	0.9
Prepaid expenses & accrued income	6.3	210'660	3.3	45'146	0.8
Total current assets		6'305'070	100.0	5'696'584	100.0
NON-CURRENT ASSETS					
Financial investments		0		0	
Subsidiaries		0		0	
Property, plant & equipment		0		0	
Total non-current assets		0		0	
TOTAL ASSETS		6'305'070	100.0	5'696'584	100.0
LIABILITIES & EQUITY					
LIABILITIES					
Accounts payable	6.4	209'032	3.3	213'690	3.8
Other short-term payables (interest-free)	6.5	1'673'668	26.5	1'906'539	33.5
Accrued liabilities	6.6	957'556	15.2	548'253	9.6
Total short-term liabilities		2'840'256	45.0	2'668'483	46.8
Total liabilities		2'840'256	45.0	2'668'483	46.8
EQUITY					
	4				
Initial capital		55'000	0.9	55'000	1.0
Retained earnings		2'973'100	47.2	1'993'735	35.0
Profit for the year		436'714	6.9	979'365	17.2
Total Equity		3'464'814	55.0	3'028'100	100.0
TOTAL EQUITY AND LIABILITIES		6'305'070	100.0	5'696'583	188.1

2 Profit & loss

	Notes	2021		2020		Variance CHF
		CHF	%	CHF	%	
OPERATING REVENUE						
Grants	6.7	5'789'693	100.0	5'084'842	100.0	704'851
OPERATING EXPENSES						
Total operating expenses	6.8	4'642'088	80.2	3'255'483	64.0	1'386'605
Country initiatives		1'611'916		1'591'968		19'948
Fracture Solutions Projects		1'906'960		868'410		1'038'550
Other special programs		1'123'212		795'105		328'107
Fundraising and general advertising expenses	6.9	143'869	2.5	136'373	2.7	7'496
Administration expenses	6.10	558'882	9.7	682'487	13.4	-123'606
Operational result		444'854	7.7	1'010'499	19.9	-565'644
FINANCIAL RESULT						
Other financial income		30'997	0.5	22'851	0.4	8'145
Other financial expense		-22'856	-0.4	-53'984	-1.1	31'128
Financial result	6.11	8'140	0.1	-31'133	-0.6	39'273
RESULT FOR THE YEAR		436'714	7.5	979'365	19.3	-526'371



3 Cash flow statement

in CHF	2021	2020
A. OPERATING ACTIVITIES		
Profit for the year	436'714	979'365
Variance of provisions	0	0
Variance of deferred tax liabilities	0	0
Depreciation and amortization	0	0
Cash flow	436'714	979'365
Increase / decrease of receivables	50'179	-9'210
Increase / decrease of prepaid expenses & accrued income	-165'513	35'245
Increase / decrease of accounts payable	-4'658	-544'063
Increase / decrease of other short-term liabilities	-232'871	411'956
Increase / decrease of accrued liabilities	409'302	-808'213
Cash flow from operating activities	493'152	65'081
B. INVESTING ACTIVITIES		
Investments in financial assets	0	0
Disposal of financial assets	0	0
Investments in subsidiaries	0	0
Disposal of subsidiaries	0	0
Investments in property, plant & equipment	0	0
Disposal of property, plant & equipment	0	0
Cash flow from investing activities	0	0
C. FINANCING ACTIVITIES		
Foundation capital	0	0
Cash flow from financing activities	0	0
D. NET INCREASE / DECREASE IN CASH	493'152	65'081
E. NET INCREASE / DECREASE IN CASH		
Cash & cash equivalents per 1.1.	5'601'258	5'536'177
Cash & cash equivalents per 31.12.	6'094'410	5'601'258
Net increase / decrease	493'152	65'081

4 Statement of changes in equity

in CHF	As of 1.1.	Allocation	Dividends	Result for the year	As of 31.12.
Total equity 01.01.2020					
Foundation capital	55'000				55'000
Earnings carried forward	1'993'735			979'365	2'973'100
Total equity 31.12.2020	2'048'735	0	0	979'365	3'028'100
Foundation capital	55'000				55'000
Earnings carried forward	2'973'100			436'714	3'409'814
Total equity 31.12.2021	3'028'100	0	0	436'714	3'464'814

5 Notes

1 General Information

The AO Alliance Foundation has its registered and principal office at Clavadelerstrasse 8, 7270 Davos Platz, Switzerland.

2 Basis of Preparation

The financial statements have been prepared on the historical cost basis in accordance with Swiss GAAP FER, Swiss GAAP FER 21, and comply with the requirements of Swiss law. The principle of individual valuation has been applied to assets and liabilities. The financial statements were authorized for issue by the AO Alliance Foundation Board of Directors at its March 2022 meeting.

3 Accounting Policies

The financial statements are presented in Swiss Francs (CHF), the functional currency of the AO Alliance Foundation.

3.1 Foreign Currency

Transactions in foreign currencies are translated to Swiss Francs (CHF) at exchange rates on the dates of the transactions. At year-end, monetary assets and liabilities in foreign currencies are measured using the exchange rate valid on the balance sheet date. Exchange differences from such valuation are recognized in profit/loss.

Year-end exchange rates applied:

EUR / CHF	1.04 (2021)	1.08 (2020)
USD / CHF	0.91 (2021)	0.88 (2020)

3.2 Impairments of Assets

Assets are reviewed on each reporting date to determine whether there is any indication of impairment. An impairment loss is recognized if the carrying amount of an asset exceeds its recoverable amount. The recoverable amount of an asset is the greater of its value in use and its fair value less costs to sell. No impairments are recognized per 31.12.2021.

3.3 Cash

Cash and cash equivalents comprise cash in the bank, and petty cash. These positions are valued at nominal value.

3.4 Receivables

Accounts receivables are carried at nominal value less allowance for doubtful receivables. The allowance is based on the aging of trade receivables, specific risks, and historical loss experience. No provision for doubtful receivables is recognized per 31.12.2021.

3.5 Prepaid Expenses & Accrued Income

Short term accruals are liabilities that are due but not yet billed on the balance sheet date, and that arise due to goods and services already received. They are assessed individually based on quotations, offers or experience. Short-term accruals also contain accrued income on projects and studies.

3.6 Revenue

Revenue is recognized at the fair value of the consideration received or receivable, net of discounts. The source of revenue of the AO Alliance Foundation is based on donations. The income recognized is either in cash or in-kind donations.

6 Details to positions of the financial statements

6.1 Cash

Cash consists of funds in the bank accounts in Swiss Francs (CHF) and US Dollars (USD). The increase compared to 2020 is primarily due to received restricted donations where projects will only be completed in the following year.

6.2 Receivables

This category includes value-added tax (VAT) refunds. In 2021, the net amount of value-added tax (VAT) is a payable amount and is recognized under accounts payables.

6.3 Prepaid Expenses and Accrued Income

This position mainly reflects part of the revenue where donors have committed to specific projects but have not yet transferred the agreed grant and prepaid expenses for personnel insurances that relate to the following financial year.

6.4 Accounts Payable

The balance on accounts payables compared to 2020 reflects the direct effect and consequences of the pandemic. Many education events could only take place in the third and fourth quarters of 2021, thus the final billing of the events was delayed to late December 2021.

6.5 Other Short-term Payables

This position includes prepayments from donors for the following financial years. These donors' prepayments are restricted to specific programs. The 2021 restricted funds prepayments are distributed as follows: **Country initiatives:** CHF 305'793 (2020: CHF 371'347); **Fracture Solutions Program:** CHF 763'026 (2020: CHF 774'253); **other special programs:** CHF 604'848 (2020: CHF 760'939). The decrease is due to the partial improvement of the pandemic situation allowing the execution of more educational events compared to the prior year.

6.6 Accrued Liabilities

The main driver of the year-to-year variance are accruals for residency programs for trainees from Sierra Leone, the Gambia, and Malawi (CHF 411K).

6.7 Grants

The source of revenue of the AO Alliance Foundation is based on donations. As of 31.12.2021, 56.2% of the donations (CHF 3'255'328) were restricted to specific programs (2020: 45.5% respectively CHF 2'315'787) and 43.8% (CHF 2'534'365) were unrestricted (2020: 55% respectively CHF 2'769'055). As of 31.12.2021, we received an in-kind donation valued at CHF 12'534 (2020: CHF 228'318). The material donated was directly sent to support our programs. The year-to-year increase is mainly due to the partial improvement of COVID-19 pandemic in the third and fourth quarters of 2021, which has allowed the execution of many face-to-face educational events. The restricted donations were made to finance the following projects:
Country initiatives: CHF 1'082'838 (2020: CHF 1'288'649);
Fracture Solutions Program: CHF 1'274'948 (2020: CHF 582'964);
other special programs: CHF 897'542 (2020: CHF 460'765).

6.8 Operational Expenses

This position covers the costs of 230 education events (2020: 67 events) throughout Sub-Saharan Africa and Asia, infrastructure development, fellowships, faculty development programs, as well as in-kind support for hospitals and costs for local personnel where we have substantial programs (country initiatives) that require onsite oversight. The main driver for the increase compared to the prior year is the relaxing of COVID-19 restrictions in Sub-Saharan Africa allowing for more education events to be executed and the presence of local faculty. Education events in 2021 were more focused on nonoperative fracture care education to limit travel of international faculty. Our ability to implement hybrid education events (with local faculty on-site and international faculty joining online) was a key factor in the successful execution of these events.

6.9 Fundraising Expenses

This cost slightly increased compared to 2020 due to services provided by an external fundraising and philanthropy specialist, and the costs incurred for the mandate of an in-depth external evaluation of the AO Alliance Foundation strategy, instruments, and selected core programs.

6.10 Administration Expenses

All expenses are recorded under the accrual principle. Personnel expenses are stable compared to 2020. The year-to-year decrease is due to partial improvements of the COVID-19 pandemic situation. While some administration expenses are normally allocated to specific programs, in the prior year, due to a significant reduction of planned activities, the costs were kept under central general administration. In 2021 IT costs were lower than in the prior year due to in-house solutions that did not require the support of external consultants.

- The total amount of remuneration to the AO Alliance Foundation Board of Directors was CHF 0K (2020: CHF 11.5K). The Board of Directors waived meeting indemnities for 2021 due to the pandemic situation and all meetings were held virtually.
- The total amount of remuneration to management was CHF 420K (2020: CHF 410K) and was distributed between program and project expenses and general administration expenses.

6.11 Financial Result

The financial result is due to foreign exchange fluctuations as the AO Alliance Foundation pays most of its costs in USD and EUR, and due to the negative interests charged on bank accounts.

7 Further information*

7.1 Employee Benefits (FER 16)

Employees of the AO Alliance Foundation are included in a collective pension plan in accordance with the Swiss Federal Law on occupational retirement, survivors' and disability pension plan (BVG). The pension arrangement contractually excludes any deficit from being transferred to the AO Alliance Foundation and the pension plan institution is fully reinsured concerning arising liability from the arrangement. Any surplus of the pension plan is immediately credited to the pension plan of the insured employees. The pension contribution for the 2021 financial year was CHF 75.6K (2020: CHF 50K). The increase is due to changes to the pension plan and the age structure of the employees.

7.2 Number of Employees (full time equivalents)

Per 31.12.2021, the weighted average full-time equivalents (FTE) are between 1 and 10.

7.3 Liabilities towards Social Security and Pension Plans

None.

7.4 Subsequent Events

At the date of issue of the financial statements no subsequent events have occurred.

* in accordance with Swiss GAAP FER / Swiss Code of Obligations

Acronyms

AO	Arbeitsgemeinschaft für Osteosynthesefragen (Association for the Study of Internal Fixation)
CHF	Swiss Francs
CTM	Clinical Training Module
COSECSA	College of Surgeons of East, Central and Southern Africa
HCW	Healthcare Worker
HIV	Human Immunodeficiency Virus
LMIC	Low- and middle-income country
MSK	Musculoskeletal
ORP	Operating Room Personnel
TB	Tuberculosis
SDG	Sustainable Development Goal
T&O	Trauma and Orthopedics

References

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Back cover:
Patient receiving fracture care
Ghana, 2021



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ao-alliance.org/donate/

ACTIVATE



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HEADQUARTERS

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