



AO Alliance

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

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and Cinzia Muggiasca**

Foreword by Hansjörg Wyss

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Disclaimer

The intention of this book is to describe the history of the AO Alliance while memories are still fresh in the minds of the editors, authors, and contributors.

The text is the sole responsibility of the respective authors. The book is a recollection of events based on the personal experiences and perspectives of the authors.

FOREWORD

by *Hansjörg Wyss*



Over the past 70 years, the Association for the Operative Treatment of Fracture, called the AO Foundation, has revolutionized the treatment of trauma in both the western and developed countries.

However, in the rest of the world, injuries are still a very important cause of permanent disabilities and death due to the lack of timely and appropriate care. Death from injuries exceed the combined death rate of major communicable diseases like HIV, drug-resistant pneumonia, and influenza.

Millions of people suffer annually from permanent disabilities due to a lack of timely and appropriate care. The problem, which is locally constrained, is steadily growing and disproportionately affects low- and middle-income countries. Two million lives could be saved annually through timely and appropriate care. Yet, local and international attention has not accepted the challenge nor the opportunity to address one of the world's major public health problems.

This book is therefore very fitting and welcome. It not only presents the problem in great detail, but also serves to further raise awareness about the burden of injuries to the less developed world. The AO Alliance, founded in December 2014, can make a meaningful impact in improving trauma care by building sustainable local capacity. This is done mainly through local fracture care education and training of healthcare workers with international and local faculties.

The AO Alliance has achieved an impressive record in its first five years, building on an already existing network of surgeons from previous activities of the AO Foundation's Socio-Economic Committee.

My foundation and myself have been engaged in this process, from the establishment of the AO Alliance and throughout its work in sub-Saharan Africa and Asia. I have personally visited AO Alliance projects and witnessed the amazing impact that they are making and the exceptional motivation of the partners to improve fracture care in their countries. I am impressed by the approach to building local capacity in challenging environments and the engagement of all stakeholders.

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.

DEDICATION

This book is dedicated to Hansjörg Wyss for his achievements as an innovative entrepreneur in the medical device industry, significantly improving the treatment of the injured, and for his generous support as a philanthropist contributing to care of the injured through the AO Alliance and other organizations pursuing the same objectives.

ACKNOWLEDGEMENTS

We thank the AO Foundation Board, AO Alliance founders, all past presidents of the AO, members of the Assembly of AO Trustees, and former chairs of the AO Socio-Economic Committee (AO SEC), for the foresight to support the AO Alliance in addressing the neglected epidemic of death and disability from injuries. We include Jim Harrison, Ram K Shah, and Chris van der Werken from the former AO SEC—as strong advocates of understanding and promoting the potential that could be unleashed through this new organization.

We thank our dedicated network of faculty—the backbone of the AO Alliance—whose dedication and passion has ensured and amplified the AO Alliance’s impact on patient care. Their engagement is the AO Alliance’s unique identifier and greatest strength.

We thank all our donors for their generous contributions and our partner organizations for supporting the long-term mission of advancing care of the injured in low- and middle-income countries, so they can receive timely and appropriate care. We also value the work of the members of the AO Alliance Board of Directors in contributing their expertise, medical knowledge and experience, as well as the AO Alliance management team. Within a short period of time, Claude Martin Jr, as managing director, and his local and regional teams have done an outstanding job.

We thank all the contributing authors for the time they spent sharing their insights and experiences. Last but not least, we thank corrieri.net/works for editorial support, Tanja Jegger for her critical review and insight, and Carla O’Donnell for the valuable contribution of proofreading and putting the book together.

Davos, September 2020

Rolf M Jeker, Joachim Prein, and Jaime Quintero

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EXECUTIVE SUMMARY

The AO Alliance was founded on December 13, 2014, with the facilitation of the AO, and the active financial support of the Hansjörg Wyss Medical Foundation. Its goal is to help close the gap in trauma care¹ that exists between high-income countries (HICs) and low- and middle-income countries (LMICs), with the vision and mission of enabling access to timely and appropriate fracture care for all.

In this book, the authors generally refer to LMICs as a country classification of low-income and lower-middle-income countries as defined by the World Bank (see Annex 1). The focus of the AO Alliance's work is on the low-income countries (LICs, gross domestic product [GDP] up to USD 1,036) and lower-middle income countries (GDP between USD 1,036 and USD 3,995) as subsections of the LMIC category.

The AO is a healthcare pioneer that has revolutionized surgical fracture care in HICs over the last 60 years. It was founded in 1958 as Arbeitsgemeinschaft für Osteosynthesefragen – the Association for the Study of Internal Fixation (ASIF) – commonly known as 'AO', and later converted to an international foundation in 1984. Two books about the AO's impact, *Leading a Surgical Revolution. The AO Foundation – Social Entrepreneurs in the Treatment of Bone Trauma* by Jeannet (2019) and *Health economic impact of the AO Foundation in fracture care over 60 years*² by Joeris et al (2019), illustrate the AO's great contributions.

Similar advancements are possible in LMICs.

To record the AO Alliance's journey so far, the authors explore the contribution of the AO Socio-Economic Committee (AO SEC) to advancing trauma care in LMICs, they analyze the human and economic burden of injury and disability from injury in these countries, they describe the process leading to the AO Alliance's creation, map its governance, policies, strategies, funding, and partnerships, chart its five-year progress, and explore its future growth trajectory.

1 The words 'trauma' and 'injury' are used interchangeably throughout the book, as well as 'trauma care' and 'care of the injured.' The main emphasis is on musculoskeletal trauma care and fracture care.

2 Recent study conducted by the Zurich University of Applied Sciences investigated the long-term health-economic benefits of internal fixation by putting monetary values on the cost savings to the Swiss health system, conservatively estimated at about CHF 800 billion. See Joeris et al (2019).

Chapter I: The AO Socio-Economic Committee

The AO Socio-Economic Committee (AO SEC) paid early attention to the problem of trauma care in LMICs. In the late 1980s, it began developing ideas to introduce low-cost implants for LMICs and later focused on educational activities. It attempted to negotiate with the AO's industrial partners to produce low-cost implants to serve LMICs. In fact, the AO was ready to waive its royalties for sales of such implants. The attempt at a two-product strategy failed, as differentiated pricing was not considered to be in the interest of the industrial partner. The AO SEC went on instead to strengthen its training and educational activities, largely in the area of conservative, nonoperative treatment of fractures, as well as some basic operative treatment (including external fixation techniques). In the process, it built a regional network of surgeons and medical institutions. With an annual budget of CHF 1.2 million, the AO SEC was active in 21 countries. Over time, the composition of target countries changed significantly. In the early years, countries in Eastern Europe and Russia, in addition to Brazil, Colombia and Thailand were the target group. By 2014, the focus turned to LMICs in sub-Saharan Africa and select countries in Asia, as the knowledge and expertise in some former target countries had progressed.

The extremely valuable and pioneering work of the AO SEC is described in Chapter I by Jaime Quintero and Urs G Jann.

Over that 24-year period, however, the problem of death and disability from injury grew exponentially with no possibility for the AO SEC to scale up to meet the demand.

Chapter II: The burden of injury in low- and middle-income countries

In Chapter II, Manjul Joshipura, with contributions from Jim Harrison and Abdoulie Janneh, highlights the heavy burden of death and disability from injury in LMICs.

Global deaths from injuries, amounting to 4.6 million annually (2018), exceed the combined annual deaths from communicable diseases such as HIV/AIDS, malaria and tuberculosis—and continue to grow year after year. For every death, at least 10 survivors end up with a permanent disability—75 percent of which are due to musculoskeletal injuries receiving either no attention, or late and inadequate treatment. Ninety percent of global deaths and disabilities from injury occur in LMICs: 70 percent of these injuries affect the working, mainly male population aged 15–40 years. Estimates put lost production value at USD 180 billion annually in LMICs. Current inequalities in care mean that patients with life-threatening but survivable injuries are three times more likely to die in LMICs than in high-income countries.

Improving the quality of and access to trauma care has proven to be highly effective in saving lives and improving clinical outcomes. It is estimated that addressing inequalities in trauma care in LMICs could potentially reduce mortality by 40 percent, saving more than 2 million lives each year (Mock et al, 2012). The lack of full awareness of this problem makes it a silent, neglected problem of epidemic proportions that is grossly underfunded. While 36 percent of health-related development aid goes to communicable diseases, only 1 percent is attributed to trauma care. Whichever yardstick is applied to the global burden of disease— either through mortality or disability-adjusted life years (DALYs) for injuries—funding is disproportionately allocated to other health conditions³.

Chapter III: The AO Alliance is born

This bleak picture coupled with the positive steps initiated by the AO SEC, and the general expertise and financial strength of the AO, set the stage for a more committed engagement by the AO to further advance its mission of “promoting excellence in patient care and outcomes in trauma and musculoskeletal disorders” by expanding its geographic scope. Against this backdrop, the idea to create an organization with more leverage was born and eventually came into being in the form and name of the AO Alliance, with the main purpose of developing sustainable local capacity to improve care of the injured in LMICs.

In Chapter III, Rolf M Jeker describes the process leading to the creation of the AO Alliance, as well as its governance, policies, strategies, funding, and partnerships. The new organization needed to be legally independent from the AO to attract funding from third parties and avoid exclusivity with an industrial partner. While the cooperation with the AO is a very close one, circumstances required the establishment of a separate legal entity with separate founders, board members and funding streams. The founders were chosen among AO past presidents as strong supporters of the new idea, AO SEC past chairs who had laid the groundwork, and Hansjörg Wyss, the main funding partner.

The AO Alliance Board of Directors needed to be an amalgamation of surgical experience and experts in international development. Fortunately, it was possible to form a solid board of directors with eminent personalities right from the start.

The AO, as the organization facilitating the establishment of the AO Alliance and backing it with funding for an initial ten-year period and allowing the AO Alliance to

³ Trauma care received USD 0.04 per DALY, while HIV/AIDS, TB, malaria, and maternal and child health received USD 4.05 per DALY, USD 25.09 per DALY, USD 9.62 per DALY, and USD 45.75 per DALY, respectively. Institute of Health Metrics and Evaluation (2018).

use 'AO' in its name, occupies two seats on the AO Alliance Board of Directors: one by the past president and the other by the executive director of an AO clinical division.

A task force representing the AO clinical divisions and the AO SEC laid out the groundwork as to its objectives, mission, scope, and focus on activities. It also came up with the name AO Alliance to express its relationship to the AO as well as its intent to work and develop alliances with other organizations locally, regionally and internationally.

AO Alliance activities would prioritize education and training to improve fracture care, namely through the Fracture Solutions Program (FSP), as a strengthening and continuation of former AO SEC activities.

To address the problem more comprehensively, country initiatives were developed. Four- to five-year support programs would address the lack of trauma and orthopedic (T&O) human resources, the quality of fracture care education, operating theatre capacity to allow healthcare workers to treat the increasing number of trauma cases, and the need for clinical research to document existing needs and register cases to eventually improve quality and capacity, as well as advocating for increased funding.

A thorough needs assessment conducted jointly with local partners in targeted countries would identify which of the above components were most relevant and what improvement could be achieved over a defined period by setting objectives and key performance indicators (KPIs).

Based on a proposal by the task force's list of potentially eligible countries, Malawi, Ghana, Ethiopia and most recently, the Gambia, were chosen. Needs assessments were conducted in Burkina Faso and Nepal. They were identified as potential target countries, depending on availability of funding and management resources. Myanmar began as a country initiative but was later recategorized within the Fracture Solutions Program, while Haiti was assessed but did not meet eligibility criteria.

Among the many existing needs and criteria for selecting a target country, the availability of reliable, trusted partners has the highest priority. Not surprisingly, they could be found among the AO SEC legacy countries.

Country initiatives and the FSP are the core of the AO Alliance's operational activities. Most of the AO Alliance's work relies on in-region surgeons and operating room personnel (ORP) to assist each other with targeted inputs from the broader AO community. However, there needed to be a more specific role for AO surgeons

and the AO clinical divisions to get involved in supporting the objectives of the AO Alliance. Under the special projects, the AO surgeons' initiative and AO clinical divisions collaboration were created from the outset. The AO surgeons' initiative was a one-time endeavor when the AO Alliance was first launched, while the collaboration with the AO clinical divisions is ongoing and expanding. The AO clinical divisions have little room to engage with LICs under the arrangements with its industrial partner. The AO Alliance is, therefore, the appropriate vehicle to accommodate the interest of the AO clinical divisions in being more active in LICs. A strong partnership with AO Trauma has been established in the Asia-Pacific region, and more recently through a country initiative in the Gambia; while AO CMF (craniomaxillofacial) is strongly focused on delivering LMIC-adapted courses in sub-Saharan Africa.

In addition to the core operational activities, awareness-building and policy advisory services became the two other thematic focus areas, although in terms of funds invested, they only account for about 5 percent annually. Awareness building is an absolute prerequisite to finding long-term solutions to the problem of death and disability from injury. Only once it is recognized as a global public health problem will sufficient funding be allocated to it. Joint activities with international organizations, such as the World Health Organization (WHO) and the Global Alliance for Care of the Injured (GACI), the Global Alliance for Surgical, Obstetric, Trauma and Anaesthesia Care (G4 Alliance) and the Coalition for Dialogue on Africa (CoDA) are of the essence, as is joint action with initiatives that at least partly encompass injury as part of noncommunicable diseases (NCDs), the United Nations Sustainable Development Goals (SDGs), *The Lancet* Commission on Global Surgery, poverty-based initiatives, and climate change are relevant and emphasize the importance of trauma care within these initiatives. The AO Alliance has engaged in data capture and clinical research efforts, again on a collaborative basis, to clarify and quantify injury needs and potential solutions in LMICs. This is an essential foundation for awareness endeavors.

The policy advisory services serve to strengthen capacity in planning and delivery of trauma care without which coordinated action is unlikely to happen. Typical services consist of the establishment of integrated national trauma plans and tailored clinical guidelines for LMICs. The case of the Myanmar national trauma plan and open fracture treatment guidelines in Malawi are addressed in Chapter IV on the implementation of AO Alliance activities.

Chapter IV: A flying start

Once the governance structure with founders, board members, and management was in place, the AO Alliance got off to a quick start. Before the official launch on December 13, 2014, some activities (the AO surgeons' initiative and two country needs assessments) had already been prepared. Its quick traction and success were to a large extent due to past AO SEC work. The existing surgeon and faculty network could immediately be utilized and leveraged. The AO Alliance was fortunate to be able to recruit Claude Martin Jr, the former executive director of AO Trauma (2010-2014), as its managing director.

In Chapter IV, on the implementation of activities and achievements, Claude Martin Jr describes getting the AO Alliance up and running and developing additional programs. Indeed, the first activities were approved somewhat before its formal establishment. This allowed the AO Alliance to get off to a flying start, but also brought important challenges for the managing director to build the managerial and operational structures. A lean management structure was put in place with few central resources, including a virtual office with operational responsibilities shared with the networks in target countries and regions.

The newly named Fracture Solutions Program (FSP), the flagship for educational fracture care training, originally initiated by the AO SEC, was greatly expanded, benefiting 23 countries in sub-Saharan Africa and seven in Asia (2019). Over the course of the first five years (2015-2019), 419 courses attended by 17,882 healthcare workers were conducted, relying on an estimated 350 local and regional faculty. Through 25 courses, 251 faculty received training as 'trainers of trainers' and 245 were offered short-term clinical fellowships. A growing annual budget of CHF 2.1 million in 2016 to CHF 2.9 million in 2019 was made available for the program, compared to the CHF 1.2 million that had previously been allocated to the AO SEC for all of its activities.

Country initiatives in Malawi, Ethiopia, Ghana, and the Gambia allowed for an expansion of impact, as they established comprehensive multi-year programs that combine education and training, reverse fellowships, clinical research, and clinical infrastructure support, all tailored to meet the specific needs of the target countries. While closely supervised and guided from the headquarters in Switzerland, much of the responsibility was delegated to local teams.

Special initiatives with dedicated donors enabled building a successful pediatric trauma and orthopedic (T&O) program in Ghana and engaging in the complex and controversial role of traditional healers, and the launches of education programs

in West Africa. Another such initiative has supported tailored T&O education in the Pacific Islands.

From the very beginning, the AO Alliance sought a close relationship with AO surgeons and AO clinical divisions. Within that context, the AO surgeons' initiative—launched right at the start of the AO Alliance—attracted great attention, with 76 proposals submitted. Seven of the proposals were retained and supported over a period of three years. Similarly, AO clinical divisions were involved in supporting the needs in LMICs by conducting courses and/or engaging in country initiatives (eg, AO Trauma in the Gambia country initiative).

The environment in which the AO Alliance works is extremely challenging, and it was made even more so during the COVID-19 pandemic. This called for a strong response—in the short term—to protect AO Alliance healthcare workers, employees, and regional consultants; and in the longer term, to develop better educational digital assets.

After five years of operation and despite the challenging environment and the many difficulties along the way, the AO Alliance has made an impressive impact in local capacity building and is recognized as an important player in the field of improving care of the injured in LMICs.

Chapter V: Funding

Funding is crucial to the impact the AO Alliance can make in strengthening the sustainable local capacity of healthcare workers to deliver trauma care, as demonstrated in Chapter V by Rolf M Jeker and Cinzia Muggiasca. With two principal donors, the AO and the Hansjörg Wyss Medical Foundation, the AO Alliance was able to gradually diversify its funding sources and triple the AO's annual contribution of CHF 2.5 million. The budget grew from CHF 4.2 million in 2015 to CHF 7.6 million in 2019. Among the new donors were Medicor Foundation, the UBS Optimus Foundation, the Johnson & Johnson Foundation, Pictet Fondation de Bienfaisance, the AO Strategy Fund, a legacy donation from Ulrike Berger, and a contribution by Joachim Prein.

An initiative by AO Alliance surgeons raised funds by running in the Kigali International Peace Marathon in June 2019, raising over CHF 50,000 for nonoperative fracture management courses in Liberia and Sierra Leone. The AO Alliance also benefits from the AO corporate social responsibility program, through per diem contributions from AO surgeons, and from AO Alliance faculty and members of the AO Alliance Board of Directors foregoing their per diems.

The AO Alliance also received substantial in-kind support from DePuy Synthes and the Naton Medical Group.

From 2015 to end of 2019, the AO Alliance invested CHF 26.6 million. Of this, CHF 9.2 million (35 percent) went into the Fracture Solutions Program, CHF 7.8 million (29 percent) went to country initiatives, and CHF 6.2 million (23 percent) went to special initiatives. CHF 3.4 million (13 percent) was allocated to general and administrative expenses.

Up to 95 percent of these investments were allocated to operational activities (under the ‘Care’ focus area), with smaller amounts being spent on awareness and policy advisory services. Approximately 85 percent of the total investments in ‘Care’ covered training and fellowships, 10 percent covered clinical research activities, and 5 percent went toward clinical infrastructure support.

Project monitoring and evaluation, verification of the donor funds invested, and the efficiency (lean operations) that accompany implementation receive prime attention. The AO Alliance strives to keep its overhead spending below 13 percent which has been achieved annually since 2016.

Chapter VI: Partnerships

Chapter VI, written by Rolf M Jeker and Claude Martin Jr, bears witness to the importance of partnerships. The AO Alliance relies heavily on local, regional and international partnerships to raise awareness and implement programs and projects. It has been very successful, over a short time, in making itself known and partnering with reputable organizations. Awareness-building partners include the WHO/GACI, CoDA, professional colleges of physicians and surgeons in Africa, the G4 Alliance, the World Health Summit, SIGN Fracture Care International, the Fédération Internationale de l'Automobile (FIA) and the Harvard Medical School Program in Global Surgery and Social Change. The AO Alliance also has implementation partners, such as the Haukeland University Hospital (HUH) in Norway, Australian Doctors for Africa (ADFA), the Pacific Island Orthopaedic Association (PIOA), and the Institute for Global Orthopaedics and Traumatology (IGOT). With them, and with their additional resources and competencies, the impact on trauma care is magnified, as demonstrated by the Lilongwe Institute of Orthopaedics and Neurosurgery (LION) project in Malawi and the Hawassa University Comprehensive Specialized Hospital in Ethiopia, mentioned in Chapter IV.

Chapter VII: Looking ahead

Some concepts are mapped out in Chapter VII on the path the AO Alliance could take during the next five-year period (2020–2024) and beyond. Issues are addressed by Rolf M Jeker, with contributions from all the authors, as to the scope of activities, the content of education and clinical research programs, and strategic considerations relating to future funding.

Death and disability from injury will continue to be a major global public health issue, as it is forecast to move even further up in the ranking of leading causes of death and disability globally. There is still a gap to be filled in addressing this silent epidemic of injuries in LMICs, and the AO Alliance can continue to make an invaluable contribution.

Tackling the burden of injury in LMICs will require adjustments and new approaches in education, clinical research, and infrastructure support measures, as well as the further strengthening of existing partnerships, increasing and diversifying funding by engaging private and corporate foundations, families, and individuals, and expanding corporate sponsorships.

The initial strategy has proven its worth in supporting the missions of both the AO Alliance and the AO and should be continued. Critical factors will be maintaining and growing funding and keeping the spotlight on the devastating impact of injury on individuals, communities, and society—often referred to as the cycle of poverty. The AO Alliance is considering alternatives to generate funding internally by acting as a social entrepreneur. Hopefully, on a global scale, some new, innovative financing instruments used in addressing other illnesses can also be evaluated for application to disabilities resulting from injury.

The AO Alliance has come a long way in its first five years. The need remains immense and continues to grow. The chosen approach of building sustainable local capacity for fracture care in LMICs has proven to be the correct one. The approach needs to be pursued and further strengthened: through awareness building, policy advice, and primarily training and education through the activities of the ‘Care’ focus area.

The AO Alliance is considering its future positioning in the global health value chain, how best to build mission-aligned bridges between operational interventions and strategic initiatives, what balance to strike between local capacity building and initiating healthcare systems change, and the role technology can play in scaling its intellectual capital and the impact of its interventions.

Jointly with donors and implementation partners, relying on its unique network of local and regional healthcare workers and contributors in the LMICs where it is active, the AO Alliance can continue to make a valuable contribution towards bridging the gap between fracture care quality in LMICs and HICs and filling the gap left by various actors. Many challenges remain, but the vision of “access to timely and appropriate fracture care for everyone” is very much alive and remains achievable.



Forcina Mdala (center) during an AO SEC practical exercise for operating room personnel, Blantyre, Malawi, September 2005
Copyright: AO Alliance



CHAPTER I

The AO Socio-Economic Committee (AO SEC)

Jaime Quintero and Urs G Jann

“*Education is
the most powerful weapon
which you can use to change
the world.*”

— Nelson Mandela —

CHAPTER I

THE AO SOCIO-ECONOMIC COMMITTEE (AO SEC)

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CONCEPTION OF AN IDEA

In the annals of the history of the AO, 1988 was a year of special anniversaries and events:

- The 30th anniversary of the founding of the Association for the Study of Internal Fixation (ASIF) in Biel, Switzerland;
- Maurice E Müller's 70th birthday; and
- The AO founding fathers Maurice E Müller, Hans Willenegger, and Martin Allgöwer recognized by the Swiss Federal Council with the Marcel Benoist Prize on November 25, 1988, for the worldwide activities of the AO/ASIF and their impact on patient care.

In June 1988, the fourth Assembly of AO Trustees was chaired by Martin Allgöwer and held under splendid summer weather at the Hotel Badischer Hof in Baden-Baden, Germany. In addition to the reports of the various commissions, new members of the Assembly of AO Trustees reported on the difficulties and challenges of appropriate fracture care in their regions. The AO was established in 1958, and it became a global foundation in 1984 with 80 leading trauma and orthopedic (T&O) surgeons. By 1988, new members from India, Thailand, Brazil, and Colombia, among others, were invited to the Assembly of AO Trustees to address the participants on issues and problems related to the availability of implants, surgical instruments and the teaching of the AO principles in developing countries.

One of the AO founders, Hans Willenegger, very early on realized the importance of developing countries. During his numerous trips to Latin America, Asia, and Africa, he established local contacts and understood the fracture care needs in those regions.

The following year, in June 1989, and during the fifth meeting of the Assembly of AO Trustees at the Bürgenstock Hotel in Lucerne, Switzerland, a more structured discussion followed in a working group session under the heading "Economic Subjects", where socioeconomic issues of applying modern AO principles and techniques in developing countries represented a barrier for the AO mission. Siegfried Weller from Tübingen, Germany, who had been teaching actively in India and East Asia, and Jose Soares Hungria Neto from São Paulo, Brazil, led the discussion. Finally, the group proposed a strategy to evaluate and implement the needs of each country and region, with the following steps:

- Identification of individuals—future AO leaders;
- Identification of implant requirements: adaptation to local needs;
- Identification of educational needs: local training, scholarships; and
- Review of producers and distributors: materials for training, workshops, hospital support, manufacturing and logistics.

Recognition was given that each geographical area had its own needs and demands, and that the strategy proposed could improve each regional situation.

The described strategy provided the basis for addressing different regional needs, particularly in developing countries without requiring considerable amounts of resources and logistics. It would also set the tone for addressing the socioeconomic and cultural differences between the different continents that in the future would lead to the establishment of official AO regions, particularly the less developed regions such as those covered by AO East Asia (established in 1995) and AO Latin America (established in 1998). At that moment, there had been no formal or sustained AO presence in sub-Saharan Africa or other low-income countries in Africa, Asia, and Oceania. Almost all AO educational activities (courses, seminars and fellowships) were centrally coordinated by AO International in Bern, Switzerland, and held in Europe and in North America.

The discussions during the Assembly of AO Trustees in 1988 and 1989 created awareness and raised important questions about how an organization devoted to the development and teaching of cutting-edge technology for fracture care could also be involved in activities in countries with limited resources, infrastructure, and poor organization of their healthcare systems.

In June 1990, discussions on socioeconomic issues in fracture care returned to the agenda during the Assembly of AO Trustees in Toronto, Canada. Quite interestingly, and for the first time in the history of the AO, the meeting was facilitated by an external consultant. One of the working groups concluded that “the needs of medically less-developed nations are growing rapidly,” that “the AO is for all people, also those in developing countries” and that “AO colleagues worldwide wanted relief for the problems of their patients.” The group identified three main barriers that were further discussed:

- The sophistication and complexity of innovative surgical equipment: Original AO implants and instruments could not be obtained by public hospitals at reasonable costs. Local copiers making low-quality products were growing rapidly and they took advantage after an AO course to market their products.

- Costs: Lower-quality products would not be acceptable and the creation of a 'second line' or 'second brand' portfolio would create additional logistic and marketing difficulties. It also would trigger ethical concerns if questions on lower quality arose. Finally, it was agreed that redesigning simpler equipment sets or making products available for specific regional needs would be more appropriate.
- Education: Important questions were raised by the group: Was the AO teaching tailored to the level of medical education in a given region/country? Was the AO teaching basic principles using basic and simpler systems? Was the teaching in line with product availability?

The objective was to make AO techniques and philosophy available in developing countries and to support education in order to achieve self-sufficiency.

The ground was now fertile to plant the seed. Discussions held during the AO Foundation Board from 1988 to 1990 finally led to the creation of a committee that would look into possible actions and specific projects of the AO in less developed regions and countries.

STRATEGY AND OBJECTIVES

Following the recommendations of the Assembly of AO Trustees, the AO Foundation Board established the AO Socio-Economic Committee (AO SEC) in 1990, with the objective of facilitating a rapid response in underdeveloped and developing countries. Ideas and needs would have to flow into this committee, where final decisions and recommendations would promote specific actions, not only with respect to product development but also education in less-developed areas.

The committee's main actions would be to:

- Identify any specific product needs for developing countries with new developments and products and simpler set configurations, not necessarily of low quality;
- Review any improvements or changes in materials and product specifications in light of the needs of developing countries and recommend if the former standard product should still be made available;

- Assist local surgeons and manufacturers in any lobbying activities and presentations to government officials made to lower the duties and taxes on AO products;
- Review the royalty structure for the special situation in developing countries;
- Ensure that teaching activities be coordinated with AO International and tailored for each specific socioeconomic level and practical availability of AO equipment; and
- Provide coordination and assistance for rapid response in crisis situations in developing countries.

COMPOSITION, STRUCTURE, AND BUDGET

The committee would be surgeon-driven with representation from the AO International office and AO management. Producers of AO implants whose geographic territory included developing areas would also be actively involved in the committee. Guests would be welcomed depending on specific needs or topics.

The AO SEC would act in close contact with the AO Education Commission and the AO International Commission in the following regions: Latin America, Africa, the Middle East, the Far East, India, China, Russia, and Eastern Europe. Its first initiatives would be tested in two pilot countries (one country per region/manufacturer). The AO SEC would report directly to the AO Foundation Board.

Members elected for the first committee were:

- James L Hughes (United States), chair
- Siegfried Weller (Germany, AO International)
- Reinhold Mathys (industrial partner representative)
- Rudolf Maag (industrial partner representative)
- Urs G Jann (AO management)



It became readily apparent that the “hardware” delivery, while problematic, was the least of the difficulties. An environment of complete care was needed with proper training for all personnel along with a sterile operating room environment.

James L Hughes (AO SEC Chairperson, 1990-2000)

The AO Foundation Board assigned an initial annual budget of CHF 100,000, which was later increased to CHF 500,000 per year. One important element was that there should be an exemption of royalties for AO technology that was tailored for developing countries. The research and development (R&D) costs would be very high compared to the low commercial potential and profit margins in the developing countries. Later, it was agreed that the AO would contribute 1 percent of its operating budget to the AO SEC, a number that matched the existing budget amount and the funds required at the time. By 2009, the financial contribution stood at CHF 1.2 million. By this time, 21 countries benefited from the AO SEC. The geographic composition, however, had significantly changed and focused on low-income countries following the United Nations’ classification.

Some countries originally supported by the AO SEC later became part of the main AO education program, namely the Eastern European countries of the former Soviet Union as well as India, Brazil, and Thailand. The latter three had graduated to the category of emerging markets, but the AO SEC continued to finance clinical fellowships in Brazil and operating room personnel (ORP) training in India. With this, the AO SEC and the AO took into account the economic and political changes in these countries over the years.

THE EARLY YEARS

Immediately after the discussions on the terms of reference during the first AO SEC meeting, the group felt that the development of a simple external fixation device for acute fracture care was the most logical way to begin. Other options were discussed, for example an interlocking nail for femoral and tibial shaft fractures that could be inserted without an image intensifier. The external fixator prototype was based on a model that had been developed in Brazil.

The following tactics for development and implementation were discussed:

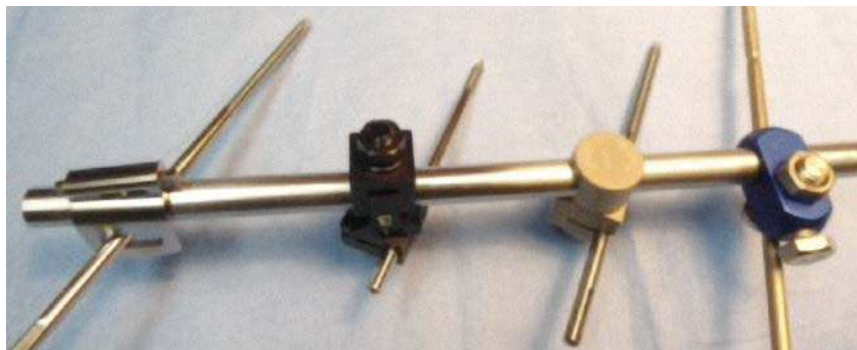
- The system would have to meet scientific quality criteria.
- The products would have to be cheaper than those available locally.
- Two target countries, India and Brazil, were proposed.
- Educational support material would have to be prepared.
- Simple documentation about the product usage and cases would be encouraged.
- If appropriate, timely consultations would be conducted.

The committee worked diligently, and different prototypes were tested by the producers in Tübingen, Germany, with the support of Siegfried Weller and his assistant Dankward Höntzsch. The first prototype was based on the Trauma Fix model that was designed for the US military forces. Different modifications and prototypes such as the ExFix Blue, ExFix Light, Tansfix and Dispofix showed the inherent complexity of reaching a very simple and affordable design that would meet the requirements. It is important to highlight that the existing AO tubular system, which was the most versatile and modular system on the market, had a price tag of CHF 1,200 to CHF 1,500, which most developing countries could not afford.

The committee was looking for a similar construct around one-tenth of the price. Important questions that would influence final costs, such as single-use or reusable, short-term or long-term use in the patient, local production or importation, and the discussion of having two quality standards under a different name, were policy decisions that would have consequential implications. Another important factor was the growing number of companies copying AO implants. In India, a prominent AO surgeon reported that dozens of companies were supplying central and district hospitals with copied implants. → [🕒]

The first clinical experiences with the ExFix Light in Tübingen and in India were satisfactory, but the price was still 50 percent of that of the regular AO tubular system. There were also concerns over having two systems. Local surgeons were trained in Mumbai, India (1992), and in São Paulo and Ribeirão Preto, Brazil (1993) by Dankward Höntzsch, who was actively involved in the design of the prototypes with the Mathys company.

“I had the chance and honor to train surgeons and treat fractures in Bombay and São Paulo with one of the prototypes—the ExFix Blue. This external fixator worked well with simple and complex fracture patterns. However, my experience showed that a system should be simple, but modular, especially in developing regions with surgeons with limited experience,” said Dankward Höntzsch. → [🕒]



© From Tansfix to Dispofix¹. Different coupling constructs were evaluated as economically and clinically viable solutions for the final external fixation device construct.

By the end of 1994, 98 cases (50 in India, 48 in Brazil) had full documentation and 96 percent of the surgeons involved reported that the handling of the system was easy and user-friendly. A new version came from the AO Development Institute (ADI), which was branded as Tansfix² (for Tanzania) and 200 additional cases were documented in Tanzania, Colombia, and the Solomon Islands. But the price, being around 50 percent of that of the regular AO tubular external fixation system, remained too costly for the local markets. → [©]

Finally, in 1998, the Transfix was commercially rebranded as Dispofix, a single-use, simple frame with one connecting rod, four clamps and four self-drilling bone pins. It was introduced by the Mathys company in India, Malaysia, the Philippines, Singapore, South Africa, and Thailand. In China, 1,000 Dispofix external fixators had already been sold. A teaching kit with a video was also produced and distributed. At a later stage, it was used in Malawi through a special fund from the German Government Development Agency (GTZ). A workshop organized by the Association of Surgeons of East Africa in Blantyre, Malawi, prepared the field and 28 orthopedic clinical officers and ORPs were trained in its use. → [©]

Due to the existing close partnership with the industrial partners³ of the AO, it was agreed that the activities should allow the manufacturers in the medium and long term to operate profitably and successfully in a given country.

1 Different prototypes of the clamp (from left to right): Frigg's clamp, United States military clamp, ExFix Light and Blue clamps, and the final version of the Dispofix (the Tansfix was similar to the Dispofix)

2 The Tansfix external fixator prototype was named after a project in Tanzania, where Uma Grob had established the Muhimbili Orthopaedic Institute (MOI).

3 The AO cooperated on a royalty agreement basis with Synthes GmbH, Straumann and Mathys.





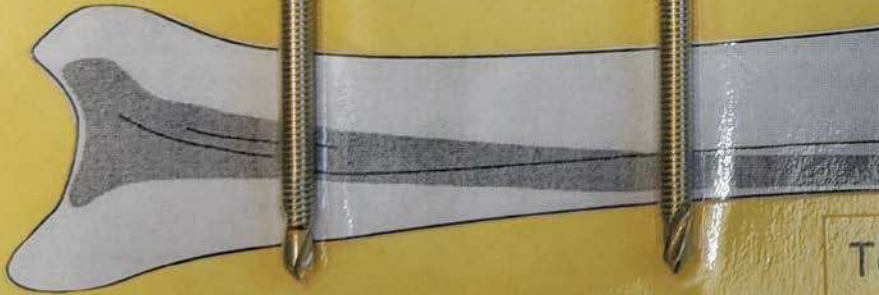
© Dankward Höntzsch presenting at the 13th European AOTK Experts' Symposium, Mainz, Germany, October 2018.
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The Tansfix

11m

Tansfix Clamp

Self dr



T
n



m Rod

drilling Schanz screw

teaching material,
not for clinical use!

© The AO Tansfix external fixator prototype.
Copyright: AO Foundation



© The Dispofix used for an open tibia fracture. Courtesy: Suthorn Bavonratanavech (Thailand)

In those early years, countries of Eastern Europe and the former Soviet Union—some of them considered as developing, due to the limitations of their healthcare systems—were also part of the discussion at the AO SEC. James L Hughes (United States) and Emmanuel Trojan (Austria) reported on several trips to Russia, Siberia, and Kazakhstan, establishing contacts and growing the network. Other initiatives followed in Lithuania, Estonia, and Latvia. A paperback edition of the AO Manual: AO Principles of Fracture Management and translations into Russian and Mandarin were other tasks that were accomplished with success.

The AO SEC was reinforced in 1996 with the election of new members with some of them representing global regions, such as Suthorn Bavonratanavech (Thailand) representing Asia Pacific, and Jaime Quintero (Colombia) representing Latin America. Max Landolt (Switzerland) would liaise with AO International and report to the AO International centrally.

From the beginning, in addition to training surgeons, it was felt that training ORPs was of paramount importance. The presence in the AO SEC of a devoted collaborator in the area of ORP education would become very significant in terms of building the local network, addressing specific needs, and supporting basic education, as it had been in the early days of the AO in Switzerland and Central Europe. Anne Murphy (Ireland) joined the AO SEC in 1996 to lead the development of the ORP education program.

By 1997, the idea of reverse fellowships was developed, where an experienced surgeon or ORP from a developed country would visit a hospital in a developing region for four to six weeks while offering their experience in appropriate trauma and fracture care. Lecturing on different topics, performing ward visits, establishing

contacts with hospitals and local authorities, and training future teachers were among the main activities. One of the first successful reverse fellowships was the visit by Jürgen Stadler (Germany) to Brazil in 1997. This visit led to the establishment at a later stage of the AO SEC Fellowship Program at the Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo (FMRPUSP) in Ribeirão Preto, Brazil. Surgeons from remote areas in Brazil would attend this teaching hospital for four weeks and receive appropriate training in trauma care, and in both surgical and conservative (nonoperative) techniques of fracture management.

Later, a Dutch team funded by the AO SEC, made regular visits to Koforidua, Ghana, leading to connection with Wilfred Addo, now the AO Alliance English-speaking Africa steering committee chair, and wider Ghana activities.

Discussions at the AO SEC addressed the need for having special basic surgical sets of instruments in the armamentarium and promoting the use of simpler techniques and standard implants that were used in the early days of the AO.

With the election of Paul Demmer (South Africa) and Cleber AJ Paccola (Brazil) in 1999 as regional representatives, the AO SEC gained new momentum. Both colleagues shared a solid experience in trauma care in critical regions on their respective continents and knew their regional networks and needs very well. The prior experience of Paccola would also prove to be of high value when the AO SEC Fellowship Program was formally established in 2000 in Ribeirão Preto, Brazil.

It is important to highlight that by 2000, and thanks to the commitment and enthusiasm of AO SEC members, a visible and active network had been established in several countries in Africa and Asia. Some initiatives were undertaken in Malawi, Tanzania, Ghana, Kenya, and Zambia, and at a later stage in Nigeria, India, Vietnam, and Nepal. It was clear for the committee that there was a need to focus on education programs and not to concentrate on the availability of equipment.



“My experience of 20 years in orthopedic outreach programs in southern and eastern African countries had shown me that implants were not what they needed. The doctors and nurses needed teaching of orthopedic and trauma management, appropriate for their environment.”

Paul Demmer (AO SEC chair, 2001-2009)

The programs would need some prerequisites:

- Clear objectives, sustainability and long-term planning, with a new appropriate curriculum
- Support from local authorities
- Involvement of local surgeons and ORPs
- Metrics to measure impact

EVOLUTION IN THE 2000s: FOCUS ON EDUCATION

From the beginning, it was foreseen that the committee would address major factors such as health economics, politics, education, and infrastructure that influence patient care in developing regions and specific countries. The AO's efforts would have to adapt substantially to each specific situation. It would require focusing efforts on fewer countries.

It was important to visit a country and assess its situation. Whatever activity or strategy to be implemented had to be integrated into the existing local healthcare system. Monitoring achievements was paramount. Sustainability had to be one of the main criteria for starting a project.

Paul Demmer took over as the AO SEC chair in 2001. He did a lot of traveling and made connections especially in English-speaking Africa. This was the start of building a sub-Saharan African network. His visits included one to Jim Harrison in 2001 in Blantyre, Malawi. He travelled with Klaus Maritz (Pretoria, South Africa) who created the East, Central and Southern African Orthopaedic Association (ECSAOA) with his support.

Regional representatives with specific responsibilities and the ORP position were also confirmed or appointed:

- Paul Demmer (South Africa), chair, represented Africa
- Anne Murphy (Ireland), was responsible for ORP Education
- Cleber AJ Paccola (Brazil), represented Latin America
- John Croser (Australia), represented Asia Pacific

In 2003, Susanne Bäuerle, who at the time was the AO International director of ORP Education, was elected as a member of the AO SEC. This would further strengthen the programs and events in ORP education. Prabodh M Desai (India) would join in 2004.

Urs G Jann started as the executive secretary in 1997, preceded by Stefan Wintsch and succeeded by Lars Kühn in 1998. Giovannina Jost joined as an administrative assistant in 1999 until she was succeeded by Polly Bühler in September 2012. Bühler's assignment was to coordinate with the AO SEC Committee, as the governing body, and with the network in the field, the courses and fellowships being executed in English-speaking Africa and in LMICs in the Asia-Pacific region. → [O]

Looking back at all that had been achieved since 1990, the committee concentrated its efforts on educational programs and in developing the necessary network. The AO SEC never had the intention of becoming a surgical mission entity in the developing regions. Moving confidently and prudently into the next decade, embracing growth and establishing a trained network of healthcare workers to allow sustainability and continuity proved to be successful in many countries in Africa, Asia, Oceania, and Latin America. The basic idea of AO education in developing countries was to “support a learning surgeon, providing appropriate care to patients according to local needs and available resources” (James L Hughes). This idea would prove to be successful in developing educational programs. Knowing and understanding specific needs with local medical leaders, healthcare authorities and if possible, in conjunction with medical centers and universities, were deemed essential. → [O]

SECURING RELEVANCE FROM 2010 TO 2014: CONSOLIDATING EDUCATION PROGRAMS

In 2010, John Croser was elected chair of the AO SEC and the committee further expanded its focus in sub-Saharan Africa, with one representative, Jim Harrison (United Kingdom), for the English-speaking countries, and one representative, Sylvain Terver (France), for the French-speaking countries. Both colleagues had a long history of experience and commitment in African countries and knew the field very well. Ram K Shah (Nepal) would coordinate the Asian region and Jose





© Susanne Bäuerle and Sylvain Terver,
AO SEC meeting during the Assembly of
AO Trustees Meeting, Lima, Peru, June 12, 2013.
Copyright: AO Foundation





📍 AO SEC meeting at the Assembly of AO Trustees Meeting in Amelia Island, Florida, United States, 2005. Copyright: AO Foundation

S Franco (Brazil) would supervise the Latin America region. Bäuerle would continue with the task of implementing ORP educational activities. This approach of regional representation would prove its value in reinforcing the local network and securing clinical efforts that would yield tangible results.



“We did not give money or goods but rather tried to stimulate an interest in improving trauma care. This approach was in contrast to the majority of aid offered to developing countries, which largely operated on a fly-in, fly-out basis.”

John Croser (AO SEC chair, 2010–2012)

Jim Harrison formed the first English-speaking Africa steering committee in 2010 and the French-speaking one soon after. These committees increased regional ownership and buy-in and helped grow the network. In English-speaking Africa, the AO SEC covered Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Uganda, Tanzania, Zambia, and Zimbabwe. In French-speaking Africa, activities were undertaken in Burkina Faso, Guinea, Senegal, Ivory Coast, Togo, Cameroon, Gabon, Democratic Republic of the Congo, and Burundi.

AO SEC courses, mainly on nonoperative treatment of fractures, as well as ORP courses were held almost every year in each country.

It is important to highlight the AO SEC’s support for and cooperation with scientific societies such as the College of Surgeons of East, Central and Southern Africa (COSECSA) and the East, Central and Southern Africa Orthopaedic Association (ECSAOA), and organizations like CareToMove, CURE International (CURE), and SIGN Fracture Care International (SIGN).

In Asia, educational courses for surgeons and ORPs were regularly held in Bangladesh, Cambodia, India, Mongolia, Nepal, Pakistan, and Sri Lanka. Fellowship programs were also established in India, Pakistan, and Thailand.

Major efforts in the form of local courses had been held in the Oceania region, which was composed of Papua New Guinea, East Timor, the Solomon Islands, and Fiji, but unfortunately were later affected by political instability and unrest.

The AO SEC Fellowship Program in Ribeirão Preto, Brazil, had proven to be a successful initiative. Each year, twelve orthopedic surgeons from underdeveloped

areas in Brazil were trained at the FMRPUSP Hospital in Ribeirão Preto, with an average stay of four weeks. By 2012, more than 300 fellows had attended the hospital as well as a second venue for the program, the Santa Casa Hospital in São Paulo.

In 2013, Joachim Prein (Switzerland) was elected chair of the AO SEC and successfully led it and its programs until the end of 2014.



“It was obvious that often, especially in less- developed countries, the patients suffered a lot from insufficient fracture care. It was a heavy burden for the people and caused a lot of misery.”

Joachim Prein (AO SEC chair, 2013-2014)

REFLECTIONS ON AO SEC ACHIEVEMENTS AFTER 24 YEARS

Since its establishment in 1990, the AO SEC had represented the social conscience of the AO. Its primary goal had been to improve care of the injured in developing countries by conducting or facilitating educational programs and events, as well as supporting individuals in the programs.

At the outset, AO SEC members wanted to develop specially adapted AO implants (external fixation devices, as described) available at low cost to developing countries. This effort resulted in an attempt to square the circle. This was due to several factors, but one key reason was that the implant production partners were fighting with back orders and double-digit growth in their key markets. Under these circumstances, the producers were not really in a position to engage in a second brand that would have been necessary for success in these markets.

From an AO perspective, the AO SEC had certainly enhanced awareness of the problems in developing countries within the AO. The content of AO courses was adapted to local needs. Reverse fellowship programs were successfully implemented and ORP fellowships were introduced. Courses on nonoperative (conservative)

treatment of fractures were held every year. The AO SEC distributed 5,000 paperback copies of the AO Manual at one quarter of the cost, plus 250,000 copies in Mandarin in China at 6 percent of the regular cost, and thousands were printed in Russian. Online learning supported the above efforts.

After more than 20 years of existence, the AO SEC's network had increased considerably and regular courses for surgeons and ORP were attended every year by hundreds of participants. Educational initiatives and fellowship programs, with the support of scientific associations and local hospitals, had been established. In several countries, the involvement of national and health authorities, as well universities and hospitals, was a significant step forward. The most important question that arose, initially in 2012, was how to secure sufficient funding and therefore sustain the impact and expand relevance for the future.

	2010	2011	2012	2013	2014
Total number of courses	34	41	45	54	45
Middle East and Africa	13	17	23	28	27
Asia	21	24	21	26	18
Number of participants	1,488	1,731	1,812	1,933	2,050
Middle East and Africa	505	710	943	1,009	1,191
Asia	983	1,021	845	924	859
Total number of faculty	317	383	382	393	340
Middle East and Africa	136	153	209	243	208
Asia	181	230	168	150	132

Table 1: AO SEC educational activities 2010–2014.

Statistics for the 2010–2014 period, for which validated data is available, show not only an impressive amount but also significant growth in the number of courses delivered, healthcare workers trained, and faculty (mainly regional) utilized.

From 2010–2014, the number of courses held increased from 34 to 45, with participants increasing from almost 1,500 in 2010 to over 2,000 five years later. There was a notable shift over time toward sub-Saharan Africa, where the needs were great, both in terms of numbers of healthcare workers and quality of training.

These courses and reverse fellowships were delivered to 34 countries in 2014, when the transition to the AO Alliance occurred, namely in sub-Saharan Africa: Cameroon, Ethiopia, Ghana, the Gambia, Kenya, Malawi, Tanzania, Nigeria, Rwanda, Sierra Leone, Uganda, Zambia, Zimbabwe, Benin, Togo, Burkina Faso, Burundi, Congo, Gabon, Ivory Coast, and Senegal; Asia: Afghanistan, Bangladesh,

Cambodia, Myanmar, Nepal, Vietnam, Sri Lanka, Thailand, Pakistan, India, and Laos; and Latin America: Brazil and Mexico. → [9] [10] [11]

In the latter years, most AO SEC courses conducted pre- and post-course knowledge questionnaires. These consistently showed marked advances in the knowledge base of participants. Reports of the impact of AO SEC education on clinical care had been anecdotal but encouraging. Some investment in data collection could sample the impact of courses in advancing clinical care. English-speaking Africa, in time, led French-speaking Africa in trauma and orthopedic educational development. The 14-year versus four-year presence of the AO SEC may well have been a contributing factor in this difference.

The AO SEC served less-developed countries for more than 20 years. In the last 14 years, it developed tailor-made educational initiatives to improve fracture care in low- and middle-income countries (LMICs) in sub-Saharan Africa and Asia. These face-to-face, on-site courses and fellowships adopted educational techniques established by the AO and adjusted the content according to local needs and resources. The nonoperative courses of the AO SEC proved to be a masterstroke, not just in appropriate education with great potential to impact patient care, but less obviously in identifying surgeons who really cared about fracture care at the national level and enabling them to connect with their national healthcare workforce. This fostered intranational communication, priority setting, and referral patterns in trauma care.

As it occurred in 1988 in Baden-Baden, Germany, the Assembly of AO Trustees in Lima, Peru, in 2013 proved again to be the best platform to convey ideas, generate momentum, and crystallize the initiatives that finally led to the creation of a new, independent entity.

The concept of the AO Alliance was born. → [12]



9 Participants at an AO SEC Basic Principles of Fracture Management course for surgeons and operating room personnel, Dar es Salaam, Tanzania, November 2014.
Copyright: AO Foundation



6 Jim Harrison (green shirt) guiding a participant at an AO SEC practical exercise for surgeons, Zambia, October 2007.
Copyright: AO Foundation



① Nurses applying a below-knee cast at an AO SEC practical exercise, Nepal, 2014.
Copyright: AO Foundation



① Left to right: Sylvain Terver, Polly Bühler, Joachim Prein, Ram K Shah, Jim Harrison, John Croser, Susanne Bäuerle, Paul Demmer, Sérgio Franco. The last AO SEC Committee meeting, Davos, Switzerland, December 2014.
Copyright: AO Foundation



Trauma and orthopedic patient ward, Yangon, Myanmar, 2015. Copyright: AO Alliance

CHAPTER II

The burden of injury in low- and middle-income countries

Manjul Joshipura,
with contributions from Jim Harrison and Abdoulie Janneh

“*A silent
and neglected
epidemic.*”

– Anonymous –

CHAPTER II

THE BURDEN OF INJURY IN LOW- AND MIDDLE-INCOME COUNTRIES

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THE PROBLEM

Death and disability from injury

Every day, over 14,000 people lose their lives as a result of an injury (World Health Organization [WHO], 2014). The spectrum of injury mechanisms includes road traffic injuries, interpersonal violence, falls, burns, conflicts, drowning, electrocution, natural disasters, etc. These deaths affect families and communities, severely compromising their livelihoods and existence.

The millions of deaths resulting from injury each year represent only a small fraction of the impact on those injured. Tens of millions of people suffer injuries that lead to hospital admissions, visits to emergency departments, or medical consultations. The relative numbers of fatal and nonfatal injuries are often graphically depicted in the form of a pyramid, as shown in Figure 1.

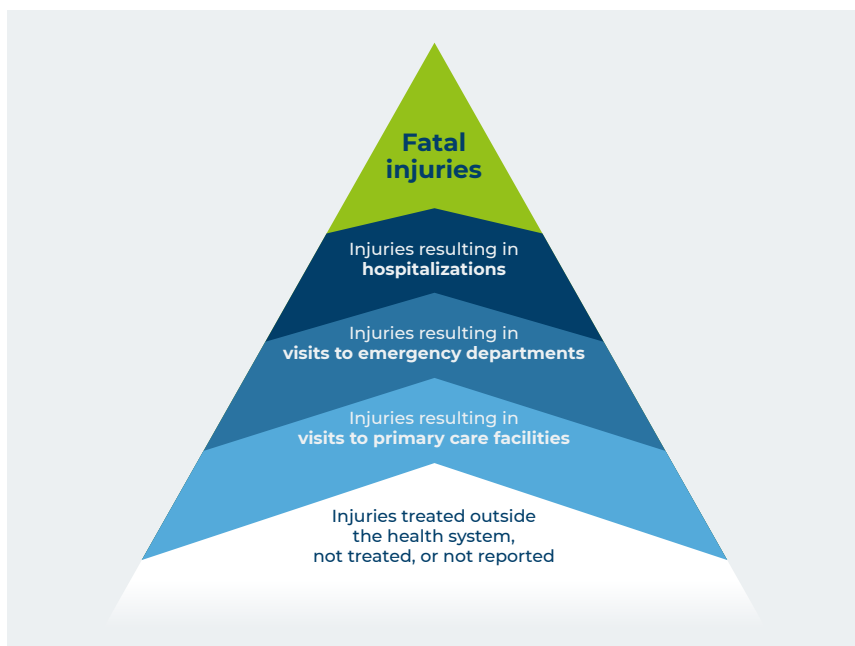


Figure 1. The injury pyramid illustrates the relative numbers of fatal and nonfatal injuries.

Note: From World Health Organization, (2014), *Injuries and Violence: the Facts 2014*.

https://www.who.int/violence_injury_prevention/media/news/2015/Injury_violence_facts_2014/en/

In addition to the severity of the injury, there are several factors that vary by country and that determine the shape of the pyramid, such as access to emergency trauma care and the accuracy of the information available. Many of those who survive an injury are left with temporary or permanent disabilities. It is estimated that injury-related disability in many countries is ten times the number of injury-related deaths. (World Health Organization, 2014).

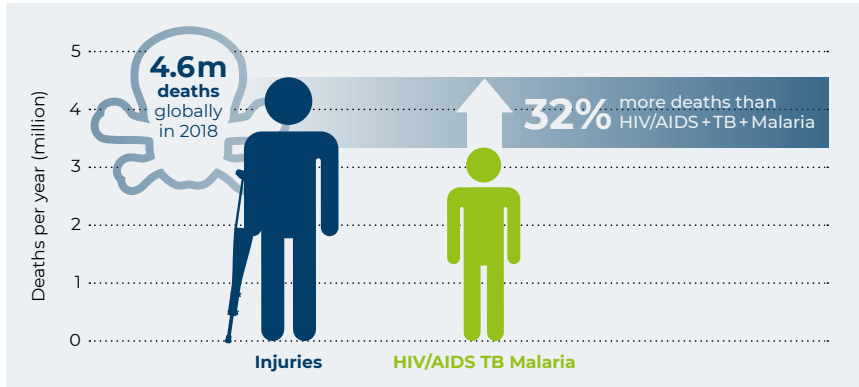


Figure 2. Deaths from injuries far outnumber deaths from many communicable diseases. Note: From the WHO Global Health Observatory 2018. https://apps.who.int/iris/bitstream/handle/10665/149798/9789241508018_eng.pdf

Injuries account for 11 percent of the global burden of disease (World Health Organization, 2014). Close to 5 million people die each year from injuries. This accounts for 9 percent of the world’s total deaths, nearly 32 percent more than the number of fatalities that result from HIV/AIDS, tuberculosis (TB), and malaria combined (see Figure 2). Approximately a quarter of these 4.6 million deaths from injury are the result of violence (interpersonal, collective, and self-directed), while road traffic injuries account for nearly a quarter. Two of the three leading causes of injury deaths—road traffic incidents and falls—are predicted to rise in the ranking of causes of death. As can be seen in Table 2, road traffic injuries are predicted to become the seventh leading cause of death by 2030, with falls rising to become the 17th leading cause of death.

Ranking of injuries within the leading causes of death

Rank	2015	2030
1	Ischaemic heart disease	Ischaemic heart disease
2	Stroke	Stroke
3	Lower respiratory infections	Chronic obstructive pulmonary disease
4	Chronic obstructive pulmonary disease	Lower respiratory infections
5	Diarrhoeal diseases	Diabetes mellitus
6	HIV/AIDS	Trachea, bronchus, lung cancers
7	Trachea, bronchus, lung cancers	Road injury
8	Diabetes mellitus	HIV/AIDS
9	Road injury	Diarrhoeal diseases
10	Hypertensive heart disease	Hypertensive heart disease
11	Preterm birth complications	Cirrhosis of the liver
12	Cirrhosis of the liver	Liver cancer
13	Tuberculosis	Kidney diseases
14	Kidney diseases	Stomach cancer
15	Self-harm	Colon and rectum cancers
16	Liver cancer	Self-harm
17	Stomach cancer	Falls
18	Birth asphyxia and birth trauma	Alzheimer's disease and other dementias
19	Colon and rectum cancers	Preterm birth complications
20	Falls	Breast cancer

Table 2. Ranking of injuries within the leading causes of death, comparison between 2015 and 2030. Note: From World Health Organization. (2013). *Global Health Estimates Summary Tables: Projection of Deaths by Cause, Age and Sex*. https://www.who.int/healthinfo/global_burden_disease/projections2015_2030/en/

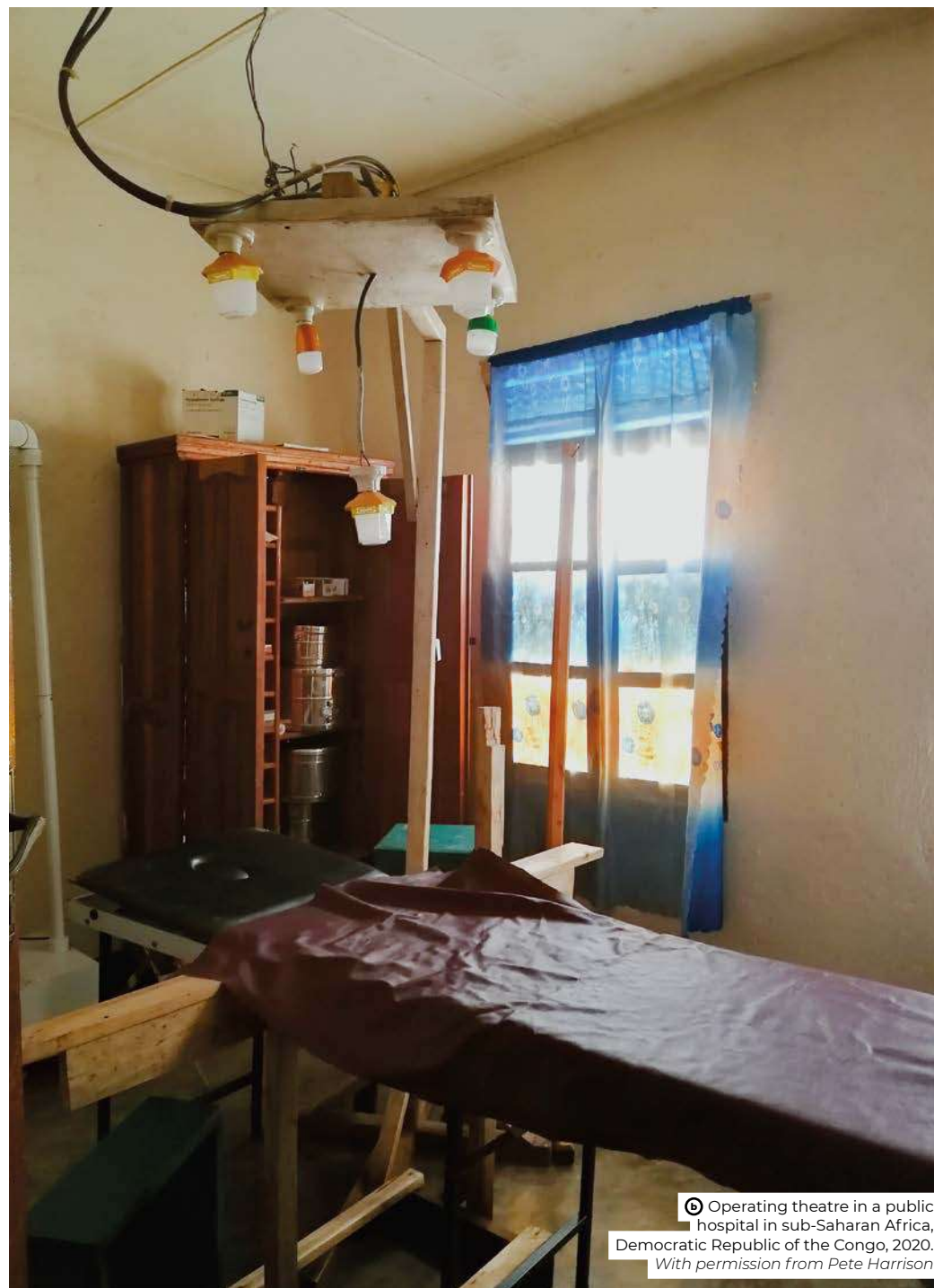
Approximately 90 percent of the injury burden is borne by LMICs. Injury is a significant cause of death and disability in all countries, but it is not evenly distributed around the world or even within countries—some populations are more vulnerable than others. Even within countries, injuries reveal strong socioeconomic disparities. People from poorer economic backgrounds have higher rates of death from injury and nonfatal injuries than wealthier people. Injuries affect all age groups but have a higher impact on young people and people in their prime working years. Road traffic injuries are the leading cause of death worldwide among those aged 15–29 years.

Impact on individuals, communities, and economies

Injuries have an immense physical and emotional impact on those affected, but they also cause considerable economic losses to the victims, their families, and countries. These losses arise from the direct cost of treatment, including rehabilitation, as well as reduced or lost productivity for those killed or disabled, and for family members who need to take time off work to care for the injured. There are a few global estimates of the costs of injury, but the following examples illustrate the financial impact of injuries on national economies and individual families:



© Swiss operating theatre in 2020.
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© Operating theatre in a public hospital in sub-Saharan Africa, Democratic Republic of the Congo, 2020. With permission from Pete Harrison

Road traffic deaths and injuries cost approximately 2 percent of the gross domestic product (GDP) in high-income countries (HICs) and as much as 5 percent of GDP in some LMICs. These costs include medical bills, vehicle damage, and lost productivity, and total around USD 1.9 trillion a year globally (Economist Intelligence Unit, 2018).

Injury remains among the most neglected global health issues of our time. Paradoxically, other health issues with lesser mortality and impact have received more global attention and funding. While prevention remains the primary foundation of injury control, the enormous potential contribution of secondary and tertiary prevention is almost entirely absent from the current global discussion. The human cost of this neglect is staggering and is borne disproportionately by the most vulnerable: fatality rates from serious injury in LMICs are much higher than those in HICs. Current inequities in care mean that patients with life-threatening but survivable injuries have much worse outcome in LMICs than in HICs (Gosselin et al, 2015). For the same injury, the survival rate in Africa is one-third of that in HICs. For serious injuries, the survival rate is one-sixth. ← [G] [G]

The Lancet Commission on Global Surgery report, *Global Surgery 2030* (Meara et al, 2015), identified that many LMICs are facing a multifaceted burden of injury. Surgical care is essential for the treatment of injuries and surgical services represent an integral component of a functional, responsive, and resilient healthcare system. In view of the large projected increase in the incidence of road traffic injuries in LMICs, the need for surgical services in these regions will continue to rise substantially from now until 2030. The reduction of death and disability from injury hinges on access to surgical and anesthesia services, and the necessary equipment, which should be available in a timely fashion and be safe and affordable to ensure good outcomes.

The rate of motorization and industrialization is growing due to economic development in LMICs. Sub-Saharan Africa has a negligible share of motorized vehicles—vehicle ownership of three per 100 persons against the global average of 18 per 100 persons—but has the highest rate of road traffic fatalities, with Nigeria leading the group. Each year, many survivors are left with a permanent disability, most often related to the musculoskeletal system.

Vulnerable road users—children, pedestrians and cyclists—are common victims. Besides the absolute increase in road traffic incidents in LMICs, there are more deaths and injuries per crash than in HICs, as each vehicle carries more passengers. The chances of survival for those seriously injured are also less in LMICs. Considering the poor quality of road infrastructure, the number of unroadworthy vehicles, the lack of road safety laws or their enforcement, and the paucity of

prevention strategies, it comes as no surprise that the burden of road traffic crashes is increasing exponentially. → [C]

The lack of any social safety net is another significant difference between HICs and LMICs, directly affecting trauma care. Because of these social hardships and other true and hidden costs, patients are reluctant to seek treatment unless they deem it necessary and often object to surgical treatment. For patients coming from remote areas, even if treatment is free, time away from work and transportation costs are barriers to care. Many patients do not return for follow-up consultations unless there is a significant problem. All these elements need to be factored in when considering treatment and healthcare system implementation for better care of the injured in LMICs.

NEEDS TO BE ADDRESSED

Human resources

Human resources, especially the surgeons needed to treat the injuries, continue to be a major bottleneck in LMICs. In terms of density, low-income countries (LICs) have 0.7 surgeons per 100,000 population, compared to 56.9 per 100,000 population in HICs (Holmer et al, 2015). There are also significant differences regionally. Africa and South Asia are especially underserved.

The Lancet Commission on Global Surgery recommended the ratio for LMICs be raised to 20 per 100,000 population by 2030. In addition to workforce shortages, the region has a significant maldistribution issue. Data indicates that 71 percent of surgeons practice in urban areas with populations greater than 500,000. Overall, in Africa, 41 percent of the population lives in urban areas, whereas this number in countries like Malawi is only 17 percent.

Attracting medical students and junior doctors to surgical training programs remains difficult. Clinicians across Africa complain that the brightest medical graduates choose public health careers because nongovernmental organizations (NGOs) and foreign agencies pay more for research assistants and interpreters than doctors can earn working in public hospitals. Lifestyle concerns, poor remuneration, and the risk of occupational exposure to HIV also affect their decisions to undertake surgery as a career. Poor healthcare infrastructures that preclude them from offering proper care to the population also discourage junior doctors from undertaking surgical training programs (Kollias et al, 2010).





© Unsafe motorcycle ridership in Malawi, 2014.
Courtesy: Nicholas Lubega

Infrastructure

Adequate healthcare infrastructure is vital to the delivery of efficient trauma and fracture care. It is equally important to have some basic prehospital care services to get injured patients to a healthcare facility as soon as possible, ideally within the so called 'golden hour'¹. The outcomes of many serious traumatic conditions, especially open fractures and dislocations, are time sensitive. Therefore, an efficient prehospital care system is important.

Injuries, especially fractures, often require operative treatment that should be accessible to all those who need it. In LMICs, hospital-based infrastructure often lacks essential equipment and implants necessary for fracture treatment. Aseptic operating theatres, anesthesia services, postoperative care, blood banking, imaging capabilities, surgical instruments, and orthopedic implants are the main pillars of essential surgical services for fracture treatment. Unfortunately, there are significant gaps in availability of this infrastructure across LMICs and therefore lack of appropriate infrastructure remains a major challenge in treating injured patients in these countries.

Clinical research

Clinical research helps to generate useful actionable information, on the basis of which the scale of the problem and scope for improvement of the system can be identified. A critical pool of skilled individuals is essential for the development of clinical research and the translation of this knowledge to improved health outcomes. Despite the World Health Organization (WHO) declaration that “well planned health research is fundamental to the improvement of health in all countries,” the reality remains that the vast majority of clinical research continues to be designed by and conducted on a small minority of the world’s population living in high-income countries (Graham et al, 2019). To strengthen clinical research in any country or geographic region, an important starting point is to strengthen the existing capacity of trained and active clinical researchers within that area. Medical and health research councils in LMICs have recognized a lack of expertise in clinical research capabilities with a shortage of staff with statistical, analytical and managerial skills. These limited capacities pose a serious challenge for the effective translation of clinical research questions, the development and implementation of comprehensive research proposals, and the ability to oversee complex clinical research projects.

1 The golden hour is the first hour following a serious injury.

Trauma registries

Trauma registries are databases created to monitor and enhance the quality of trauma care and public health programs related to injury prevention, treatment, and research. For decades, trauma registries have been used in HICs for injury surveillance and clinical governance, but their adoption is minimal in LMICs. Paradoxically, LMICs face a disproportionately high burden of injury with few resources available to address this. Despite these resource constraints, several hospitals and regions in LMICs have managed to develop trauma registries to collect information related to the injury event, process of care, and outcome of the injured patient (Chokotho et al, 2019). While the implementation of these registries is a positive step forward in addressing the injury burden in LMICs, numerous challenges still stand in the way of maximizing their potential to inform injury prevention and mitigation and improve the quality of trauma care in LMICs.

Awareness and funding

Awareness

Essential surgery, which includes trauma care, has traditionally been neglected as a public health strategy due to the misperception that it is costly and resource-intensive and benefits are few, contrary to maternal, newborn and child health (MNCH) issues and communicable diseases like HIV/AIDS, malaria, and tuberculosis. This perception appears to be changing. Over the past several years, surgical care has received greater attention as a public health intervention in LMICs, leading to *The Lancet* Commission on Global Surgery report, *Global Surgery 2030*, an entire volume of *Disease Control Priorities in Developing Countries*, and a resolution at the 68th World Health Assembly titled *Strengthening Emergency and Essential Surgical Care and Anesthesia as a Component of Universal Health Coverage*.



“We are quiet about trauma and injuries in Africa. They are a huge killer. I have met every head of state in Africa, but we never talked about injury prevention or trauma care. We need to build awareness and build capacity. The AO Alliance is training doctors in a number of African countries, but we need to scale up and replicate the projects.”

Abdoulie Janneh, AO Alliance Board of Directors member →





© Abdoulie Janneh, AO Alliance Board of Directors member (former executive director and under-secretary general of the United Nations Economic Commission for Africa [UNECA]) addressing the Assembly of AO Trustees during the AO Alliance breakout session, Basel, Switzerland, July 2018.

Copyright: AO Foundation

Funding

There are proven solutions, both affordable and feasible—but the global community has failed to respond adequately. Despite causing substantially fewer deaths and disabilities than injuries, three conditions, HIV/AIDS, tuberculosis and malaria, received 36 percent of development aid allocated to health in 2017, while injury care received only 1 percent. In other terms, injury care received USD 0.04 per disability-adjusted life years (DALY) incurred, while HIV/AIDS, TB, malaria, and MNCH received from USD 4 to 45, or 100 to 1,000 times as much relative to their contribution to the global burden of disease. From a health economics perspective, injury treatment outcomes were much less expensive to avert DALYs, compared to the cost of averting DALYs due to other causes, such as the diseases mentioned above. There is recent recognition that injury and other noncommunicable diseases now cause more global deaths than communicable diseases, even in LMICs. However, focus is largely on chronic and lifestyle-related noncommunicable diseases which affect older people, and still not on injury which disproportionately affects younger people in LMICs (Bukhman et al, 2020).

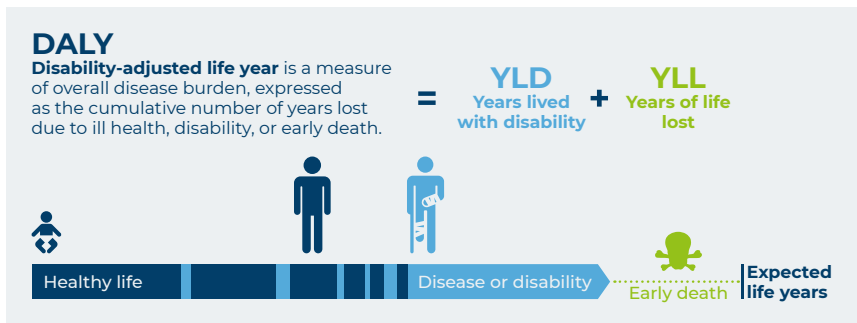


Figure 3. Disability-adjusted life year (DALY) explained.

The DALY is a scientifically accepted measure to reflect the burden of disease. It aggregates the total health loss at the population level into a single index by summarizing premature mortality in years of life lost (YLLs), and nonfatal health outcomes in years lived with disability (YLDs). Thus, the DALY provides a more comprehensive measure of the relative magnitude of different health problems. Globally, DALY rate due to injury is over 10 percent of total DALYs (due to all causes) and in actual terms, it is 250 million DALYs as per 2013 estimates.

For the ministries of health, there are several competing health sector priorities, and their limited health budget gets allocated disproportionately to perceived national priorities ahead of trauma care. Private insurance and other social security methods of financing care have not fully matured to cover the entire population in LMICs.

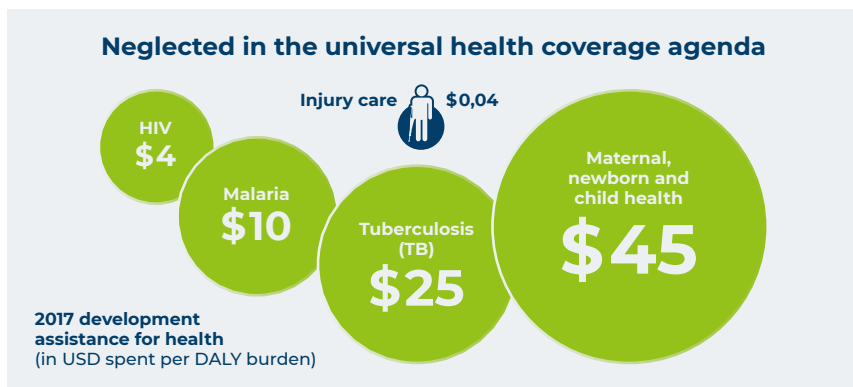


Figure 4. Injury care receives a fraction of the financial support provided to other global health issues. Notes: From: Institute of Health Metrics and Evaluation. (2018). *Flows of Global Health Financing*. <https://vizhub.healthdata.org/fgh/>
From: World Health Organization. (2019). *Trauma care development and development assistance: opportunities to reduce the burden of injury and strengthen health systems*. <https://www.who.int/bulletin/volumes/97/5/18-213074/en/>

COST AND EFFECTIVENESS OF INTERVENTIONS

Costs per DALY averted for injury-prevention interventions ranged from USD 11 for speed bump installations to USD 17,000 for drunk driving and breath testing campaigns in Africa. The cost-effectiveness of interventions for care of the injured is less well studied. The average cost of treatment of injury varies widely across LMICs, with mean costs ranging from USD 14 to USD 17,400 due to the large breadth of fractures and the variation in treatment types. Nonoperative treatment for long bone fractures is commonly offered in many LMICs. However, wherever operative treatment is available, it generally offers better outcomes and is cost-effective even in LMICs. For example, surgery (internal fixation) for a femoral shaft fracture had better clinical outcomes and was more cost-effective than traction (USD 888 versus USD 1,107 per DALY averted respectively) in a study in Cambodia (Gosselin et al, 2009). This contradicts the often-held opinion that mainly, or only, nonoperative treatment is appropriate in LMICs. It underlines the necessity for some training and education in operative treatments, particularly for open fractures.

The Lancet Commission on Global Surgery report, *Global Surgery 2030* (Meara et al, 2015), shows that a lack of adequate surgical services impedes economic

development in LMICs where access to surgical care is limited. Without urgent investment in the scale-up of surgical services, these conditions will be a major barrier to national income growth, economic productivity, and overall human welfare.

SOLUTIONS

Evidence-based solutions, ranging from better prevention strategies to efficient rehabilitation services, are available across the trauma care spectrum. Improving access and quality of trauma care through the development of integrated trauma systems has been proven to be effective in saving lives and improving clinical outcomes (Gosselin et al, 2015). It has been estimated that addressing inequalities in trauma care in LMICs could reduce mortality by up to 40 percent, saving more than 2 million lives each year (Mock et al, 2012). To address the injury epidemic in LMICs, interventions at multiple levels are required.

For road traffic injury prevention strategies, there are a number of interventions outlined by the WHO. Some of them are described here.

Prevention

Despite growing awareness of the magnitude of the problem, attention to injury and violence prevention and control among policymakers and those funding global public health programs remains disproportionately low. Injury-related deaths are increasing in many LMICs. This is particularly alarming given that many injuries can be prevented; there is a broad range of strategies based on validated scientific evidence that have been shown to be efficient and cost-effective at reducing injuries and violence, and these strategies need to be more widely implemented. The WHO recommends the following evidence-based strategies for the prevention of road traffic injuries (WHO, 2018):

- Setting and enforcing laws on speeding, drunk and drug driving, motorcycle helmets, seatbelts, and child restraints;
- Developing safer roadway infrastructure, including engineering measures to reduce speeds in urban areas and separate different types of road users;
- Implementing vehicle and safety equipment standards;
- Setting and enforcing laws on daytime running lights for motorcycles and cars; and
- Introducing a graduated driver licensing system for novice drivers.

Trauma systems

Although the goal must be to prevent injuries from occurring in the first place, much can be done to minimize their impact and consequences. Providing quality support and care to victims of injuries can prevent fatalities, reduce the amount of short-term and long-term disabilities, and help those affected to cope with the impact of violence or injuries on their lives. Improving the organization of, planning and access to trauma systems, including prehospital and hospital-based care, can help reduce the effects of injuries. Establishing an effective trauma system and applying interventions that have been implemented in HICs leading to significant reductions in both morbidity and mortality should be followed in LMICs with locally suitable adaptation.

The challenges of establishing trauma systems in LMICs include setting up trauma centers in appropriate locations, staffing these with well-trained personnel, and establishing sustainable funding streams to support their work. Partnerships with public health groups (including ministries of health) for an integrated approach are needed for successful implementation.

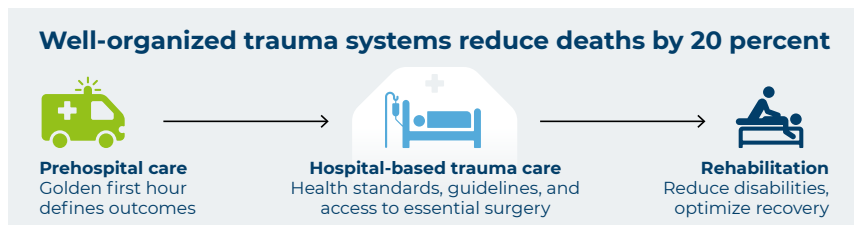


Figure 5. Trauma systems encompassing prehospital, hospital-based and rehabilitation care.

Prehospital care

Prehospital care can be provided by offering care at the scene and during transportation to a definitive care facility. The elements of prehospital care include, at a minimum, prompt communication and activation of the system, the prompt response of the system, and the assessment, first-aid treatment, and transport of injured patients to formal healthcare facilities, when necessary (Sasser et al, 2005). Most HICs have developed advanced emergency medical services (EMS), but in many LMICs, prehospital care is often nonexistent or only available to certain groups of the population. First responders and trained community personnel often offer prehospital care, and a variety of transport options are used to transfer patients to the hospital. There is good evidence to suggest that many lives can be saved if efficient prehospital care systems can be developed (Sasser et al, 2005). An investment into

strengthening the prehospital care system can help save many lives and is found to be a cost-effective intervention in many LMICs (Gosselin et al, 2015).

Hospital-based care

Timely and appropriate definitive care of the injured can be instituted only in a hospital and, therefore, hospital infrastructure and capabilities for diagnosis and treatment for the injured are crucial. Many healthcare systems categorize and designate some hospitals as trauma centers if they have certain essential infrastructures and personnel to take care of the injured. Seventy-five percent of the severely injured will present with fractures and/or some musculoskeletal trauma. With the rise in the incidence of injuries, orthopedic trauma services must be developed to ensure appropriate patient care. Addressing this need may not only reduce premature death and disability, but may also have positive effects on welfare, economic productivity, and long-term development in LMICs. Orthopedic trauma care is essential and must be a priority in the linear development of global health systems. The education of surgeons, non-physician clinicians, and ancillary staff in LMICs is central to improving access to, and quality of, care. Volunteer surgical missions from HICs can sustainably expand and meaningfully strengthen orthopedic trauma care only when they serve a local need and build local capacity.

Rehabilitation

Rehabilitation is an important component of an integrated trauma system. Rehabilitation forms the final, and generally the longest, phase of treatment. The goals of rehabilitation are to improve physical and mental health, reduce disability, and enhance personal autonomy and productivity when injuries leave behind residual disabilities. Much of the disability from musculoskeletal injuries should be eminently preventable through proper rehabilitation. The rehabilitation of patients with injuries should integrate with the acute treatment phase to maximize recovery of independent function. Some key elements of rehabilitation services include physiotherapy, occupational therapy, prosthetic services, psychological counselling and reinsertion into the workplace. The functional recovery of severely injured patients often involves complicated rehabilitation issues, coordination of the input of multiple professionals, and treatment of ongoing medical problems. The fields of physical medicine and rehabilitation have arisen in response to this need and have advanced neuropsychological and speech therapy professionals to offer such therapies. Unfortunately, rehabilitation remains a largely neglected area in LMICs. Therefore, LMICs are home to 90 percent of people with disabilities, and they are typically among the poorest.

SUMMARY

Injury remains a severely neglected public health problem in LMICs, where 90 percent of deaths from injury lie. It has an immense impact on individuals, families, societies, countries, and their economies. Several evidence-based solutions are available to prevent and control the growing burden of injury. A concerted multi-sectoral global effort is needed urgently to address this public health problem. Developing trauma systems that will encompass the entire spectrum of injury, from prevention to rehabilitation, is important to addressing the burden of disability and mortality in LMICs worldwide.



Child with a fracture of the femur being treated in traction, Nepal, April 2015. Copyright: AO Alliance

CHAPTER III

The AO Alliance is born

Rolf M Jeker

“*We envision a world
where timely and appropriate
fracture care is accessible
to everyone.*”

– AO Alliance vision –

CHAPTER III

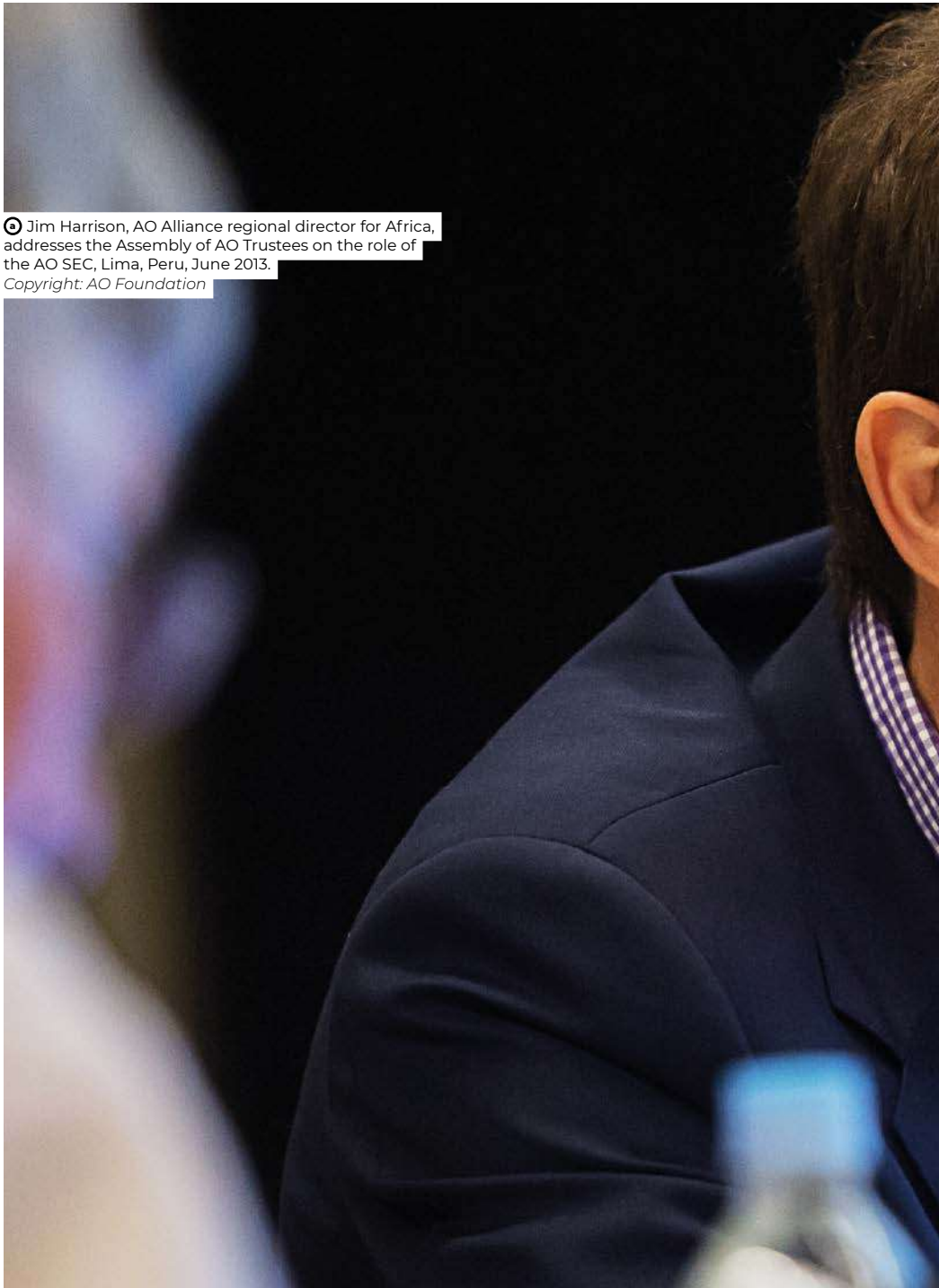
THE AO ALLIANCE IS BORN

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MATURING THE IDEA

The AO Socio-Economic Committee (AO SEC) first raised Rolf M Jeker's attention and interest in the early phase of his term as CEO of the AO and vice-chair of the AO Foundation Board (AOFB) in 2011. Several factors contributed to that:

- Jeker's professional background which had focused intensely on development matters in the Swiss government as well as in the private sector (at the Société Générale de Surveillance [SGS]). While covering all areas of the world, his earlier experience focused primarily on Africa, with time spent in Zambia (as advisor and director of research, and later in the Ivory Coast as executive director in the African Development Bank).
- A presentation by Jim Harrison on death and disability from injury in LMICs at the Assembly of AO Trustees in Lima in June 2013. It was the first wake-up call to understand that these health issues had overtaken the weight of all communicable diseases together. The latter were on everybody's mind and agenda when it came to proposing health-related measures and contributing funding. Death and disability from injury is not only growing but is evidently a silent and neglected epidemic to which countries and the world health community pay little attention. Indeed, this interest in LMICs was not a new one. Chris van der Werken, past president of the AO, had presented the problems LMICs were facing—trying to raise awareness and stronger involvement of the AO—in 2005 during the Assembly of AO Trustees in Amelia Island, Florida, United States. → [📄]
- The conviction that the AO needed a new orientation to remain relevant and to renew the uniqueness that it had under the leadership of its founders, back when the trauma burden presented a huge problem in HICs similarly to today's issues in LMICs. With its industrial partners, the AO has contributed significantly to this success, albeit only exclusively focusing on treatment. The problem is largely resolved in HICs. The AO's contribution today is still relevant, but no longer unique.
- The AO SEC budget was under great risk of being subjected to strict industry compliance rules and the joint education program process



© Jim Harrison, AO Alliance regional director for Africa, addresses the Assembly of AO Trustees on the role of the AO SEC, Lima, Peru, June 2013.

Copyright: AO Foundation



(CONCERTO)⁸. The general trend pursued by one of the industrial partners' compliance rules was to subject all AO educational activities to standard industry compliance processes as the unrestricted grant by the industrial partner was an integral part of the overall AO budget⁹.

- The AO is an education and research organization, and not a development organization, which would be needed to deal with low-income countries (LICs) and their specific needs.

PREPARING THE STAGE FOR THE CREATION OF THE AO ALLIANCE

From Crans Montana to Lima

The first time the idea was presented was in a presidential line¹⁰ retreat in Crans Montana, Switzerland, on February 18–19, 2012. The initial reaction to becoming more active in LMICs was a rather neutral one, with the exception of Jaime Quintero, who was involved in AO SEC activities and therefore was particularly interested in the idea. He was in line to succeed Norbert Haas as the next president of the AO. He subsequently defined the establishment of the new entity as a priority item during his presidency.

From that moment in February 2012 in Crans Montana, where the first internal discussions began, more than two years passed before officially establishing the AO Alliance in December 2014. This time was used to prepare actionable, detailed options and plans. The time was used even more so for internal consultations and decision-making by the AO clinical divisions' international boards, the AO Foundation Board (AOFB/AOVA¹¹), and the Assembly of AO Trustees, which consisted at the time of over 160 members. Legally speaking, the final decision belonged to

8 CONCERTO was an educational event planning software solution developed by the AO and the industrial partner.

9 This issue was subsequently resolved a few years later under the new cooperation agreement which introduced the 'two-flow concept' allowing detailed allocation to individual budgetary lines.

10 The presidential line consisted of the president, past president, president-elect and CEO/vice-chair of the AOFB. It was later abolished as a formal decision-making unit.

11 The AOVA was the predecessor to the AO Foundation Board, with a different composition and status.

the AOFB/AOVA, but the buy-in from the AO trustees and their leading group of past presidents was an absolute prerequisite.

These consultations were done in various stages, namely at a special breakout session at the Assembly of AO Trustees in Lima, Peru, in June 2013, under the leadership of then-AO president Jaime Quintero. Jim Harrison made an introductory presentation on the gravity of the problem and how it fit with the AO mission. Three subgroups debated various topics. The outcome was very positive and gave the green light for the pursuance of the project. The next major step would be the creation of a task force to provide guidance and make recommendations upon which the AOFB would mandate the CEO to work out an implementation plan.

The task force

Terms of reference

The task force, under the chairmanship of Joachim Prein (AO SEC chair) and cochaired by Rolf M Jeker (CEO of the AO and vice-chair of the AOFB) met on February 13-14, 2014, in Zurich, Switzerland. → [©]

Its members were Jim Harrison (AO SEC), Claude Martin Jr (AO Trauma), Osmar Moraes (AO Spine), Ram K Shah (AO SEC), Travis Tollefson (AO CMF), Nicholas Lubega (AO SEC), and Michel Orsinger (global president of DePuy Synthes) as guest ad personam. With this composition, all AO clinical divisions except AO VET were involved in the process. → [©]

The task force's mandate was to focus primarily on the objectives, scope, and activities of the new organization, and to provide some preliminary guidance on the following questions:

- Governance and operational structure;
- Definition of territories (ie, geographic scope);
- Division of responsibilities between the new foundation and the AO clinical divisions; and
- Allocation of funding to different programs:
 - Core activities;
 - Surgeon-led initiatives;
 - AO clinical divisions' initiative;
 - Proposals for the name of the new entity; and
 - Funding opportunities.

ⓑ For a seamless transition:
Joachim Prein (left) and Rolf M Jeker (right)
at the AO Alliance founding session,
Davos, Switzerland, December 13, 2014.
Copyright: AO Foundation







© Left to right: Travis Tollefson, Jim Harrison, Ram K Shah, Joachim Prein, Rolf M Jeker, Nicholas Lubega, Osmar Moraes, Michel Orsinger, and Claude Martin Jr, new entity task force meeting, Zurich, Switzerland, February 2014.
Copyright: AO Alliance



The guidance and recommendations given by the task force proved invaluable and were largely implemented.

Objectives of the new entity

The task force came up with seven recommendations which, in their view, would also provide the framework for defining the name of the new entity (see below) and the mission statement. These were to:

- Enhance care of patients with fractures and musculoskeletal conditions, including spine and craniomaxillofacial-related ones, in less-developed countries (LDCs);
- Provide locally adapted education promoting appropriate treatment of fractures in LDCs;
- Establish local sustainable capacity to reduce external dependence;
- Foster the development of local clinical role models;
- Enhance understanding of the trauma problems in LDCs and the effectiveness of potential solutions;
- Attract healthcare workers and other actors eager to engage and help develop the new entity in LDCs; and
- Develop and promote LDCs to achieve AO clinical division country member status.

The proposed vision statement was: “Partnering to enhance patients’ lives and transforming fracture care in less developed countries.”

While local capacity building was the sole emphasis, it was also discussed what the entity would not be: a surgical mission organization, a fly-in/fly-out mission, a charity, or a funding agency.

Scope and activities

Five recommendations were submitted to address activities and instruments to provide care, as well as to define the geographic scope:

- The new entity would focus on four key areas: education, fellowships, clinical research and clinical care support (infrastructure);
- The target group would be LMICs, with a particular emphasis on LICs, primarily in sub-Saharan Africa and Asia;
- The primary focus would be on countries where AO clinical divisions are absent;

- Integration of current AO SEC activities was an integral part of the initiative; and
- Clear definition with the AO clinical divisions to avoid duplication and overlaps by defining the lead entity (geography, ownership and accountability).

Definition of territories

Based on the five abovementioned recommendations referring to country selection, the task force itself—with subsequent approval from the AO Alliance Board of Directors—produced a table of countries, largely reflecting the AO SEC countries, with a few potential additions.

The lead countries for the new initiative

Afghanistan	Angola	Bangladesh	Benin
Bhutan	Burkina Faso	Burundi	Cambodia
Central African Rep.	Chad	Comoros	Congo (Democratic Rep.)
Djibouti	Equatorial Guinea	Eritrea	Ethiopia
Gambia	Guinea	Guinea-Bissau	Haiti
Kiribati	Lao People's Demo. Rep.	Lesotho	Liberia
Madagascar	Malawi	Mali	Mauritania
Mozambique	Myanmar	Nepal	Niger
Rwanda	Samoa	Sao Tome and Principe	Senegal
Sierra Leone	Solomon Islands	Somalia	Sudan
Timor-Leste	Togo	Tuvalu	Uganda
United Rep. of Tanzania	Vanuatu	Yemen	Zambia

Additional countries identified by the force not on the list above

Cameroon	Gabon	Ghana	Ivory Coast
Kenya	Nigeria	Zimbabwe	

Table 3: Initial (core) countries for the initiative in sub-Saharan Africa and Asia (slide extract from the presentation to the task force, February 2014).

The selection strictly followed the principle that the primary focus would be on countries where the AO clinical divisions were absent, the only exception being

Nigeria and Kenya, where some marginal AO activities took place. It considered the principles implicitly agreed upon by the AO with its industrial partner, that AO courses in lower-income regions are only eligible for inclusion in the AO education activities if and when a local distributor of their products supported the courses. As there are very few distributors of the industrial partner's products in these low-income regions, there would be little or no funding available for such plans within the existing AO education budget. At the time, Nigeria and Kenya were the only countries in sub-Saharan Africa benefiting from this eligibility.

The situation presented itself, however, somewhat differently in Asia. AO Trauma Asia-Pacific lacked resources to optimally cover low-income Asian countries where local distributors are more widely present, and where AO Trauma operative courses were being requested. To meet the needs of these countries and to support AO Trauma in the process, the new entity would include Bangladesh, Cambodia, Laos, Myanmar, Nepal, Sri Lanka, and Vietnam in its territory.

The AO clinical division that was particularly interested in sub-Saharan Africa was AO CMF, under Chair Warren Schubert, who wanted to create a separate Africa region within AO CMF to focus more on LICs. This did not materialize.

Fortunately, practical arrangements were worked out, with the new entity partially meeting the expectations of AO CMF, which became a strong ally in sub-Saharan Africa, and the agreement with AO CMF opened the door for joint cooperation in LMICs in Asia.

Latin America was not deliberately excluded, but there were only a few countries meeting the LIC inclusion criteria: Haiti and Cuba.

From the outset and during discussions within the task force, it was agreed that the new entity would not compete for territory. Instead, it would be a sign of success for an AO SEC/new entity eligible country to 'graduate' to the AO's regular education program. It would meet the task force recommendation that support activities should help these countries to achieve AO clinical division country-member status over time.

What was important, however, was to agree on who between AO and the new organization would lead the activities in a defined country. The worst outcome would be an uncoordinated approach by individual clinical divisions and the new entity in specific countries. The general principle upheld at the time was: In LMICs not already in the mainstream of AO activities (such as India and China), the new entity would have the lead for coordination and implementation.

Allocation of funding to programs

The plan was to incorporate additional implementing partners, by allocating funding to them to support the new entity in implementing its objectives. The partners identified were the AO clinical divisions and the AO surgeon community. The programs were identified as the AO clinical divisions' initiative and the AO surgeons' initiative, and funds would be allocated to them. The AO surgeons' initiative was also intended to give the new entity a jump start in its activities by enabling it to rely on and support existing projects of the AO surgeon community in low-income settings. Some of the projects might become eligible for longer-term support under the regular activities of the new entity, such as the Pacific Islands Orthopaedic Association initiative described in Chapter IV.

Naming the new entity

One important element in the task force discussion was to find a name for the new entity. A long list was drafted during a brainstorming session including names like AO Development, AO Cutting Edge, AO Frontline, and AO Action. In the end, AO Alliance was chosen, as proposed by Travis Tollefson (AO CMF). At the time, it best reflected the intent: to address a huge public health issue that required alliances on a global level and also alliances locally, to raise awareness to the problem and create sustainable local capacity to improve care of the injured.

Funding

The task force hoped the new AO Alliance could be established with an endowment by the AO of CHF 50 million or more, or alternatively receive guaranteed annual support payments from the AO of CHF 2.5 to CHF 5 million for the first 10 years. This thinking was influenced at the time by the hope that the Hansjörg Wyss Medical Foundation would also contribute to the endowment to make the total in excess of CHF 100 million.

The road to Davos

The road to Davos leading to the official establishment of the AO Alliance in December 2014, passed through Cartagena, Colombia (March 13–14, 2014), Budapest, Hungary (June 25, 2014) and Chang Mai, Thailand (September 19, 2014) where three AOFB meetings were held, and relevant decisions were taken in stages. In fact, the AOFB was involved in every detail regarding governance, policies, activities and operations until its final set up.

In Cartagena, policies and activities were approved; in Budapest, the need for a separate legal foundation was considered necessary and viable; in Chang Mai, eligibility requirements of AOFB members and AO Alliance founders to be officers of the AO Alliance Board of Directors, the nomination of other board representatives, the approval of the charter and by-laws, the collaboration agreement with the AO, as well as the appointment of Claude Martin Jr as the managing director, were decided upon. A much-appreciated amount of CHF 0.5 million was granted by the AO to match (1:2) the generous donation of the Hansjörg Wyss Medical Foundation of a CHF 1 million grant for start-up expenses.

Discussions within the AOFB were animated. An interesting debate developed around defining activities within clinical care services. The AO Alliance is foremost about education and training, and not about brick-and-mortar initiatives. A separate subcommittee with Jaime Quintero, Luis Vialle, and Keita Ito was put in place to further review the proposal by the AO Alliance task force. To underline that these clinical care services would be complementary and not an end in themselves, the finally approved term was 'clinical services support'. It was also understood that care would not entail subsidizing individual patient treatment.

The AO Alliance Board of Directors also approved in advance two needs assessment missions, to be ready to hit the ground running. The mission to Malawi was led by Jim Harrison (November 2014), the one to Myanmar by Michael Schuetz (September 2014), two renowned AO surgeons with extensive experience in LMICs and trauma system.

By October 2014, a call for proposals under the AO surgeons' initiative was also preapproved and funded with CHF 1 million. By December 2014, 76 proposals had been submitted. A small committee set up under the new board could proceed with the evaluations of the proposals practically from day one of AO Alliance operations.

The decision establishing the AO Alliance rested solely in the hands of the AOFB. It did not require formal approval by the Assembly of AO Trustees. Nevertheless, the Assembly and particularly the informal past president group were consulted. The trustees expressed their views at a breakout session in Lima in 2013; and were again extensively briefed in Budapest in 2014. The case for the AO Alliance was presented at this occasion by Jaime Quintero and Joachim Prein; and was supported by a strong statement in favor by Chris Colton, past president of the AO and an AO Alliance founding member. → [🗨️] [🗨️]

While the idea gained momentum and seemed to convince almost everyone, some had reservations. Among them were some of the former chairs of the AO SEC. It

was never quite clear what their doubts were as the proposals were entirely in line with AO SEC objectives and activities.

Some visionary individuals within the AO SEC at the time, however, recognized the real potential and became strong and decisive advocates for the new organization. Among them, were notably Joachim Prein, Jim Harrison, Ram K Shah, and Chris van der Werken attending as a guest member, from the then-existing AO SEC committee structure. → [🔗]

James Kellam, past president of the AO, supported this development, saying that following on from the success of the AO SEC, this was “the opportunity now for the individuals who know what they are doing on the ground level to have the financial resources to take it to the next level and do something really worthwhile.” While James Hughes rightly pointed out that “the strength of this foundation is based on the quality of the people who are involved.”

A SEPARATE LEGAL ENTITY

A considerable amount of time was spent discussing the relationship with the AO. Should there simply be more money for the AO SEC? Should a separate entity within the AO be created? Or should the AO Alliance be a legally separate foundation, with close links to the AO?

After in-depth discussions—and with external advice from a reputable Swiss foundation governance specialist, Roland Müller—the decision was made to establish a separate legal entity with strong involvement from the AO.

What spoke in favor of this option?

- Providing a solution for LMICs required a different approach and activities than for which the AO is traditionally equipped. The AO education programs were not developed to meet the need for nonoperative training and complementary measures to ensure that trained surgeons could actually fulfill their roles in their local environments.
- The existing cooperation between the AO and the industrial partner was not conducive to significantly expanding the scope to LMICs where neither implants nor instruments were required for courses on nonoperative fracture treatment principles.

④ Presenting and deliberating on the need to establish a new entity to support LMICs, AO SEC breakout session at the Assembly of AO Trustees, Lima, Peru, June 2013.
Copyright: AO Foundation



⑤ Presenting and deliberating on the need to establish a new entity to support LMICs, AO SEC breakout session at the Assembly of AO Trustees, Lima, Peru, June 2013.
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① AO Alliance signing ceremony, Davos, Switzerland, December 13, 2014. Copyright: AO Foundation



② Left to right, seated: Chris Colton (founder), Paul Demmer (founder), Norbert Haas (founder), James L Hughes (founder), James Kellam (founder), Peter Matter (founder), Joe Schatzker (founder). Left to right, standing: Joachim Prein, Jim Harrison, Sylvain Terver, Ram K Shah, Sérgio Franco, Susanne Bäuerle, John Croser (founder), Chris van der Werken (founder), Polly Bühler, Claude Martin Jr. Absent from photo: Hansjörg Wyss (founder) and the late René Marti (founder). Davos, Switzerland, December 13, 2014. Copyright: AO Foundation

- Given these special needs and circumstances surrounding LMICs, an exclusive relationship with an industrial partner did not make sense, even less so as the AO and its partner themselves were increasingly trying to achieve an arm's-length relationship to meet compliance and competition law requirements.
- The new compliance rules were such that the AO SEC could not have continued its activities unchanged. It would have meant copying and pasting the industrial compliance rules, which in fact never really matched the AO's needs, much less those of a low-income setting. It would have become part of the CONCERTO process, requiring significant internal and external negotiations on the programs. The AO Alliance would have been bureaucratized from the start.
- Being within the AO would have meant adopting AO travel and per diem rules and AO hiring policies. This would have absorbed a significant part of the AO Alliance's resources that could be put to better use¹². Paying an AO faculty per diem that is appropriate in a HIC could have been construed as an improper payment in AO Alliance territory, considering that two or three per diems would have exceeded a monthly wage in these countries.
- Last but not least, the independence of the AO Alliance from the AO would allow for third-party financing which otherwise would not have been possible. Who would provide funding to an organization with an endowment of over CHF 1 billion? The potential major independent funder made it clear that his contribution had to go to an independent body. Experience over the first five years has shown how relevant this independence is for external fundraising (see Chapter V).

Indeed, since 'AO' is still part of the overall name of the AO Alliance, potential funders commonly raise the issue of whether there is a need for funding given the wealth of the AO. Whether or not to include 'AO' in the name was subject to an in-depth debate in 2014 weighing pros and cons. The compromise chosen to benefit from the AO network and its reputation, while showing governance independence, has worked during the first five years. The AO Alliance was able to attract three times as much funding from various donors who were apparently satisfied by the conceptual and organizational setup.

With all this in place, the AO Alliance Foundation was officially created in December 2014 in the presence of most of its founders and board members. It has its headquarters legally registered in Davos, Switzerland.

12 It would have involved hiring staff primarily in Switzerland and allowing business class travel for management and faculty, etc.

PREPARING FOR IMPLEMENTATION

The founders

Swiss statutory law requires a minimum of CHF 50,000 as foundation capital, while the number of founders required is not specified. Any new foundation must look for personalities giving credibility to the organization and continued support. For the AO Alliance, it was important to have clear criteria for selecting a founder. Picking and choosing without a rational process might have led to disappointment, if not the feeling of being disenfranchised. Governance considerations excluded those candidates that had cemented the idea of the new entity and were likely to play a formal role within it. Regrettably, this excluded the president of the AO, Jaime Quintero, and Rolf M Jeker, as the designated future chair of the AO Alliance.

The final decision was to invite past presidents of the AO as founders. Most were in favor of the idea of seeing a diversification for the future for the AO in the coming 10 to 20 years. Moreover, in a spirit of maximum inclusion and in recognition of the great work they had done at the AO SEC, the AO Alliance invited its past chairs. Magnanimously, they all accepted. Regrettably, Joachim Prein as designated vice-chair of the AO Alliance Board of Directors, could not be included for governance reasons. ← [🔒]

Last but not least was to attract Hansjörg Wyss as a founder. He had lent great support to the idea of the AO Alliance and concluded a memorandum of understanding. The Hansjörg Wyss Medical Foundation has been the main funding source over the first five years of the AO Alliance's existence, other than the AO (see Chapter V). → [🔒]

The AO Alliance Board of Directors

The AO Alliance foundation charter requires a board of directors composed of five to seven members. Two of these members are put forward by the AO and elected by the AO Alliance Board of Directors. The small board allows the AO Alliance to be agile and cost conscious.

Before proceeding to the selection and election of the board, clear criteria on the board's composition, in terms of skills and experience, were laid out:



© Hansjörg Wyss and Nyengo Mkandawire at the Queen Elizabeth Central Hospital, Blantyre, Malawi, June 2017.
Copyright: AO Alliance



- Surgical knowledge to be adequately represented;
- Practical experience in development matters in LMICs;
- Experience with development organizations—bilateral or multilateral;
- Access to political and financial networks;
- Geographic representation of regions primarily covered by the AO Alliance; and
- Management and governance experience, including in nongovernmental entities (NGOs).

These skills and experiences were required as a whole for the organization, not at the level of the individual. Additionally, a seat was kept in reserve to accommodate a major donor contributing unrestricted (not earmarked) funding over a long period of time.

The following representatives made up the first AO Alliance Board of Directors:

- Rolf M Jeker, board chair, bringing to the AO Alliance 30 years of development experience in Africa and Asia, as well as governance and management skills, delegated by the AO;
- Joachim Prein, board vice-chair, craniomaxillofacial (CMF) surgeon, final chair of the AO SEC, ensuring a smooth transition from the AO SEC to the AO Alliance;
- Jaime Quintero, orthopedic surgeon, past president of the AO, delegated by the AO, with vast experience in lower-income settings and former AO SEC operations;
- Jean-Daniel Gerber, former Swiss State Secretary, former World Bank board executive director and dean, chair of Swiss Sustainable Investment Fund and Swiss Solidarity Fund, with broad experience in development and finance;
- Manjul Joshipura, trauma and orthopedic surgeon, former WHO leader for the Global Trauma Care Programme; and
- Abdoulie Janneh, executive director of the Mo Ibrahim Foundation, former executive director of United Nations Economic Commission for Africa), former United Nations under-secretary-general, former director for Africa at the United Nations Development Programme (UNDP), vice-president for the Coalition for Dialogue on Africa (CoDA), with broad access to decision makers in Africa. → [O]

The regional representation of Africa and Asia was ensured by Abdoulie Janneh (the Gambia/Senegal) and Manjul Joshipura (India). The donor position was left vacant.

The representatives of the AO would be elected every two years. Aside from the chair, the AOFB first delegated Jaime Quintero and then Suthorn Bavonratanech, both past presidents of the AO, for a period of two years. Both had in-depth knowledge of LMIC trauma issues and also great experiences closely associated with the AO SEC.

The other members of the AO Alliance Board of Directors were initially elected for five years when a change in the statutes allowed them to serve up to an additional three years, during which they would be replaced in a staggered manner to allow for a smooth transition.

Toward the end of his term as CEO of the AO and vice-chair of the AOFB, Rolf M Jeker became an independent chair of the AO Alliance Board of Directors and was reelected for an additional five years in 2019. As the involvement of the AO clinical divisions increased, due to a dedicated AO financing contribution, the decision by the AOFB was to delegate henceforth one representative at the governance level and one at the operational level. Thus, it was decided that the past president of the AO would be elected to the AO Alliance Board of Directors, as well as one of the executive directors of an AO clinical division.

Thus, Nikolaus Renner (AO) and Tobias Hüttl (AO) joined the AO Alliance Board of Directors in 2019 for a first period of two years. Their terms, and those of the other members, were extended by one year due to the COVID-19 pandemic. By July 2021 (instead of 2020 as planned), Robert McGuire (AO) will assume one of the AO positions, also for a period of two years, replacing Nikolaus Renner.

The AO Alliance Board of Directors was put in charge of the overall administration of the organization. It was endowed with all the powers that are not expressly entrusted to a different body by the charter and by-laws. It has the following duties that may not be delegated:

- The overall administration and issuing of necessary directives, as well as defining business objectives and determining the means necessary to achieve these;
- Establishment of the organization and creation of the respective organizational charts;
- Provision of accounting, financial control, risk management, and the financial planning;
- Ruling on the authority to sign;
- Election and recall of the AO Alliance Board of Directors, considering the rights of the AO and the auditors;



① The initial AO Alliance Board of Directors included (left to right): Jaime Quintero, Manjul Joshipura, Rolf M Jeker (chair), Joachim Prein, Abdoulie Janneh and Jean-Daniel Gerber, Davos, Switzerland, December 2015.
Copyright: AO Foundation



- Appointment and dismissal of persons entrusted with the management, control over authorized signatories and overall supervision of the persons entrusted with the management, also in regard to compliance with laws, charter and by-laws, regulations, and directives;
- Determination of the remuneration policy for members of the AO Alliance Board of Directors and the executive management;
- Preparation and approval of the annual financial statements (after having taken note of the audit report) and the annual report as well as forwarding them to the supervisory authority; and
- Issuing the necessary regulations.

Management

From the outset, it was clear that the AO Alliance needed a lean organization and management structure, fostering transparency and control, and especially keeping operational costs low. A very ambitious target was set to keep general administrative costs below 13 percent of expenses, a benchmark that is unusually low but that was met during the first five-year period.

The most important immediate decision was to appoint a managing director to lead the new organization and its operations. The AO Alliance was extremely fortunate to bring aboard Claude Martin Jr, who combined the skills of being trained as a trauma and orthopedic surgeon and who had acquired significant leadership and management experience, not least as the executive director of AO Trauma. The latter allowed him to fully understand the AO network and interactions with the AO. These experiences and qualities clearly outweighed his lack of practical experience in LMICs, which he had to acquire on the job.

The AO Alliance Board of Directors delegated the utmost responsibility to the managing director and his team for operational matters, focusing on policy and strategic issues, and exercising close control.

The start-up period was certainly facilitated by the fact that the board chair and the managing director had already worked together at the AO as CEO of the AO and executive director of AO Trauma, respectively.

To assume his new position in the AO Alliance, Martin had to accept a reduction in salary, which he graciously did, proving his utmost dedication to the new task. Gradually, management expanded its organizational chart to meet the need for financial and communications support.

By practicing a lean approach, the AO Alliance not only aimed to keep a minimum number of employees centrally employed in Switzerland, but also hired project management and support consultants in the target countries—close to the action, and true to its mission of sustainable local capacity building in selected countries.

When office space became scarce in the AO center's Davos offices, where the AO Alliance has registered its headquarters, the Swiss-based team moved to a virtual office system, saving substantially on overhead costs.

The lean overhead structure was facilitated by cooperation with the AO, under a service-level agreement stipulating that the AO Alliance could buy at fair market value accounting, information technology, and human resources services from the AO.

Initial funding

The AO SEC had an annual budget of CHF 1.2 million that provided support to 21 countries, most of them classified as low-income. In creating the AO Alliance, the ambitions had to be set significantly higher to make it worthwhile and attract contributions from more than one source.

The AOFB agreed to commit an annual contribution of CHF 2.5 million over a ten-year period as a nonrestricted budgetary contribution. Hansjörg Wyss had expressed support from the outset, on the condition that the AO itself would make a firm commitment.

In a memorandum of understanding with the Hansjörg Wyss Medical Foundation, Hansjörg Wyss generously agreed to offer funding in a ratio of 2:1 to the AO contribution for a total of CHF 50 million over 10 years. The annual contribution would be project-based and would require the submission of individual projects and programs for approval. Despite the large contribution, this qualitative difference in the nature of the contribution did not necessitate/justify a permanent seat on the AO Alliance Board of Directors as it would have created a conflict of interest.


In addition, the Hansjörg Wyss Medical Foundation made an extraordinary CHF 1 million start-up contribution. The AOFB also authorized CHF 0.5 million for the same purpose.

For the first year of operation, the AOFB authorized a higher contribution of CHF 3.7 million to allow for a smooth transition from the AO SEC; the difference of CHF 1.2 million corresponded to the already-approved AO SEC contribution for 2015 provided in the regular AO budget of that year.

RELATIONSHIP AND COOPERATION: THE AO AND THE AO ALLIANCE

While a legal distinction between the two foundations was of absolute necessity as outlined in a previous section, the link and complementarity between the two entities is obvious and convincing:

Same mission, different geography

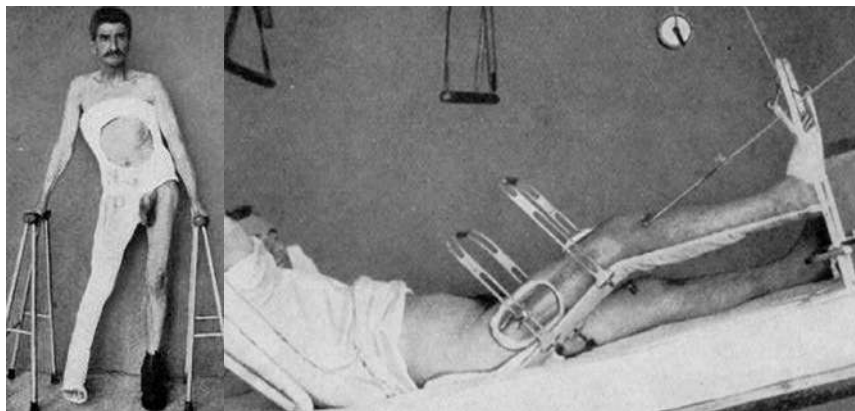
The newly adopted mission statement of the AO, “to promote excellence in patient care and outcomes in trauma and musculoskeletal disorders,” is a complete match, albeit with a different geographic scope and project orientation of the AO Alliance’s mission and objectives. The AO Alliance’s challenges are very similar to the challenges the founding fathers of the AO encountered 60 years ago in Switzerland and other HICs, where care of long bone fractures of the lower limbs required 14 weeks in hospital—with a disability rate as high as 40 percent. The early work conducted by the AO SEC pioneers, who at the time were also the leading pioneers in the AO, underline this commitment and natural link. → 

The collaboration agreement

The close link was legally cemented in a collaboration agreement between the AO and the newly established AO Alliance, which recalls the major arrangements and principles that guide the AO Alliance in its operations and defined the relationship with the AO. It referred primarily to the purpose, the nonexclusivity with industry, the AO’s financial contribution, and conditions for using ‘AO’ in its name.

Use of ‘AO’ in the name of the AO Alliance

As referred to previously, considerable discussions took place about including ‘AO’ in the name of the new foundation. The externally obtained governance expertise was not to directly refer to the AO in its name. It could be construed as an AO organization, with the downside of the perception of being bound by industry exclusivity and not by requiring any funding by being part of a wealthy organization.



🕒 The situation in HICs 60 years ago. Copyright: Lorenz Böhler in *Die Technik der Knochenbruchbehandlung im Frieden und im Kriege, Vienna 1943*

The decision was nevertheless made to leverage the AO's reputation and experience to draw credibility to the new organization. When the AO Foundation later changed its logo in 2019, the AO Alliance kept its original logo.

A first conclusion after the first five years taught us two things: The reference to the AO has indeed helped to get credibility within the surgeon network and partners, while the name provides some challenges for fundraising. They can be in part addressed, however, by detailed explanation of the distinction between the two entities in terms of legal and governance structure and cooperation with an industrial partner.

AO funding and representation

The AO/AO Alliance agreement extends over ten years for a total amount of CHF 25 million. As this is an unrestricted contribution, the AO delegates two representatives to the AO Alliance Board of Directors. While they are bound by the AO Alliance rules and are accountable to the AO Alliance, their role is to provide a permanent link to ensure that both parties are fully informed and that the collaboration agreement with the AO is respected.

Cooperation with AO clinical divisions

AO education activities are delivered through its four AO clinical divisions¹³ and other units. From the outset, it was obvious, as experienced by the AO SEC, that development activities in LMICs could not be directly delivered by each of the AO

13 AO CMF, AO Spine, AO Trauma and AO VET

© Injured patient receiving lower extremity nonoperative fracture care with a traction device, Antananarivo, Madagascar, 2017
Copyright: AO Alliance





clinical divisions through their own structure. This would have been too complicated and led to uncoordinated actions. Since long bone trauma is the main in-house focus of the AO Alliance, its cooperation with the AO clinical divisions focusses on the additional trauma education capacities brought by AO CMF and AO Spine.

While not directly part of AO clinical division delivery, there was keen interest by some surgeons within the AO clinical divisions to contribute to resolving problems in LMICs. This interest was not only legitimate, but also extremely welcomed by the AO Alliance as insufficiently addressed trauma treatment needs are particularly prevalent in LMICs.

From the outset, to address the interest from surgeons and the AO clinical divisions, the AO Alliance included an AO surgeons' initiative as well as an AO clinical divisions' initiative. The latter would provide funding for AO clinical division activities to benefit low-income populations in their territories, following AO Alliance principles, and joint activities with the AO Alliance in AO Alliance territory. While the latter activities had a successful start (see AO clinical division activities in Chapter IV), the former never materialized due to funding and compliance constraints.

AO CMF was particularly interested in this joint participation for facial trauma-related education in sub-Saharan Africa. This cooperation got off to a good start and was able to be scaled up in recent times, not least thanks to a generous private donation from Joachim Prein.

Cooperation with AO Trauma, especially in AO Alliance Asian countries, has been made possible by the generosity of DePuy Synthes, which has provided instruments, implants, and workstations for practical exercises during AO Alliance courses, as a separate in-kind contribution to the AO Alliance. It was limited to some Asian countries where the AO Alliance had taken over the lead and financing for AO Trauma.

AO faculty have been recruited to teach certain AO Alliance courses in sub-Saharan Africa and Asia, thereby becoming AO Alliance faculty for such events.

The interaction between the AO Alliance and the AO clinical divisions was further strengthened following the breakout session on the progress of the AO Alliance at the AO Assembly of AO Trustees in Basel, Switzerland, in 2018.

Emphasis on the need for enhanced trauma care in LMICs by prominent speakers like Jean Todd from the Fédération Internationale de l'Automobile (also United Nations under-secretary for the Road Safety Decade), Etienne Krug (director, Management of Noncommunicable Diseases, Disability, Violence and Injury Prevention

at the WHO), and Abdoulie Janneh (former United Nations under-secretary-general and former executive director for UNECA) raised the interest and support of the audience.

The breakout session revealed, however, that the AO clinical divisions felt they themselves should be more closely involved.

As a consequence, the AOFB subsequently introduced two new programs:

- The AO clinical divisions collaboration for a first period of three years (2019–2021), funding it with CHF 250,000, CHF 350,000, and CHF 500,000; and
- AO clinical division activities in LMICs, funded with CHF 5 million from the AO Jubilee Fund on the occasion of the 60th anniversary of the AO in 2018.

These two programs would allow more direct in-depth participation by the AO clinical divisions in trauma-related issues in LMICs. The former would be jointly conducted with the AO Alliance, which holds an earmarked budget line for the AO clinical divisions¹⁴, while the latter is strictly an AO program with the AO Alliance only indirectly called upon when its experience, network, etc, are needed.

The continuous communication between the AO Alliance managing director and the executive directors of the AO clinical divisions, as well as the direct representation of an AO clinical division representative in the AO Alliance Board of Directors, help to maintain this alignment.

THE VALUE PROPOSITION

Vision and mission

The task force had ventured at the time to propose input for a vision and mission statement: “Partnering to enhance patients’ lives and transforming fracture care in less developed countries.” Around these ideas and considering the AO mission statement, the AO Alliance Board of Directors, through various iterations, finally agreed on the following vision and mission statements, further defined by specific objective and value statements:

14 AO Foundation Board decision taken in September 2018 in Sardinia, Italy.

The **vision** of the AO Alliance is a world where timely and appropriate fracture care is accessible to everyone. While this is a long-term view, as is common in a vision statement, the AO Alliance strongly believes that with the necessary recognition of injury as a global health issue, this is achievable.

The **mission** is to reduce suffering, disability and poverty by enhancing fracture care. As the AO Alliance is active in the poor countries of the world, the poverty aspect carries high importance. Injuries and disabilities are intrinsically linked with poverty. Any improvement of treatment –timely and appropriate–will also be a major tool for poverty alleviation.

The **objective** to achieve this is to create sustainable local capacity for care of the injured. It is predominantly to train local healthcare workers who can bring the necessary changes locally in injury and fracture care.

Last but not least, the AO Alliance embraces the following **values**: empowerment, partnership, and sustainability. These meticulously chosen values carry important weight toward achieving its goals. Partnership and empowerment are the cornerstones to creating sustainable local capacity, based on trusted healthcare personnel, directly linked to implementation.

The above-mentioned vision, mission, objective, and value statements clearly define the AO Alliance’s relevance and value proposition.

These desirable outcomes are not illusionary dreams but very realistic targets to pursue. While the AO has been very successful at improving care of trauma patients in many parts of the world, the AO Alliance can make a similar contribution to populations in low-resource settings. To achieve this, sufficient means (see Chapter V) and effective partnerships (see Chapter VI) are of the essence.

Ethics and compliance ---

The AO Alliance follows the principles of the AO Code of Ethics and Conduct, while maintaining a lean structure for implementation. In critical situations, it is the chair of the audit committee who serves as ombudsman until a special person is appointed. Not being subjected to industry compliance, as is the case with the AO, the AO Alliance nevertheless follows strict rules reflecting best medical technology industry compliance practices for continuing medical education.

The AO Alliance's understanding of ethics goes well beyond the mere code of conduct for its employees and officers. It embraces good governance in general, to avoid conflicts of interest in decision-making and activity implementation. Its activities are chosen and implemented regardless of gender, politics, religion, creed, language, and ethnicity, while respect for equity, diversity and human rights are highly valued. As to the former, the AO Alliance has not been able to fully meet its gender diversity expectations. While it clearly follows a policy of noninterference in its target countries, it uses governance and human rights as entry criteria. Deteriorations on those fronts can lead to limited involvement or no involvement at all. This was the case in Myanmar, where expectations were not met and initial plans for a full-fledged country initiative were postponed.

Failing in ethics, governance, avoidance of corruption, etc, would be a serious threat to the reputation of the AO Alliance. Hence, the topic ranks very high on the agendas of the AO Alliance Board of Directors and executive management, and is revisited at least once a year.

STRATEGIC FOCUS AREAS OF THE AO ALLIANCE

To achieve the intended goals and outcomes, three strategic areas for intervention were defined, namely awareness building, policy advisory services, and care. Each of these contributes to the overall mission. The combination of the three generates more value in its totality than the simple sum. In fact, they feed and magnify each other and influence potential outcomes.

Awareness building

While only a small fraction of its budget is dedicated to awareness-building activities, an AO Alliance presence is highly relevant to drawing attention to the pressing issue of the burden of injuries. Working with partners pursuing the same objective—directly or indirectly—will help to leverage the AO Alliance's impact in positioning and fracture care as a global health issue and subsequently increasing funding sources.

The World Health Organization (WHO) and the Global Alliance for Care of the Injured (GACI)

The WHO and GACI are the designated organizations to create awareness of the problem to alert and activate decision makers locally, regionally and globally. Without the problem of death and disability from injury being advocated to the global health community and being ranked among the priority global health issues, the support to remedy this problem will be sporadic rather than systematic. Without this recognition, the AO Alliance's work will be even more challenging.

With the 60th anniversary jubilee contribution of the AO of CHF 10 million to the WHO for the Emergency and Trauma Care Initiative, the AO has helped to make major inroads: It allowed the WHO to pass a special resolution attracting the attention of the global health community to the problem, allowing a significant number of countries to get direct support toward implementing trauma systems. While the AO Alliance is not directly involved in this process, the work conducted by the WHO program has facilitated the effectiveness of AO Alliance activities in some of the countries covered by the program (eg, Ethiopia and Nepal).

Other initiatives to reinforce the awareness message

It has become clear that awareness promotion for death and disability from injury has partly to be conducted in related fields where global health attracts more attention (noncommunicable diseases [NCDs] and global surgery) or where global political attention sets a priority (ie, the United Nations (UN) Sustainable Development Goals [SDGs] and climate change) and where injuries are partly embedded in it.

- **Prevention:** To reduce the burden of death and disability from injury, prevention is the most important area to target. Many of the necessary measures to reduce road traffic accidents (RTAs) are known and usually within the remit of government policy. While acknowledging this priority, the AO Alliance has set its focus on prehospital care, hospital-based treatment, and rehabilitation.

The AO Alliance, however, has partnerships with advocacy organizations for prevention, such as the Fédération Internationale de l'Automobile (FIA) headquartered in Paris, France. For the purposes of awareness and advocacy, the AO Alliance works hand in hand with them.

- **Noncommunicable diseases (NCDs):** Despite the steep rise in NCDs, attention is still overshadowed by communicable diseases (CDs), although the latter are on the decline. Some health conditions within NCDs, such as maternal, newborn, and child health (MNCH), as well as chronic diseases, such as diabetes and hypertension, have, however, already received wide recognition as public health issues—and importantly—also found industry champions to support and benefit from them at the same time.

Death and disability from injury also fall under the NCD category. They have, however, even within the NCD category, clearly taken the back seat. Only recently—mainly proposed by the Harvard University Program in Global Surgery and Social Change and the AO Alliance at the World Health Summit (WHS) in Berlin, Germany—and still on a very small scale, have injuries received more attention within the NCDs.

At a global level, in 2017, more than 60 percent of the burden of disease resulted from NCDs, with 28 percent from communicable, maternal, neonatal, and nutritional diseases, and just over 10 percent from injuries. And within injury, 75 percent involve the musculoskeletal system. There has been a notable shift since 1990, when CDs held the highest share at 46 percent (Roser and Ritchie, 2016). Unfortunately, unlike for diabetes, maternal, newborn, and child health (MNCH), as other important NCDs, corporate interest to act as conference/seminar sponsors dealing with trauma is very limited as implants rarely find a lucrative market in low-resource settings.

- **The UN Sustainable Development Goals (SDGs):** The SDGs are a bold commitment to a better world—one where there is peace, partnership, and prosperity for everybody and for the planet—and ending poverty in all forms and dimensions by 2030. This involves targeting the most vulnerable, increasing basic resources and services, and supporting communities affected by injuries, conflict, and climate-related disasters. The burden of injury and the AO Alliance's work are embedded in SDG 3 (Good Health and Well-Being), SDG 10 (Reduce Inequalities), 16 (Peace, Justice and Strong Institutions, Capacity Building), and SDG 17 (Partnerships for the Goals) to build service-delivery capacity in care of the injured in LMICs and support just and sustainable communities and institutions.



Figure 6. The United Nations (UN) Sustainable Development Goals (SDGs) are an urgent call for action by all countries in a global partnership.

For the AO Alliance's awareness building efforts, the road safety (SDG 3) and poverty reduction (SDG10) goals are particularly relevant to demonstrating the impact it can make and thus attracting funding. The latter target is highly relevant for the work of the AO Alliance and its impact—as well as for fundraising.

- **Global surgery and trauma:** A 2015 report by the reputable *Lancet* Commission on Global Surgery highlighted the issue of injuries from a different angle. The need for essential surgery is huge and growing, particularly in LMICs. It argues that operative treatments for musculoskeletal injuries are also relevant. To move the case forward, the AO Alliance needs to develop stronger partnerships in the area of global surgery (see Chapter VI on partnerships) and promote trauma care also as an essential surgery issue.
- **Climate change:** Climate change is figuring high on the agendas of the international community and potential donors. Discussions at the World Health Summit (WHS) in Berlin in 2018 highlighted that there will be significant increases in injuries because of increased instability in weather conditions. The impact of climate change on trauma will need to be addressed increasingly in AO Alliance awareness-building activities going forward.

Policy advisory services

Appropriate trauma systems provide the macro background of policies, strategies, and organizational issues. The continuum includes prevention, emergency pre-hospital care, hospital-based care, and rehabilitation. While such policy advisory services are in the competence of governments with the WHO being the main advisory body, the AO Alliance through its network of experts can put its practical knowledge at the disposal of governments and NGOs to establish national trauma plans and national surgical, obstetrics, and anesthesia plans (NSOAP).

The existence of national trauma plans and clear policies, strategies, and action plans by governments is a necessary precondition to conducting successful fracture care education and training by the AO Alliance and other actors. Without these framework conditions already in place, external support can easily turn into humanitarian rather than sustainable long-term development support.

Care

The most significant direct task of the AO Alliance, however, is to improve care of the injured through its training programs and country initiatives. Its interventions are defined by the trauma care ecosystem. Relying on its core competence, the AO Alliance 'Care' thematic area focuses entirely on hospital-based care. Its operational activities consist of educational events delivered mainly by regional and national faculty to train local healthcare workers, grants fellowships to allow trainees to work with experienced trainers in a hospital in a low-resource setting, conducts clinical research, and contributes to building surgical capacity (operating theatres, equipment).

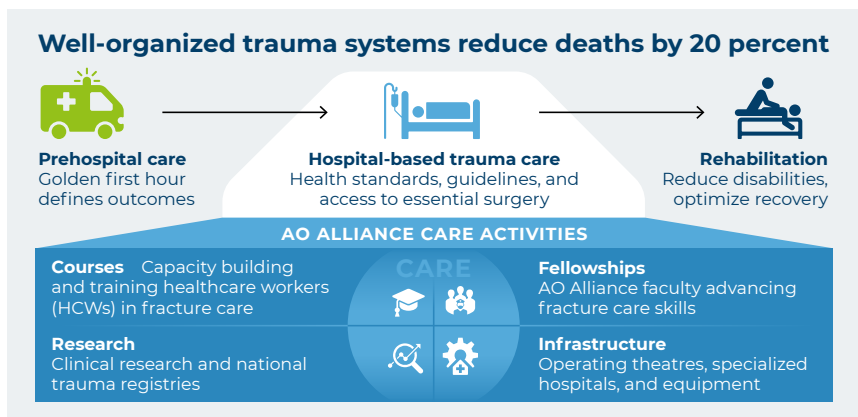


Figure 7. AO Alliance activities within the 'Care' focus area.

The Fracture Solutions Program

The program is an expanded version of AO SEC training events (courses, fellowships, symposia, seminars) in sub-Saharan Africa and Asia. The objectives are to train local healthcare workers and to develop Faculty Education Programs (FEP) to perpetuate local capacity building by local trainers (train-the-trainer model). Twenty-three countries in sub-Saharan Africa and eight countries in Asia benefited from these activities. The main emphasis is on nonoperative fracture management training. Steering committees in English and French-speaking Africa and in Asia oversee the educational programs and activities. Administrative hubs in each of these subregions attend to the operational activities. This is all part of the AO Alliance’s regional capacity building objective.

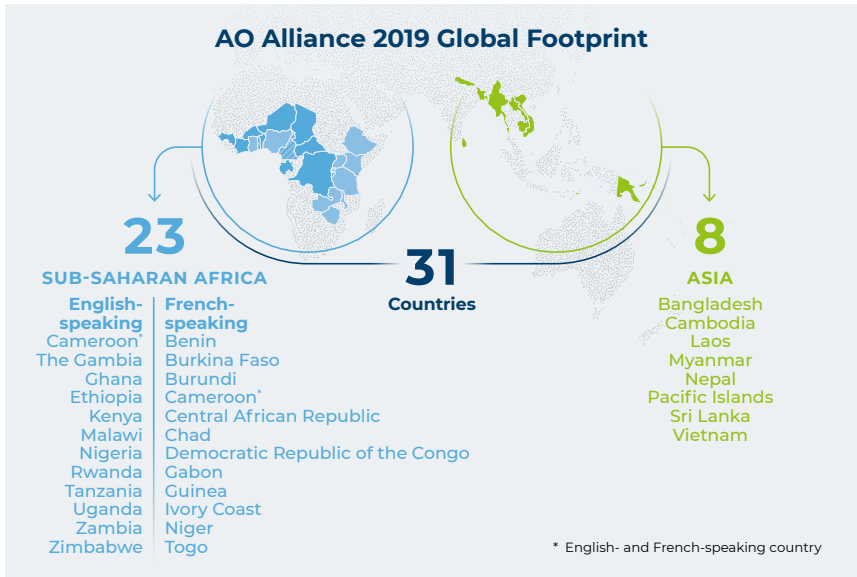


Figure 8. The AO Alliance’s global footprint includes 31 countries in sub-Saharan Africa and Asia.

Country initiatives

A country initiative pursues a more ambitious target, namely, to support a country with concrete activities over a longer period of time to build sustainable local capacity. It goes beyond simple training of healthcare workers and aims at a comprehensive strategy customized to local needs and acting as a system change agent to improve care of the injured.

The selection of eligible countries is always based on countrywide needs assessments conducted with local government and healthcare workers, as well as a dedicated AO Alliance team.

They include an assessment of economic development, the country's governance, and especially its support to the healthcare sector. A general lack of government commitment will not bode well for support by a third party such as the AO Alliance. The AO Alliance provides no money directly to governments but tries to insert its activities to be compliant and supportive of the government health strategy and programs. If such a sufficient, enabling environment does not exist, the AO Alliance abstains from intervention.

The more practical aspects of needs assessments with local healthcare workers relate to the number of trauma and orthopedic (T&O) surgeons, operating room personnel (ORP) and T&O residents, their level of training, available operating room capacity, as well as clinical research capacity to evaluate the magnitude of the problem and the potential impacts of possible concrete interventions. The AO Alliance also evaluates the amount of task shifting of trauma and fracture care in the selected country, as this is pertinent to educational program development.

As a result, the emphasis and design of programs in the selected countries differ. Some—such as Malawi and the Gambia—have deficiencies in all of the above criteria, while Ethiopia and especially Ghana already have more established systems, allowing the AO Alliance to focus more narrowly.

Initial efforts for a country initiative in Myanmar were abandoned and were not pursued in Haiti after a needs assessment was conducted by Jaime Quintero and Michel Orsinger in November 2018.

Crucial to the selection of a country is the availability and buy-in of trusted local implementation partners. The AO Alliance has been fortunate to have such dedicated resources in the countries chosen so far, thanks to the already existing AO SEC work.

A strong emphasis is put not only on training additional surgeons but also on retaining them in their countries. Therefore, the conditions surrounding training and local employment are critical criteria in country selection. Since practicing in a local public hospital is poorly remunerated, there is little incentive for trained surgeons to stay in the country once training is completed. The opportunity to also do private work is therefore a strong argument to retain local surgeons once trained. The AO Alliance supports the approach—particularly promoted by the College of

Surgeons of East, Central and Southern Africa (COSECSA)—to train within the region and adopting training qualifications that only apply to that region, and also to ensure that a trained surgeon can actually exercise his or her skills.

Special initiatives and programs

- While the bulk of the AO Alliance's work focuses on the Fracture Solutions Program (FSP) and country initiatives, there is room for specially designed programs or projects, usually limited in duration and supported by individual donors. As will be discussed in Chapter IV on implementation, they consist of the AO surgeons' initiative, the Pacific Islands initiative, the Pediatric Fracture Solutions for Ghana project, collaborations with AO clinical divisions, the development of a sub-Saharan Africa T&O clinical research network, with trauma and fracture care registries and setting clinical research priorities for the region (the ORCA clinical research initiative), and the AO Alliance's efforts to mitigate the impact of the COVID-19 pandemic on AO Alliance activities under the COVID-19 response program.

SETTING THE STAGE FOR IMPLEMENTATION

Establishing the AO Alliance was a lengthy but smooth process, bringing all potential stakeholders on board. The strategies and policies outlined and the solid network of surgeons the AO Alliance was able to rely on from day one, allowed for quick and successful implementation, as outlined in the next chapter.



Participants at the Basic Principles of Fracture Management for Operating Room Personnel, Dhaka, Bangladesh, October 2019.
Copyright: AO Alliance

CHAPTER IV

A flying start

Claude Martin Jr

“*A dream doesn't
become reality through magic;
it takes sweat, determination
and hard work.*”

– Colin Powell –

CHAPTER IV

A FLYING START

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AO ALLIANCE: THE FIRST FIVE YEARS

After the AO Alliance's first five years of activity, this chapter demonstrates how management and operations were put in place, what programs and projects were implemented, and the results achieved. It also gives an account of the impact COVID-19 had and how the AO Alliance responded and adjusted its course.

Prior to its official establishment on December 13, 2014, the AO Alliance had already undertaken the AO surgeons' initiative and conducted country needs assessments in Malawi and Myanmar.

The AO Alliance got off to a quick start, with no management or organizational structure in place or plan of upcoming activities. Claude Martin Jr was juggling two roles: the newly designated managing director of the AO Alliance and executive director of AO Trauma. Polly Bühler, former project officer for AO SEC, was the only other employee immediately hired.

On day one in January 2015, there was no logo, no website, and no office.

MANAGEMENT AND OPERATIONS

Staffing and early implementation

On January 1, 2015, the AO Alliance was its own legal entity with two employees: Claude Martin Jr and Polly Bühler. Martin made the switch from AO Trauma executive director to AO Alliance managing director. Having taken the reins of AO Trauma on October 1, 2010, he had accomplished what he had been mandated to do for AO Trauma and the AO.

But the AO Alliance could rely on the extensive surgeon, operating room personnel (ORP), and other healthcare worker networks established by the AO SEC. This truly formed the foundation upon which to build the AO Alliance.

It was becoming clear from the outset that this two-person setup would not be a sustainable way to run the organization as it grew. It was not ideal that all management and administrative tasks were being undertaken by only two employees. As well, the AO Alliance, as it outsourced the very important functions of accounting and controlling to the AO, did not have a clear overview of its finances. Although the AO Alliance Board of Directors did its best to provide strategic leadership, there was much to be done to get a lay of the land with local stakeholders. Although Bühler had worked for three years with the AO SEC, she had rarely met the faculty and the networks in sub-Saharan Africa and Asia face-to-face. This needed to change, as the AO Alliance wanted to be able to undertake the work necessary to move fracture care education forward. For this, an expanded AO Alliance team was needed to undertake key management and administrative roles, and the team required the appropriate tools, data, processes, and procedures. In 2016, a finance and operations manager was hired. Cinzia Muggiasca was a seasoned finance professional with a solid human resource and auditing background as well as nonprofit experience. She quickly took over the controlling and operations of the AO Alliance and set out to implement standard operating procedures and financial processes.

To be able to communicate with funders, stakeholders, and partners, it became clear that the AO Alliance needed to add a communication manager to its small team. This was done in 2017 with the addition of Carla O'Donnell. The need to also build administrative capacity was recognized as more and more projects were developed, and more countries were added to the portfolio. At the end of 2019, the AO Alliance had a total of six Swiss-based employees representing 4.7 full-time equivalents. It has taken over some of the initial services provided by the AO, such as controlling, and communications. The website was brought back from Weber Shandwick¹ and is now under AO Alliance control with its own webmaster, Dominique Nkoa in Yaoundé, Cameroon. AO Alliance staff and consultants are provided with targeted learning opportunities and a professional development planning process. The AO Alliance invests in its people. → [🌐]

With a decentralized model in sub-Saharan Africa and Asia supporting AO Alliance activities, the AO Alliance has coordination hubs in Accra, Ghana, for English-speaking Africa (ESA); in Yaoundé, Cameroon, for French-speaking Africa (FSA); and in Kathmandu, Nepal, for Asia. Each of these coordinating units relies on the work and leadership of local surgeons who donate their time to advance AO Alliance activities.

¹ Weber Shandwick is one of the world's leading global public relations firms with offices in major media, business, and government capitals around the world.



④ The AO Alliance has a small, lean management, administrative, and consultant structure. Left to right: Reuben Addo, Laxman Yadav, Tigest Gelagle, Bernard Akueteh, Angela Weber, Jim Harrison, Polly Bühler, Claude Martin Jr, Precious Kamange, Dominique Nkoa, Isaac Owusu, Vanessa Banerjee, Sanjeev Shrestha, Zurich, Switzerland, December 2019. Absent: Cinzia Muggiasca and Carla O'Donnell. Copyright: AO Alliance



Regional steering committees

The AO Alliance is active in two distinct geographic locations: sub-Saharan Africa and Asia. Sub-Saharan Africa needed to be divided into two subregions: English-speaking and French-speaking. In order to be able to develop tailored and appropriate activities for this diverse collection of countries, taking into consideration language and cultural differences, three steering committees were created early on with central management oversight to drive the regional development and growth of these activities. These steering committees are an integral, highly relevant part of the AO Alliance approach of relying on local knowledge to further build local capacity. The sub-Saharan Africa committees would be under the leadership of Jim Harrison, medical director for Africa, and Ram K Shah, medical director for Asia, would oversee the Asia steering committee.

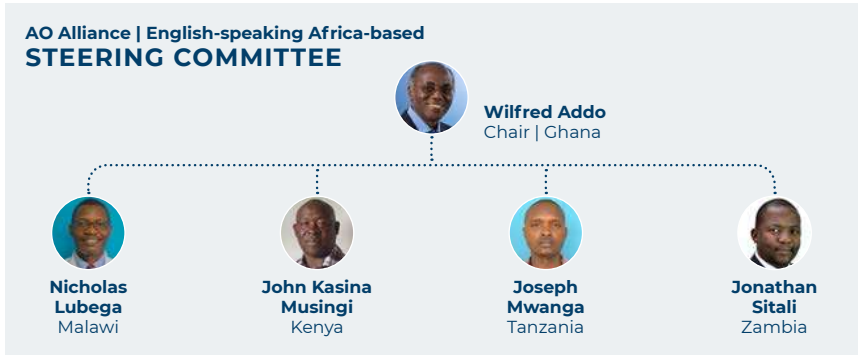


Figure 9. Wilfred Addo chairs the English-speaking Africa-based steering committee.

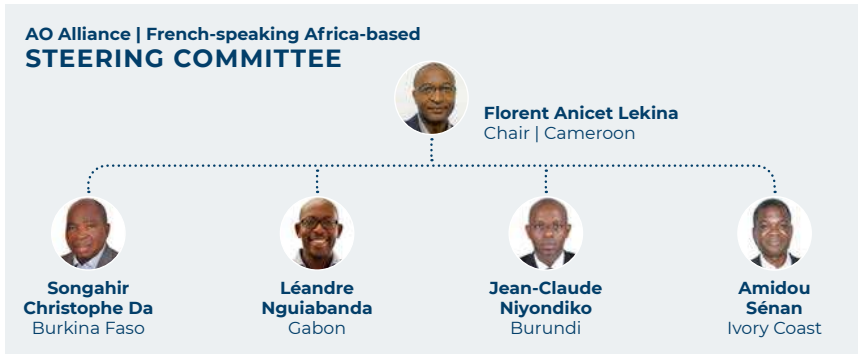


Figure 10. Florent Anicet Lekina chairs the French-speaking Africa-based steering committee.

Wilfred Addo (Ghana) would lead the ESA Steering Committee with Nicholas Lubega (Malawi), John Musingi (Kenya), Joseph Mwanga (Tanzania), and Jonathan Sitali

(Zambia). Sylvain Terver initially chaired the FSA steering committee. He was succeeded by Florent Anicet Lekina (Cameroon) in 2016 with the following committee members in place: Songahir Christophe Da (Burkina Faso), Amidou S nani (Ivory Coast), L andre Nguiabanda (Gabon), and Jean-Claude Niyondiko (Burundi).

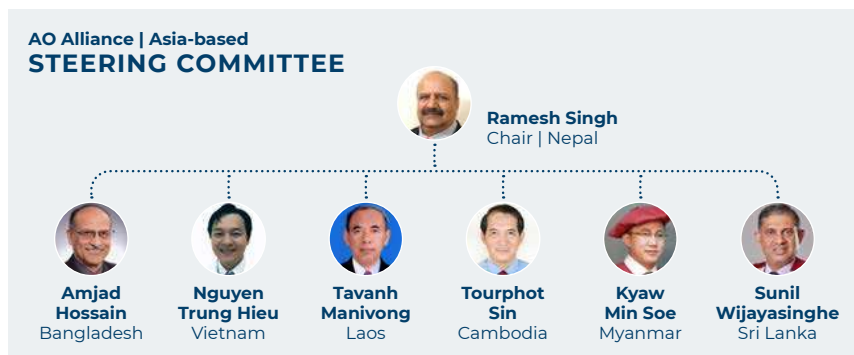


Figure 11. Ramesh P Singh chairs the Asia-based steering committee.

Ramesh P Singh (Nepal) leads the steering committee for Asia. Each of the seven countries is represented by one surgeon: Amjad Hossain (Bangladesh), Kyaw Min Soe (Myanmar), Tavanh Manivong (Laos), Tourphot Sin (Cambodia), Sunil Wijayasinghe (Sri Lanka), and Nguyen Trung Hieu (Vietnam).

The three steering committees were given the following terms of reference to function effectively and steer AO Alliance educational and development opportunities:

- Oversee the running, governance, and development of the Fracture Solutions Program (FSP) in their region;
- Facilitate educational and fellowship activities that occur within country initiatives;
- Oversee strategic development of faculty and country representatives;
- Promote the AO Alliance reputation for high-quality education and excellent governance;
- Formulate policies, programs and monitoring systems that would ensure quality course organization and teaching to enhance the knowledge, skills, and attitudes of healthcare workers for improved care of the injured;
- Provide technical and logistical support for monitoring of course organization, quality faculty delivery and post-course clinical performance improvement of key participants;
- Encourage the establishment of clinical research units and trauma registries in potential locations;

- Develop a database for faculty and participants for easy communication, faculty development programs and follow-up of clinical progress of key participants; and
- Assist in course evaluation processes for evidence-based educational research.

Steering committee meetings are held once a year face-to-face with regular follow-up activities online. The cohesiveness of the three bodies has made for an integrated approach adapted to the local needs of each of the three regions.

The local surgeon and ORP leadership through the three steering committees continues to steer AO Alliance activities in the right direction. The simple and reactive nature of this setup has allowed agile, cohesive, and coordinated decision-making.

The service-level agreement with the AO

In January 2015, the AO Alliance needed to have the necessary back office support to run the start-up operation and the basic functions of a small business: accounting, controlling, payroll, information technology (IT), human resources (HR) and legal services. The AO Alliance was established as a separate legal entity from the AO.

A service level agreement (SLA) to obtain from the AO certain core services at fair market value, necessary for a small NGO like the AO Alliance, was negotiated and put in place. This outsourcing of vital operational activities allowed the first two employees to concentrate on developing projects and coordinating existing activities, without having to worry about accounting processes, human resources, insurances, pension funds, IT, and communications. The AO Alliance briefly had a small physical office at the AO center in Davos in 2015, but this was soon abandoned in favor of a remote working solution. Working from home and working on the road became the new norms. In many ways, the AO Alliance was ahead of its time in terms of teleworking and teleconferencing—long before the COVID-19 pandemic swept the world in 2020.

The AO had expressed its preference for the AO Alliance to procure the services needed from the AO, provided that the financial terms were competitive with what was available elsewhere. The initial SLA was valid for three years and it was renewed for an additional three-year term in 2017. In February 2020, the AO Alliance was notified by the AO that it would terminate the SLA at the end of 2020.

Although the AO would be fully supportive during the transition period, the AO Alliance needed to evaluate its strategy going forward. The most critical decision

revolved around the accounting and payroll software management tool and services. As the AO Alliance had such a small footprint, bringing this expertise in-house was not a viable option. Outsourcing was the best solution. The AO Alliance ultimately selected a Swiss-based firm to take over this competency. One by one, the services that were provided by the AO were replaced. And this was done with no financial loss to the AO Alliance and its employees. It allowed the AO Alliance, however, to shape its accounting and reporting structures to meet its own needs.

In addition to being a pioneer in using a virtual office, the AO Alliance was also a pioneer in certain optimization processes: it needed to find a solution to its authorization policy for payment of invoices. Having no physical office, with all Swiss-based employees working from home or on the road, a digital authorization solution was developed through a simple PDF document management system. This allowed the AO Alliance to maintain accountability and transparency of the two-signatures requirement, without the need for actual physical handwritten signatures. This process was later introduced by the AO for its employees. Such changes occurred often due to external pressures to which the AO Alliance had to react—as it later did when COVID-19 struck.

AO Alliance logo

December is always busy at the AO and December 2014 was no exception. The AO holds its flagship educational event, the AO Davos Courses, during the first two weeks of December. In 2014, the event attracted over 1,200 surgeons, residents, and ORPs gathering at the Davos Congress Centre. This provided little time to develop the AO Alliance brand. Branding is important because not only is it what makes a memorable impression, but it allows stakeholders and contributors to know what to expect.

The AO Alliance could not spare the funds to hire a professional graphic designer. The mandate was given to two entities: 21SOLUTIONS, a film production company based in Switzerland, and the AO Communications & Events unit.

The former AO logo with its main components, the globe and the triangle, was used to develop the AO Alliance logo. The idea was to simplify the AO logo and give it a more organic feeling while incorporating additional information. The look and feel were to clearly indicate an affiliation with the AO without giving the impression that the AO Alliance was an AO clinical division or an entity of the AO.

The logo design was to also give the impression of folk-art patterns and simply have the air of being handmade.



Figure 12. Preliminary work done by the AO Communications & Events unit.

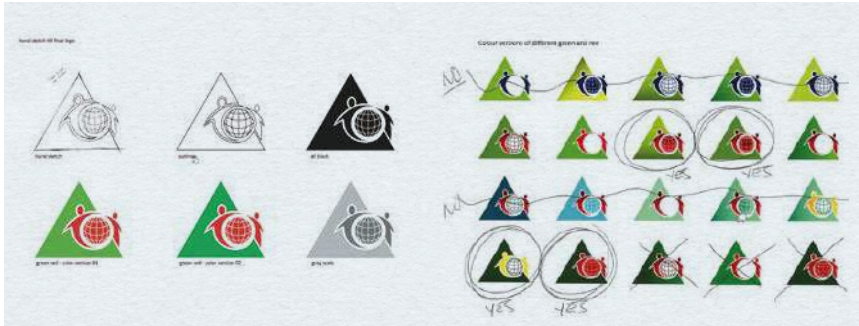


Figure 13. Preliminary work done by 21SOLUTIONS.

Color selection was discussed at length. Colors matter for brand identity and meaningfulness. Color-blindness matters as a person with color blindness has trouble seeing red, green, blue, or mixtures of these colors. Since the AO Alliance had strategically determined it would be active in sub-Saharan Africa and select countries in Asia, it found itself with a conundrum: The two most common colors present in flags of sub-Saharan countries are red and green. The most identifiable color in Asia is blue. It was decided to select blue and green as a compromise, realizing there was no perfect solution.

There were other elements requiring attention during the process of creating the logo, reflecting on the organization's purpose:

- The AO Alliance purpose: Through alliances and partnerships, the AO Alliance aims to improve care of the injured in LMICs. The AO Alliance also wanted to keep some brand association with the AO, with its permission.
- The choice of a color palette: The logo would carry its depth and personality across all media, whether printed on t-shirts, banners, or mass-distributed flyers or painted by hand.
- Balance of visual elements including typography, negative space, etc: The AO Alliance wanted the logo to be simple, and easy to use in various media.
- Aim for a timeless design: This was important as the AO Alliance had to keep expenses in the future to a minimum for noncore activities.
- Making it memorable: This would ensure that people would recognize the AO Alliance upon encountering the logo a second time.

After many design considerations, the final logo was approved at the AO Alliance Board of Directors meeting in April 2015. The AO Alliance is thankful for all the support provided by Toto Ghali and his creative team at 21SOLUTIONS.



Figure 14. The AO Alliance logo was approved in April 2015.

After the successful strategic retreat with the AO Alliance Board of Directors in December 2016, the AO Alliance set out to further develop its communication strategy, messaging, and branding. Much of this important work had been done in a fragmented fashion in 2015. The AO Alliance did not have a communications department initially. All communication work was done by two employees and outsourced to Weber Shandwick. In February 2017, some of the board members, representatives of Weber Shandwick and management gathered in Zurich for the first AO Alliance communications retreat. The important deliverables, later approved by the AO Alliance Board of Directors, included the following:

- The AO Alliance Foundation would now be known as the AO Alliance;
- The vision, mission, objectives and core values were finalized;
- A set of PowerPoint™ slides was developed to reflect the AO Alliance message, programs, projects and focus areas; and
- The logo, although representative, was not social media friendly. A mandate was given to revisit it. In the end, the logo was updated to reflect this tendency and the removal of the word 'Foundation'.



Figure 15. The AO Alliance logo was updated in May 2017.

In 2019, the AO changed its logo. The AO Alliance decided to keep its logo unchanged as it was serving its purpose and continued to reflect, to even greater extent, the distinction as a separate legal entity. In addition, it would have been costly to change.

At a meeting in 2017, it was also decided that the AO Alliance needed to take back control of its communication competency. In October 2017, a communications manager was hired, and the website was repatriated with AO Alliance's own webmaster.

The website

The development of the initial website was an enormous project done quickly and efficiently with Weber Shandwick. The website was officially launched in June 2015, soon after the AO Alliance Board of Directors meeting that took place at the AO center in Davos, Switzerland in April 2015.

The AO Alliance needed substantial support and expertise as there was no communication department or manager, and no IT resources to develop its own website. Through personal contacts from the previous role of Claude Martin Jr at AO Trauma, and with the assistance of Isabella Wong, AO Trauma Asia Pacific regional director, the AO Alliance contracted with Weber Shandwick in Hong Kong to develop a fresh website that would allow the AO Alliance to reach its network, frontline healthcare workers and potential donors and funders. The website hierarchy required four months to develop. The content was written during the first five months of 2015. After review and approval at the first AO Alliance Board of Directors meeting in April 2015, the website went live in June 2015.

To build a fully functional website and have e-mail addresses for employees, the AO Alliance needed to secure a domain name (web address) and a web hosting account. Although simple on paper, this turned out to be more complicated than anticipated. As a nonprofit organization, the domain extension .org was easy to choose. The hard part was related to the domain name, as many of the selected names were not available. The ideal name would have been www.aoalliance.org. The AO Alliance settled for www.ao-alliance.org as the former was already taken.

The next step was to make the AO Alliance better known to a broader audience. Social media management and content distribution needed to be addressed. The usual three social media platforms (LinkedIn, Twitter, and Facebook) were engaged, and active promotion was made through active posts.

The AO Alliance elected to repatriate its website in 2017 and to work internally to further develop it and maintain it. Thanks to the technical know-how of Dominique Nkoa, AO Alliance webmaster, the AO Alliance website remains a modern model that served as a basis for redesigning other websites of the AO.

AidImpact

By 2019, the AO Alliance had expanded its activities to over 20 countries in sub-Saharan Africa and seven countries in Asia. It had three country initiatives. The annual operating budget had tripled. Course management administration had become standardized but was still being managed with very lengthy spreadsheets. The AO Alliance needed a modular and flexible project management solution to track projects through the cycle progress. After a thorough evaluation of various offerings tailored to NGOs, the AidPortfolio project management solution from *AidImpact* was selected and implemented in 2019. The software tool was operational on January 1, 2020, and has delivered on what it was intended to do:

- Managing key AO Alliance projects and activities;
- Planning and monitoring budgets allocated to projects;
- Managing relations with stakeholders on the ground; and
- Managing, evaluating, and publishing activity data for senior management, the AO Alliance Board of Directors, and funders.

AidImpact, with leadership from its CEO Pierre Girardier, and project manager Laetitia Delrieu, was able to assist the AO Alliance with a quick and thorough implementation of a business solution. The buy-in of all AO Alliance stakeholders was the pivotal piece that made it happen. The leadership provided by AO Alliance finance and operations manager Cinzia Muggiasca and senior project manager Polly

Bühler was instrumental in keeping the momentum going and having AidImpact understand and translate the needs into the solution now in place.

INITIATIVE FOR A QUICK START: THE AO SURGEONS' INITIATIVE

To get off to a quick start, the AO Alliance called on surgeon members of the AO network to submit proposals of clinical projects that would help address practical challenges in providing trauma care to patients in LMICs, be they in a remote village in Africa or on an isolated island in the middle of the Pacific Ocean. The aims were to select and support projects likely to have a powerful and sustainable impact on fracture management, help patients, train healthcare workers, and empower communities. These proposals, as diverse as the countries from which they emanate, can often be adopted elsewhere. A budget of CHF 1 million was set aside.

The call generated a huge response, with 76 proposals submitted over a period of six weeks between September and October 2014. A committee set up by the AO Alliance Board of Directors selected seven proposals that met the criteria and the objective of improving fracture care, during a meeting in London on November 8–9, 2014. The committee consisted of Jim Harrison, Rolf M Jeker, Claude Martin Jr, and Jacqueline Grieder. All projects had been peer-reviewed by an expert panel of surgeons and philanthropists.

The seven projects for which financial assistance of CHF 513,700 was granted were the following:

Cameroon: Pediatric fracture care _____

The proposal

Florent Anicet Lekina of Yaoundé, Cameroon, proposed the creation of a referral center for children to receive proper fracture care in a timely manner. By informing and teaching parents, medical staff from district hospitals, and traditional healers in the administration of proper initial fracture treatment in children, this project aimed to reduce fracture complications suffered by too many children in Cameroon. The project aimed to treat about 90 children per year, for a total of 270 children in three years.

Achievements

The first year of the project required organizational and administrative development. Staff recruitment, equipment purchase, and awareness building in the community required close to one year. Forty-two patients were enrolled in 2016 and 105 patients were enrolled in 2017. A total of 150 surgeons and ORP were trained in pediatric fracture care techniques. The project extended into 2018. The program achieved 70 percent of the target patient enrollment at its conclusion. A total of 193 patients were enrolled. The most common anatomical sites of injuries were the femur (32), the elbow (20), the wrist (13) and the tibia (12).

Three additional educational sessions and workshops were held in Douala and Mbalmayo. A national Cameroon trauma registry was put online as part of the project. → [O]

Budget

CHF 100,000 was allocated to this project for three years.



“The work that the AO Alliance is doing in our African countries is catching up from a delay of about several decades. Before it came, there was no one doing advocacy for state-of-the art, basic, and essential fracture care in sub-Saharan Africa. The AO Alliance is the very first. It goes beyond what our governments can do. It is visionary and pioneering work.”

Florent Anicet Lekina, Cameroon

Pacific Islands Orthopaedic Association

The proposal

The burden of trauma care in the Pacific Islands is mainly borne by general surgeons who are inexperienced in trauma and orthopedic surgery, and current fracture management, leading to suboptimal results. By improving expertise in these fields within existing healthcare systems of the Pacific Island nations, these countries would no longer be unequal when it came to fighting the trauma epidemic.



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pour l'Ostéosynthèse**
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Projet de Prise en Charge des Fractures Pédiatriques Pediatric Fracture Care Project Cameroon

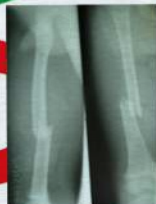
Contrat d'Exécution N° _____

Description du Projet

Le Projet de Prise en Charge des Fractures Pédiatriques est l'une des activités de l'Association Camerounaise pour l'Ostéosynthèse (AO Cameroon), ayant pour objectif l'amélioration de l'accès aux soins spécialisés des enfants vivants au Cameroun victimes de traumatismes avec lésions musculo-squelettiques et particulièrement de fractures

Objectifs du Projet

Prodiguer de manière diligente des soins aux enfants victimes de fractures
Réduire les complications liées aux fractures en cas de traitements inadéquats et tardifs
Enseigner les bonnes pratiques thérapeutiques aux praticiens en cas de fractures pédiatriques



Catégories de Patients et Prestations

	Traitement	Prestations
Patients de Catégorie Ia : Patients présentant une fracture récente diaphysaire d'un os long ou court	Orthopédique (plâtre) Traitement chirurgical (ECMES)	Prise en charge à 100% par le projet (traitement et suivi) Prise en charge à 50% par le projet (traitement et suivi)
Patients de Catégorie Ib : Patients présentant des larges plaies post traumatiques récentes avec perte de substance cutanée nécessitant une greffe de peau	Traitement chirurgical	Prise en charge à 100% par le projet (traitement et suivi)
Patients de Catégorie II : Patients présentant une fracture articulaire (Salter et Harris I-V) ou une fracture ouverte	Traitement chirurgical	Prise en charge à 50% par le projet (traitement et suivi)
Patients de Catégorie IIIa : Patients présentant une fracture ancienne consolidée ou non avec foyer d'ostéomyélite	Traitement chirurgical	Prise en charge à 40% par le projet (traitement et suivi)
Patients de Catégorie IIIb : Patients présentant des pertes de substances cutanées post-traumatiques anciennes nécessitant une greffe de peau	Traitement chirurgical	Prise en charge à 40% par le projet (traitement et suivi)

Critères d'Eligibilité au Traitement :

Enfants de 0 à 16 ans
Le patient doit apporter sa première radiographie à la présentation au projet
Pouvoir déposer une caution de 3000 FCFA remboursable à la fin du traitement

Références du Projet et Financement

Association Camerounaise pour l'Ostéosynthèse
Projet de Prise en Charge des Fractures Pédiatriques
Pediatric Fracture Care Project Cameroon
AO Alliance Foundation
AO Surgeon Project No. 5 "Pediatric Fracture Care Project Cameroon
Ministère de la Santé Publique
Contrat d'Exécution N° _____

Localisation du Projet

Bureau du Projet et Site Central des Soins
Fondation Médicale Andre Fouda Yaoundé
Bureau du Projet et Site des Soins de Douala
Hôpital Laquintinie / Service des Urgences
Bureau du Projet et Site des Soins de Bafoussam
Hôpital Régional de Bafoussam/ Service de Chirurgie

Contacts

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Le Projet reçoit les enfants du lundi au vendredi de 08h à 15h30



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© Left: Project intake form for pediatric patients.
Right: Injured child having received care provided by the project at the Clinique Fouda,
Yaoundé, Cameroon, 2019.
Copyright: AO Alliance

The Pacific Islands Orthopaedic Association (PIOA) was formed to promote and develop modern orthopedic surgical care in the Islands of the South Pacific. The association was established in Honiara, Solomon Islands, and has trainees from nine Pacific Island countries: Papua New Guinea, Solomon Islands, Fiji, Samoa, American Samoa, Kiribati, Federated states of Micronesia, Timor Leste, and Vanuatu.

Hermann Oberli (Switzerland) and Des Soares (Australia) submitted an initial project to achieve the following:

- Expand of the PIOA program to additional Pacific Island nations with the intake of new trainees;
- Develop an introductory module and a module on the knee and upper extremity; and
- Launch foot and ankle, and spine modules.

Achievements

Trainees in the program, ranging in number from eight to 15 in any given year, attend two to three modules per year. Each module lasts three to four weeks. The face-to-face education takes place in one city of the Pacific Islands. The following milestones have been achieved:

- Introduction of the SIGN intramedullary nailing education program in the training modules;
- Launch of the arthroscopy workshop in Honiara, using a computerized simulator model, for teaching and evaluation of skills;
- Establishment of a standardized trauma database in cooperation with the Swiss surgical team (2016), allowing for documentation and evaluation of cases, research, and comparison of results and issues of fracture treatment in participating countries;
- Organization and support of short-term attachments and fellowships for subspecialist training in arthroscopy, spinal surgery, and craniomaxillofacial surgery;
- Increased awareness of PIOA throughout the Pacific Islands by attending scientific meetings organized and supported by Orthopaedic Outreach and the Australian Orthopaedic Association, as well as presenting and publishing clinical research papers;
- Creation of an international professional network, increased access to telemedicine and scientific literature;
- Training of ORPs in collaboration with the Solomon Islands National University (SINU) and Ministry of Health & Medical Services;

- Upgrading of ward nurses' skills through practical short courses in cooperation with the Queensland Orthopaedic Nurses Special Interest Group; and
- Training of community-based rehabilitation workers at SINU.

Since 2013, 30 candidates have been admitted to the PIOA program. Five have completed the program and passed the certification exam.

In December 2016, a five-year partnership agreement was reached between the AO Alliance and PIOA. The agreement called for funding with the Hansjörg Wyss Medical Foundation to provide sufficient funding to support all activities until the end of 2021.

In 2019, to ensure succession planning and sustainability from the Swiss collaboration with Soares, Martin Walliser and Philipp Stillhard were appointed by Oberli to continue the immense work in the Pacific Islands. Unfortunately, due to the escalating COVID-19 pandemic, the PIOA training committee decided on March 6, 2020 to cancel the Apia module that had been scheduled to commence on March 23, 2020. The Australian government had banned all overseas travel. All modules for 2020 were canceled due to the pandemic and resultant travel restrictions. Hopefully, training modules will resume in 2021.

Budget

A budget of CHF 45,000 was awarded to the PIOA for three years initially.

Uganda Sustainable Trauma Orthopaedic Program _____

The proposal

In 2007, Peter O'Brien, Piotr Blachut, and Trevor Stone, three orthopedic surgeons from the University of British Columbia (UBC) Department of Orthopaedics in Vancouver, Canada, were invited to visit Uganda to investigate the emerging health crisis of injuries. A year later, the UBC Faculty of Medicine and Makerere University established a formal partnership called the Uganda Sustainable Trauma Orthopaedic Program (USTOP) to reduce the human suffering, disability, and poverty caused by injuries in Uganda. Uganda has nearly the same population as Canada (36 million) and only one tertiary hospital with the capacity to manage complex orthopedic injuries. By addressing trauma systems, capacity, and policy through training, partnership, and research, USTOP's objective is to reduce the burden of disability due to orthopedic trauma in Uganda. The key concept behind

the project was that the effort would need to be sustainable; at completion, the Ugandan healthcare system would provide clinical care, education, and research needed to ensure high-quality orthopedic trauma care.

USTOP was designed to include all aspects of an orthopedic trauma surgical team. The collaboration included orthopedic surgeons, orthopedic trainees, nurses, physiotherapists, sterile supply personnel, administrators, and others.

The program aimed to expand training, clinical support, and research required to meet the burden of orthopedic trauma with the newly designed East Africa Orthopedic Trauma Program.

Achievements

- Training of local perioperative staff and trainees (surgical, nursing) in modern surgical management of orthopedic injuries using appropriate methods for low-resource settings;
- Support of new orthopedic graduates establishing clinical practices in regional hospitals by providing an initial investment in basic surgical sets, providing feedback on surgical cases, and training perioperative staff on basic orthopedic principles;
- Mentorship of local research initiatives from study design to publication while ensuring outcomes are reported to decision-makers to guide future health policy; and
- Investments in biomedical engineering colleagues to develop resource-appropriate surgical technologies.

Expansion of the program with the AO Alliance funding enabled orthopedic graduates to establish their practices in 12 regional hospitals in Uganda and in neighboring countries and further promote investigations into health systems research, patient outcome analysis, and clinical protocols. USTOP has been involved in training 30 orthopedic surgeons and trainees, hosted 22 bioskills workshops, provided clinical training in over 400 surgical cases, and achieved a 60 percent reduction in the national hospital's length of stay by instilling a system to treat orthopedic trauma upon arrival at the healthcare facility.

Budget

The AO Alliance supported the program with CHF 100,000 in funding for three years.



Surgical skills laboratory, Makerere Medical School. Kampala, Uganda, April 2015.
(Copyright: USTOP)

Peru: Fracture care outcomes

The proposal

Peter Cole established an organization called Scalpel at the Cross in 2005 and has since coordinated orthopedic teams traveling to the jungle town of Pucallpa, Peru. Each short-term medical team ranges from ten to 20 visiting team members including two to five orthopedic surgeons, fellows, and residents. They are joined by a task force of Peruvian healthcare workers.

To increase capacity and to prepare for future expansion to multiple sites, Scalpel at the Cross identified a need for enhanced technology integration. Financial support from the AO Alliance would be used to fund a project to build and implement a custom software solution that would build on the existing proven processes used in campaigns, and would add efficiencies and innovation for new capabilities in the capture of patient outcomes.

The project was aimed at developing simple methodology and supporting electronic tools to benefit the undertreated orthopedic trauma victims of Peru and to be expandable and transferable to other impoverished locations globally by fracture care teams desiring an essential patient follow-up program. The project would enhance, streamline, and expand upon the existing patient outcomes process model.

The project would also create greater opportunity for shared implementation beyond the visiting teams in Pucallpa and promote a critical learning environment with simple tools facilitating implementation in resource-poor medical settings. The

scalability of the project made this attractive, as all surgical missions faced the same logistic problems of data capture and follow-up of patients.

Achievements

The Outcomes Program Technology Solution (OTPS) concluded within the time-frame and reached the initial goals and projected benefits in the pilot test in Peru. The software solution was developed, and the architectural design was finalized. The end goal of developing and implementing a sustainable surgical patient follow-up program with results and achieving acceptable outcomes was reached.

The AO Alliance had envisioned rolling out the technological solution to document patient outcomes to other LMICs. Of course, the international digital divide between HICs and LMICs is obvious.

The digital application, although critical for proper patient care, could not be leveraged for wider distribution to other AO Alliance countries. Intellectual property issues, hardware availability (iOS versus Android), and the unrecognized administrative setup required to make these databases function were factors that led to unmet expectations by the AO Alliance.

Budget

The AO Alliance awarded CHF 98,700 to this project for three years.

Nepal: Mobile camps

The proposal

Mobile camps are one of the means of providing medical and surgical services to people living in rural areas of a low-income country (LIC) like Nepal. Outreach camps are beneficial in providing care unaffordable to people living in rural and remote areas where healthcare facilities are limited and inaccessible. Patient safety is a key concern in such camps.

Mahesh Shrivastava, from the Nepal Medical College Teaching Hospital, initiated the orthopedic mobile surgical camps in 1996. Initially, the camps were organized in regional hospitals and were run in collaboration with the ministry of health.

Over the years, the camps have been coordinated with teaching institutions to harness the organizational capabilities as well as the orthopedic talent needed to efficiently run the camps. This would also serve as an excellent opportunity

for residents in training to be mentored. Shrivastava also wanted to add Ponseti technique programs. Congenital clubfoot (talipes equinovarus [TEV]) is the most common congenital birth defect of the musculoskeletal system. Eighty percent of children living with clubfoot reside in LMICs where the limitations of medical knowledge and scarcity of resources prevent adequate care. Left untreated, this leads to long-term physical, psychological, emotional, and economic adversity for affected individuals and families. In addition, because up to 50 percent of these individuals have both feet affected, it becomes even more evident how neglected clubfoot is one of the most common physical disabilities in the world. In Nepal, where the prevalence of clubfoot is estimated to be 1/1000 births, affected individuals face diminished prospects for education and employment, leading to a dependency on family or external aid (eg, begging) for survival.

The project's goals were twofold: to provide treatment for patients and to train local healthcare workers, in particular paramedics who practiced in rural areas providing initial treatment to trauma patients and were able to refer the patients to the proper hospitals in time. The project aimed to utilize local resources, young doctors along with expertise from various hospitals and abroad, as needed.

The camp's objectives were to:

- Serve financially insecure patients for free;
- Create awareness about various treatment methods for clubfeet and fractures;
- Raise awareness about the mobile surgical camps;
- Provide education and training to healthcare workers; and
- Provide training on the Ponseti technique for patients presenting with clubfoot deformities. → [📷]

Achievements

Over the course of the three years, three to four surgical camps per year were executed with the collaboration of the following hospitals: Janakpur Orthopedic Hospital, Alive Trauma Hospital, Kankai Hospital, and Birgunj Healthcare Hospital. Over 80 patients were seen in consultation per camp. Clinical training was delivered at four outreach clinics and nine seminars on Ponseti training for paramedics took place in 2017. Each seminar was attended by over 25 participants. The program was extended into 2018 due to the late start. In 2018, 15 Ponseti training seminars for paramedics were delivered in remote rural areas of Nepal.

Budget

The AO Alliance awarded CHF 100,000 to the project for three years.



© Faculty and participants at the Basics of the Ponseti Method of Clubfoot Treatment course, Simara, Nepal, February 2019. Copyright: AO Alliance



The Philippines: Increasing fracture care capacity _____

The proposal

This proposal looked to expand the efficiency of fracture care through the systematic evaluation of barriers and the application of teamwork and principles derived from successful trauma programs in HICs. It intended to initiate a dialogue capitalizing on existing expertise but applying it specifically to LMICs to enhance fracture care in that arena.

SIGN Fracture Care International (SIGN) has for the past 15 years increased the capacity for the surgical treatment of long bone fractures in LMICs. By providing reliable surgical implants and education, as well as a method for tracking successful implantation and healing, it facilitated the treatment of fractures in individuals who otherwise would have been bedridden or who would have struggled to afford even suboptimal treatment. Provision of the implant and training to perform the surgeries were necessary first steps; however, as the project matured, SIGN identified two opportunities that would allow further increases in capacity and logical ways to expand care of patients.

The first of these was identifying barriers within existing programs that limit surgical efficiency and the number of patients that could be effectively treated. The second was the creation of teams which included not only the surgeons but also ORPs, surgical technicians, anesthesiologists, and others involved in surgical care of patients with fractures. It has been clearly demonstrated across disciplines that teamwork increases efficiency and safety, and that education and empowerment of team members enhance the outcomes of complex procedures such as surgeries.

Achievements

The Department of Orthopedics at the Southern Philippines Medical Center (SPMC) was selected by SIGN as a test center. SIGN had contributed implants to the SPMC for twelve years. Residents and faculty from the SPMC have been engaged with SIGN, having presented papers at the SIGN conference, attended the Orthopaedic Trauma Association (OTA) annual meetings as SIGN scholars, and continued close dialogues about care of the injured.

SIGN had survey data from SIGN surgeons over the previous ten years suggesting that delays in access to surgery exist at many hospitals in LMICs.

A report from the Department of Orthopedics at SPMC, presented at the SIGN

annual conference in Richland, United States, in September 2017 identified the following barriers to access to surgical care:

- Delays in surgical treatment of fractures is multifactorial;
- Communication with other hospital staff and ORPs, especially between residents and anesthesiology residents, was found to be deficient;
- Limited operating days per week dedicated to T&O surgery;
- Lack of a dedicated operating room for urgent cases;
- Limited availability of blood products for transfusions in complicated cases; and
- Competing priorities between traumatic and nontraumatic cases (obstetrics, general surgical emergencies, etc).

The following interventions to reduce barriers to surgery were recommended:

- Having an anesthesiologist see the patient the day before surgery to reduce cancellations at the last minute;
- Communication between the anesthesiologist and the surgeon; and
- Adopting a protocol allowing for emergency surgical fixation.

Overall, the most important intervention was communication with the anesthesia team surrounding the subsequent day's surgery schedule including the provision of blood products. Secondly, the protocol for open fractures made for more timely and increased access to surgery.

Budget

The AO Alliance supported the project with CHF 40,000 for three years.

Eritrea: Reverse fellowships and education _____

The proposal

The impact of injuries on the socioeconomic burden and general health of the population of Eritrea is substantial. In addition to the major life-threatening injuries, the much larger number of isolated extremity injuries can lead to serious impairment. Most of these minor-to-moderate or isolated extremity injuries are treated by primary healthcare workers in a community center or small district hospital and only referred to the next higher referral center in a late stage of complication (eg, infection). This implies a high level of competence in surgical fracture care at the referral center.

Roland Jakob from Môtiers, Switzerland, established with other AO Swiss surgeons a project focusing on two key aspects of musculoskeletal care in Eritrea:

- Courses teaching the principles of nonoperative fracture treatment for primary healthcare providers in rural facilities; and
- Skills and knowledge for T&O specialist (e-book Trauma Essentials for Developing Countries and training fellowships).

The basis of this program was to provide local healthcare workers with the necessary know-how to be able to take care of most fractures in a simple way, realize when referral is necessary, and anticipate possible complications.

Since 2003, Jakob and his Swiss Eritrean Trauma Orthopedic Fellowship Foundation (SETOFF) team had been visiting Eritrea once or twice per year. But there had been no visits by the team in community hospitals or rural health centers.

Achievements

The one-week course covered treatment of the most common fractures amenable to conservative treatment, importance of soft-tissue management pertaining to conservative treatment, infection, and indications for surgery as well as indications for early referral to a specialist. Faculty consisted of the four local orthopedic surgeons, visiting SETOFF members and members of the faculty of the school of medicine in Asmara. The course was held once a year.

The concept of reverse fellowships in Eritrea where six Swiss AO surgeons visited to teach and assist the local four orthopedic surgeons continued during the project. The visits would last four to six weeks each. Three of the local Eritrean orthopedic surgeons were able to attend fellowship opportunities during two months in the cantonal hospitals of Fribourg and Davos.

The development of the e-book on trauma essentials for developing countries, although a much-needed tool for interactivity and being able to create a personal learning catalogue, has lagged in finalization.

The activities of the SETOFF project have contributed to sustainability of better care of the injured in Eritrea. One of the local orthopedic surgeons has become chief of the surgical unit. Daily patient rounds with the treatment team have been implemented as best practices. Funding provided by the AO Alliance permitted much needed rural outreach as the brunt of fracture treatment continues to be provided by healthcare providers with almost no formal training.


Budget

CHF 30,000 was awarded for three years.

AWARENESS-BUILDING ACTIVITIES

Awareness is one of the three AO Alliance focus areas, along with policy advice and programs related to care of the injured. Over the course of five years, several initiatives were launched to raise attention to the silent and neglected epidemic of injury, as outlined in Chapter III.

The Davos Global Fracture Care Consultation

From the outset, the AO Alliance was determined to play a role as a promoter and facilitator of awareness building. → 

In December 2016, the AO Alliance brought to Davos, Switzerland, a diverse group of 25 thought leaders in the field of musculoskeletal trauma—practitioners, researchers, public health specialists, and relevant actors—from Africa and Asia to form a coalition of like-minded people with injury prevention and care of the injured in LMICs as a common goal. Further development was planned to strengthen global awareness.

This initiative was to pave the way to raise awareness of the global burden of musculoskeletal injuries and trauma surgery's potential to reduce that burden in resource-poor settings.

Strategies to achieve greater attention to affordable and sustainable improvements in fracture care services globally were agreed upon. In particular, the participants agreed on the ways in which to mobilize decision-makers in countries worldwide to increase their focus on fracture care. The participants sought to start a broader collaborative process to create an expanded network for trauma and fracture care advocacy globally.

Attending plenary presentations and small group workshops were Russell Gruen (Lancet Commission on Global Surgery, Teri Reynolds (World Health Organization



④ Jaime Quintero, Joachim Prein, and Rolf M Jeker were among participants at the AO Alliance Global Consultation on Strengthening Fracture Care in LMICs, Davos, Switzerland, December 2016.
Copyright: AO Foundation



⑤ Left to right: Ram K Shah, Richard Gosselin (IGOT, Doctors Without Borders), and Steve Schwartz (executive director, AO North America), at the AO Alliance Global Consultation on Strengthening Fracture Care in LMICs, Davos, Switzerland, December 2016.
Copyright: AO Alliance



① Jeremy Shiffman, professor, Department of Public Administration and Policy School of Public Affairs, American University, Washington, DC, United States, speaks at the AO Alliance Global Consultation on Strengthening Fracture Care in LMICs, Davos, Switzerland, December 2016. Copyright: AO Alliance

[WHO]), Chris Lavy (Oxford University), representatives of the Global Alliance for Surgical, Obstetric, Trauma and Anaesthesia Care (G4 Alliance) and the UBS Optimus Foundation, Graham Forward and Paul Tye (Australian Doctors for Africa), Richard Gosselin (Institute for Global Orthopaedics and Traumatology [IGOT], Doctors Without Borders), surgeons from Malawi, Nepal, Ghana, and Myanmar, and members of the AO Alliance Board of Directors.

The work was conducted by two workshop groups focusing on the following:

- **Workforce and training:** Defining current gaps and proposing ways to improve skills and training;
- **Infrastructure:** Defining the minimum essential infrastructure (operating facilities, equipment, implants, imaging tools, etc);
- **Infrastructure systems** necessary to gathering required data through trauma registries;
- **Advocacy efforts** to gain political and public attention for injuries and fracture care; and
- **Financing of care of the injured:** Defining potential sources and innovation models.

Conclusions

The report summary highlighted the following issues and recommendations for further explorations:

- The AO Alliance and the AO have solid links to education, and local capacity building offering tailored solutions needs to be upscaled;
- Advocating for improved care of the injured in LMICs is a complex undertaking and requires framing the problem to be able to involve external actors, especially governments and ministries of health;
- Steps toward standard setting are required in LMICs:
 - Healthcare workforce targets need to be developed and justified, and ways to work toward these need to be laid out;
 - The trauma and orthopedic components of what essential services should be, and what is expected to be universally available (with accompanying metrics) need to be developed:
 - A benchmark;
 - Quality of care metrics; and
 - Ways to promote these within the medical community.

Recommendations

- Sufficient investments can be scaled up quickly if decision-makers can agree to commit;
- How to get the momentum going with smaller funding, as countries move toward expenditure shifts;
- Positioning fracture care as a development issue, not just a health issue, reduces competition for funding;
- Visible publications on the burden of injury, with a focus on cost-effectiveness of treatments;
- Collaborating with visibility groups;
- Publishing success stories concerning care of the injured;
- A complex solution that needs to be expressed more clearly with consistent messaging;
- To make available quality, affordable trauma and orthopedic implants; and
- To engage with the medtech industry.

The meeting's intention was always problem-based: the burden of injury in LMICs. The AO Alliance wanted to make a case for the problem and moves that can be made towards solutions. Though the consensus during the meeting was vague, there was consensus on the following: It is a big problem getting bigger, and there are solutions and intervention that will be cost-effective.

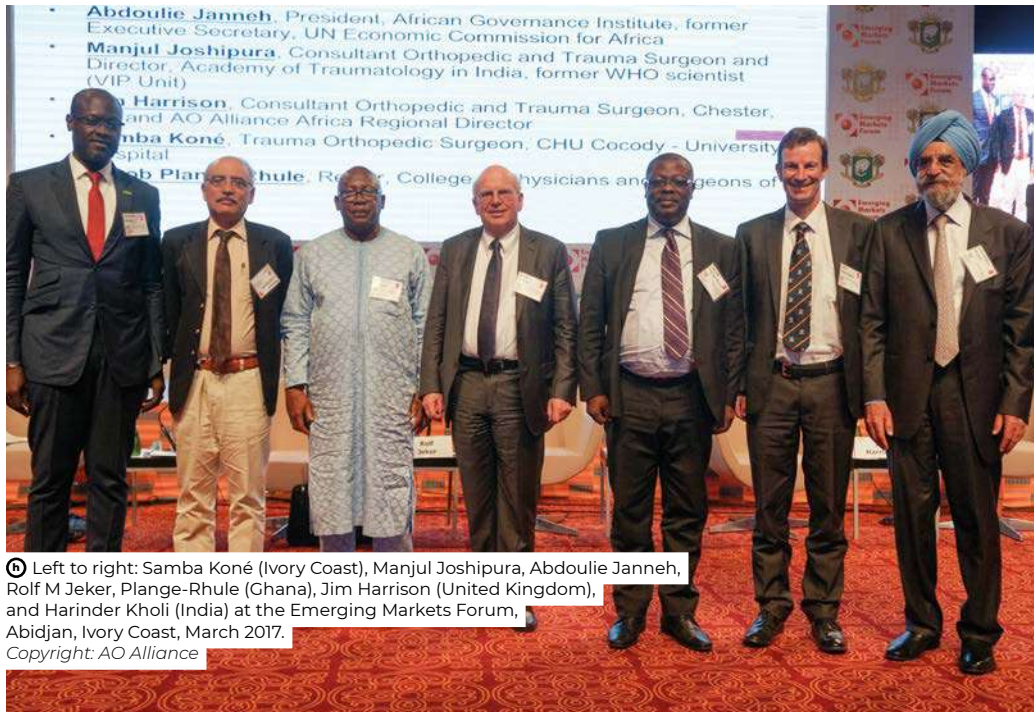
The Africa Emerging Markets Forum

The Emerging Markets Forum (EMF) for Africa was a first step toward improving awareness and identifying partners on the African continent to improve care of the injured in LMICs. The EMF, as a global policy forum promoting issues relevant to developing countries, brings together important decision-makers from governments, the private sector, and the scientific community. Its Africa forum, which took place in March 26–27, 2017, in Abidjan, Ivory Coast, under the auspices of President Alassane Ouattara and Prime Minister Duncan, brought together high-level decision makers. → [📍] [📅]

The cochairs of the Africa EMF—Ivory Coast President Alassane Ouattara and Michel Camdessus, former managing director of the International Monetary Fund (IMF) and honorary chair of Banque de France, led the major sessions. The forum was attended by leading lawmakers and policymakers, business leaders, academics, and thought leaders from across Africa and other regions.



⑨ Panel discussions at the Emerging Markets Forum, Abidjan, Ivory Coast, March 2017.
Copyright: AO Alliance



⑩ Left to right: Samba Koné (Ivory Coast), Manjul Joshipura, Abdoulie Janneh, Rolf M Jeker, Plange-Rhule (Ghana), Jim Harrison (United Kingdom), and Harinder Kholi (India) at the Emerging Markets Forum, Abidjan, Ivory Coast, March 2017.
Copyright: AO Alliance



① Jim Harrison, Manjul Joshipura, Rolf M Jeker, and Abdoulie Janneh at the Coalition for Dialogue on Africa meeting, Addis Ababa, Ethiopia, September 2018. Copyright: AO Alliance



① Participants at the Coalition for Dialogue on Africa meeting, Addis Ababa, Ethiopia, September 2018. Copyright: Coalition for Dialogue on Africa

The AO Alliance was provided with the opportunity to expose the silent epidemic that is severely affecting Africa: injuries and road traffic accidents (RTAs). Led by Rolf M Jeker, the panelists for the session titled, “A Private Initiative to Help Curb a Silent Epidemic”, were:

- Abdoulie Janneh, president, African Governance Institute, former Executive Secretary, United Nations Economic Commission for Africa (UNECA), member of the AO Alliance Board of Directors;
- Manjul Joshipura, consultant T&O surgeon, director of the Academy of Traumatology in India, former WHO scientist, member of the AO Alliance Board of Directors;
- Jim Harrison, consultant T&O surgeon, Chester, United Kingdom, and AO Alliance regional director for Africa;
- Samba Koné, T&O surgeon, CHU Cocody University Hospital, AO Alliance faculty; and
- The late Jacob Plange-Rhule, rector, College of Physicians and Surgeons of Ghana.

Few participants at the meeting were aware of the burden of injury in LMICs. A call to action for awareness, assistance in identifying private partners and funding, and forming an African coalition to help identify solutions for the were the resounding messages brought forward.

The Coalition for Dialogue on Africa ---

An important entry into awareness building was achieved through a joint meeting in Addis Ababa, Ethiopia, on September 16, 2018 with the Coalition for Dialogue on Africa (CoDA), which assumed 80 percent of the cost in a deal brokered by Abdoulie Janneh, AO Alliance Board of Directors member. ← [O]

Hosted by CoDA and the AO Alliance, in collaboration with the African Union Commission (AUC) and the support of Teri Reynolds (Global Alliance for Care of the Injured [GACI]/WHO) and Manjul Joshipura (member, AO Alliance Board of Directors), the meeting’s objectives were to raise awareness and set an agenda for action to tackle the trauma epidemic in Africa.

Participants agreed to call on member states of the African Union, multilateral organizations, the private sector, and civil society, to ensure the consideration of policies and measures to prevent injuries, and to improve care of the injured at all stages of trauma systems, from prehospital intervention to rehabilitation.

The event was chaired by Olusegun Obasanjo, former president of Nigeria, and chair of CoDA. Amongst other dignitaries in attendance were guest of honor John Mahama, president of Ghana; ministers of health from the Gambia, Ghana, and Nigeria; the United Nations Economic Commission for Africa (UNECA), the WHO, and representatives from Norway and Denmark. The AO Alliance was represented by Rolf M Jeker, chair of the AO Alliance Board of Directors. African Union Commission (AUC) Deputy Chair Ambassador Kwesi Quartey stressed that “sufficient research is needed to inform our policymakers, improve our clinical practice, and contribute to our advances in knowledge. A consistent theme which has hampered progress on this issue is the lack of data available (trauma registries) on road traffic injuries as well as trauma cases and without such data, public officials cannot be expected to recognize trauma and injuries as serious public health problems.” ◀ [O]

The meeting ended with detailed recommendations and a plan of action—addressed to governments, the private sector and civil society, as well as a call to the African Union to address issues of trauma management and care of the injured on a continental scale—to be used to adopt a resolution in the African Union.

This agenda and plan of action allows concerted action by all players, including the AO Alliance, which is guided by these recommendations.

Outcome Document of High-Level Policy Dialogue on Challenges of Trauma and Care of the Injured in Africa: *The Neglected Burden of Death and Disability from Injuries in Low- and Middle-Income Countries*

Key actions for African Member States:

1. *Conduct a standardized national assessment of the Emergency Care Systems* (e.g., WHO ECSA) and convene meeting to develop associated priority action plan
2. *Establish a dedicated government lead agency* at the national level (such as a ministry directorate) to coordinate integrated prehospital and facility-based care for the injured, including development of standard operating procedures and a mechanism for accreditation and monitoring.
3. *Increase access to emergency and trauma care*
 - a. Mandate universal access to emergency care-free of payment at the point of care
 - b. Explicitly integrate pre-hospital and facility-based emergency care into National Health Plan and any national pre-payment health funding scheme
4. *Collect standardized emergency and trauma care registries and data*, including integration into existing NHIS, and link to system planning, resource-allocation and quality improvement activities.
5. *Ensure at every first-level hospital a 24-hour dedicated emergency unit* with fixed trained staff and formal triage, and 24-hour of essential surgical services.
6. *Develop key components of prehospital emergency care*
 - c. Establish a single universal access emergency call number
 - d. Establish a mechanism for centrally-coordinated dispatch of ambulances and providers
 - e. Establish a dedicated certification pathway for prehospital providers
 - f. Establish a formal lay emergency care provider programme and legislation to protect bystanders who provide help to the acutely ill or injured
7. *Strengthen dedicated emergency and trauma care across the health system*
 - g. Establish trauma surgery, emergency medicine specialist and rehabilitation programmes and post-graduate nursing programmes.
 - h. Incorporate dedicated emergency and trauma care training into initial and ongoing certification for all providers who care for emergency patients.
 - i. Incorporate emergency and trauma care training into undergraduate medical and nursing curricula
 - j. Address the severe lack of necessary infrastructure and supply chain management necessary for optimal trauma care
8. *Establish harmonized regulations for continental Africa*

We further call on the African Union to mainstream the issues of trauma management and care of the injured into continental health policies.

Key actions for Private Sector:

We call on the African Union Commission to lead the establishment of a continental fund for the support of the implementation of a set of strategic actions. Such a fund could be financed by among others by car manufacturers such as Toyota, Mercedes Benz and Tata, oil companies, insurance companies, alcohol beverage companies, logistics companies, other philanthropic organizations, and foundations.

Key actions for Civil Society:

We call on the Coalition for Dialogue on Africa to mobilize an alliance of African champions and civil society organizations and the media to launch a continental campaign aiming at:

- A. Giving visibility to the challenges of trauma and care of the injured in Africa
- B. Lobbying policy makers and parliamentarians for the introduction of legislations towards the improvement of care systems from the event through prehospital and hospital-based care to rehabilitation
- C. Consolidating a global network for advocacy with a far-reaching network of people and organizations that actively advocate for trauma care
- D. Creating an African "Trauma Day" to be observed

We call on the African Union Commission and the Coalition for Dialogue on Africa to develop this outcome document into a five-year framework for adoption.

POLICY ADVISORY SERVICES

The AO Alliance policy advisory services build on the experience obtained through the faculty and stakeholder network. It complements the AO Alliance's expertise in fracture care education to shape the trauma care ecosystem together with national governments and contributes to setting standards of care of the injured.

Myanmar national trauma plan

The project aimed to bring together stakeholders in Myanmar to identify strategies for the development of trauma care and injury prevention, and to craft a national trauma plan that would provide the basis for all trauma system activities to ensure complementarity and consistency by government and non-state actors. → [\[C\]](#) [\[O\]](#) [\[M\]](#)

While initiated and facilitated by the AO Alliance, numerous nongovernmental actors joined the exercise. These were, among others, the AO, the Fédération Internationale de l'Automobile (FIA), the WHO, the University of Hong Kong School of Public Health, the Myanmar Ministry for Health and Sports, the Myanmar Ministry of Justice, the Myanmar Orthopaedic Society, the Yangon Medical School 1, the Yangon General Hospital, The Lancet Commission on Global Surgery, and many international speakers and consultants in trauma systems and injury prevention, treatment, and rehabilitation.

An initial meeting in May 2017 in Naypyidaw with over 70 collaborators set the course for the trauma plan development. A series of smaller national workshops was conducted to identify current issues and options for further development. The project was supported financially by the AO Alliance, with strategic leadership from the Ministry of Health and Sports. The needs were identified, and groups were formed to scope out potential solutions in four broad areas: injury prevention, prehospital care, hospital-based care and rehabilitation.

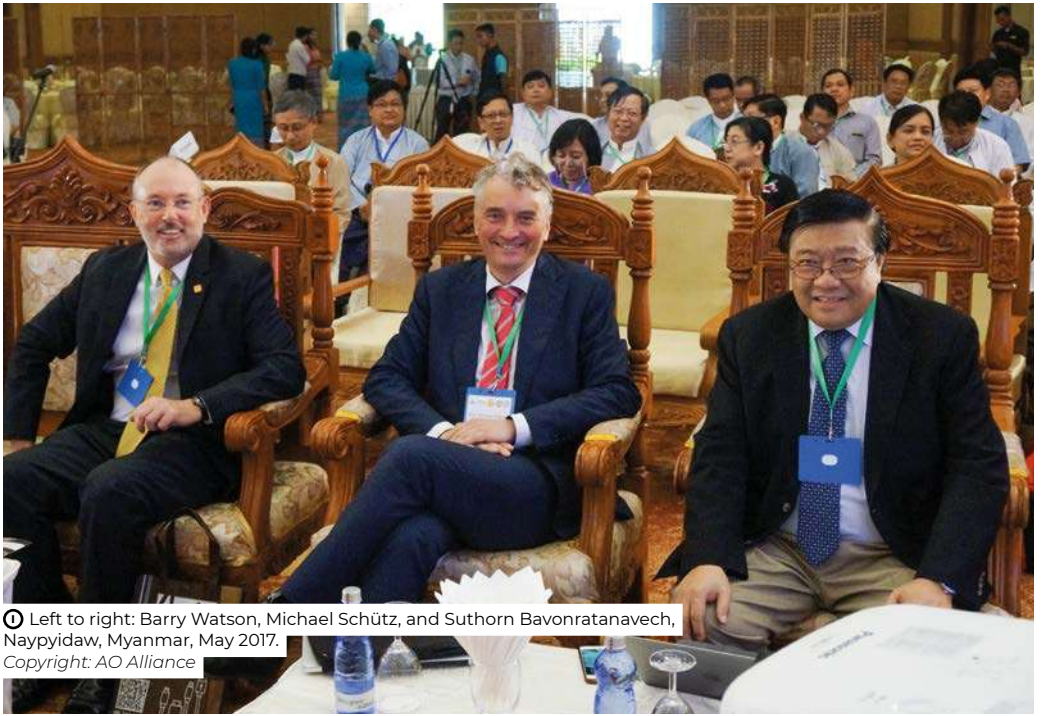
A comprehensive and cohesive reform was proposed, built around the WHO framework for the organization of trauma systems and reflecting a strategic approach to enabling reform.

Key aspects of that reform included the following:

1. **Clarity of strategic leadership, terminology, governance, monitoring and direction setting** achieved by actions to:
 - Prepare and publish a ***trauma care plan for Myanmar*** which incorporates categorization of hospitals based on their trauma capability, development of a clinical service capability framework for trauma, development of clinical standards and a performance indicator framework across the system. The proposed Trauma Plan should link with and complement other relevant national action plans such as the National Road Safety Action Plan.
 - Incorporate into the trauma plan ***an injury prevention plan, an emergency care system plan, a finance plan and a human-resources plan*** to identify how the system may be upgraded to meet modern standards.
 - Establish a ***national trauma committee*** at the highest possible level of Government. This committee to include subcommittees for injury prevention, emergency care systems, facility-based care and rehabilitation. The committee should liaise across government and the wider community and forge partnerships with other key relevant bodies such as the National Road Safety Council.
 - Establish a ***trauma clinical council*** answering to the National Trauma Committee to monitor the quality of performance of the system.
 - Establish a small administrative ***trauma support unit within the Ministry of Health and Sports*** tasked with providing policy advice, administrative and technical support for the policy advisory structures, and supporting data collection and analysis to inform system evaluation.
 - Establish a ***trauma institute*** to work alongside the standards and system development structures. The Institute would work in partnership with academic institutions and be responsible for coordinating the research and development activities and the ongoing data monitoring and evaluation.
2. **Upgrade resources** across the system including improvements to community infrastructure that reduce risk, improvements to service provision for the treatment of injury and improvements to rehabilitation and community re-integration. This resource upgrade should seek international support and sustainable funding mechanisms.
3. Continue to upgrade education and training through the development of a **training and development plan**. It must be noted that while this report has focused largely on the health consequences, enhanced training and development is needed across government and the broader community.
4. **Standardize and upgrade data and performance evaluation** to include common data definitions, linkage between organizations and datasets, community-wide approach to data collection and availability including the concept of a data warehouse, ensuring the currency and accuracy of data to enable timely access and rapid utilization of information, enhanced accessibility and maintenance of data integrity, privacy and confidentiality.
5. Development and improvement of a **national trauma communication strategy** using multiple modes of communication and built around promulgating the National Trauma Plan and achievement of reductions in trauma risk and improved outcomes.



① Myanmar national trauma plan working group, Naypyidaw, Myanmar, May 2017.
Copyright: AO Alliance



① Left to right: Barry Watson, Michael Schütz, and Suthorn Bavonratanevech, Naypyidaw, Myanmar, May 2017.
Copyright: AO Alliance



After extensive consultation and additional work, the national trauma plan for Myanmar was published and made available to the Myanmar Ministry for Health and Sports in April 2018.

It is hoped that, as the political situation stabilizes, the trauma plan can be advanced with the leadership that will be in place. The exercise was one that can be replicated in other countries, as trauma care system plans are required everywhere to provide a scientific basis for policy and action.

Myanmar was initially an official candidate for a country initiative, following a needs assessment in September 2014 by Michael Schütz, Rolf M Jeker, and Ram K Shah. The following projects—in addition to the trauma plan— were agreed upon during the needs assessment:

- Funding the development of a skills laboratory (workshop equipment for orthopedic trauma management) as part of an integrated training program in Yangon;
- Developing a master national trauma plan; and
- Creating capacity to run AO Alliance basic principles courses to fulfill the newly established mandatory requirement for every orthopedic registrar before sitting the final T&O fellowship examination.

The skills laboratory became functional in 2015. It contains ten workstations that make up the practical component of the AO Alliance basic operative course. It allows national faculty to organize teaching sessions for surgeons, residents, and ORPs without having to rely on the industrial partner for equipment transport. It has been instrumental in providing hands-on fracture care education to T&O residents and surgeons in Myanmar under the leadership of Myint Thaug and Kyaw Soe. Zaw Wai Soe, rector at the University of Yangon Medicine 1 in Yangon, has been a driving force in continuing the work undertaken to advance care of the injured in Myanmar.

It took until May 2017 for the national trauma plan gathering to occur. The white paper was written and submitted to the Ministry of Health and Sports in April 2018. Attempts to revive the agenda were further taken during a plenary at the Myanmar Orthopaedic Society Meeting in November 2018.

Plans to establish the Myanmar country initiative as a comprehensive program were suspended in 2019. Trauma and orthopedic fracture care education in Myanmar, however, continues through the Fracture Solutions Program in Asia. The skills laboratory continues to fulfill its purpose in point of care education for young

residents and ORPs in training. The national trauma plan sits on the shelves of the Myanmar Ministry for Health and Sports awaiting consultation and implementation.

Malawi open fractures clinical guidelines

The AO Alliance convened a consensus meeting to craft treatment guidelines for the management of open fractures in Malawi. Eighteen members from different professional backgrounds and regions of Malawi participated in the one-day consensus meeting on September 7, 2019. → [©]

The British Orthopaedic Audit Standards for Trauma (BOAST) for open fractures as well as relevant systematic reviews and seminal literature were used as a baseline. Panel members gave presentations on open fracture management, followed by an open discussion. They developed statements for each standard and guideline. They then voted to accept or reject the statements. Unanimous agreement was reached for all of the 17 guidelines and the associated terminology. These guidelines were then presented to the members of the Malawi Orthopaedic Association (MOA) at their Annual General Meeting on September 28, 2019, and all participants agreed to adopt them. These national guidelines aimed to set a standard for open fracture management that could be regularly measured and audited in Malawi to improve patient care.

Hopefully, they will be replicated elsewhere where conditions are similar. The AO Alliance hopes application of these standards and guidelines will help improve the management of this devastating injury in Malawi. The AO Alliance encourages units to audit their performance against the standards in their ongoing efforts to improve patient care.



MOA/AO Alliance Guidelines and Standards: open fracture management

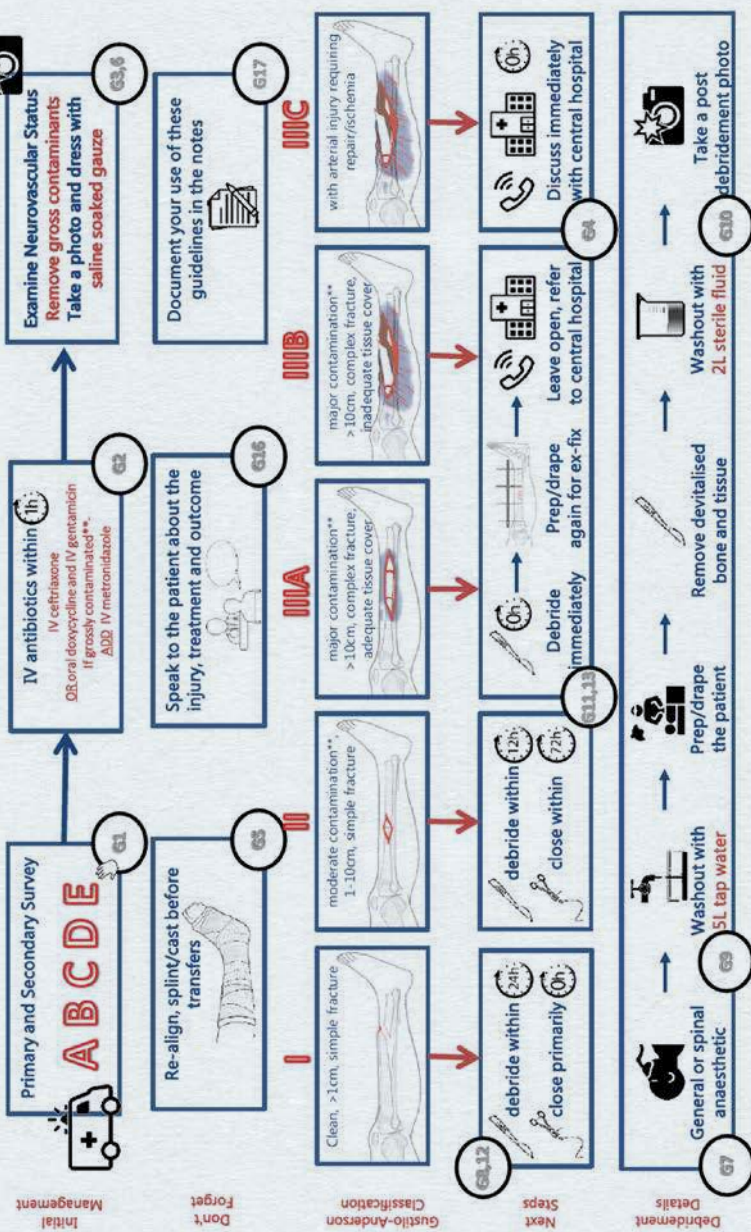


These guidelines are for all patients with open fractures of long bones, hind foot or midfoot (excluding hand, wrist, forefoot or digit). Grading refers to the Gustilo-Anderson classification.

- 1) Primary (A,B,C assessment) and secondary survey, according to ATLS/PTC, should precede the treatment of open fractures.
- 2) Intravenous prophylactic antibiotics should be administered as soon as possible and at least within 1 hour of presentation to the health facility:
 - a) Intravenous Ceftriaxone (at appropriate doses for age and weight)
 - b) Alternatively, oral Doxycycline & intravenous Gentamicin (if no Ceftriaxone is available)
 - c) For grossly contaminated wounds, in addition, administer intravenous Metronidazole
 - d) If none available, give the most appropriate available antibiotics
- 3) The examination of the injured limb should include assessment and documentation of the vascular and neurological status. This should be repeated systematically, particularly after reduction manoeuvres and/or the application of splints or casts.
- 4) Grade III C fractures with an ischaemic limb should be discussed immediately with the central hospital by telephone with a view to immediate referral when appropriate.
- 5) The limb must be re-aligned and splinted or casted before transfer to the ward or another health facility.
- 6) Prior to formal debridement the wound should be exposed only to remove gross contamination and to allow photography, then dressed with a sterile saline-soaked gauze.
- 7) Washouts outside the operating theatre environment are not indicated and patients should be prepared for debridement under spinal or general anaesthetic.
- 8) Debridement should be performed, under general or spinal anaesthetic, using fasciotomy lines for wound extension where possible:
 - a) Immediately for highly contaminated wounds (agricultural, aquatic, sewage) or when there is an associated vascular compromise (compartment syndrome or arterial disruption producing ischaemia).
 - b) Within 12 hours of presentation to hospital for grade II & III fractures
 - c) Within 24 hours of presentation to hospital for grade I fractures
- 9) Before prepping and draping the patient, contamination is removed with at least 5L of tap water. At debridement, all devitalised soft tissue and bone should be removed, both bone ends exposed, further irrigation with at least 2L of sterile fluid.
- 10) Photographs of the wound should be taken at first presentation to the health facility and after debridement.
- 11) Once debridement is complete any further procedures (e.g. external fixation) carried out at that same sitting should be regarded as clean surgery; i.e. there should be fresh instruments and a re-prep and draping of the limb before proceeding.
- 12)
 - a) Clean grade I fractures should be closed primarily
 - b) Grade II fractures should be left open and closed within 72 hours
 - c) Grade III A & B fractures should be left open and referred to the nearest central hospital within 24 hours to enable wound closure or flap within 72 hours. This should include a letter and before & after debridement photographs to the receiving surgeon
- 13) Long bone Grade III A & B fractures should be stabilised with an external fixator at the time of debridement. In some cases, an orthopaedic surgeon may use internal fixation.
- 14) Definitive internal stabilisation should only be carried out when it can be immediately followed with definitive soft tissue cover. Approximation sutures over exposed bone should not be done.
- 15) Immediate amputation, except in life-threatening emergency, should not be undertaken without consultation with another surgical colleague.
- 16) Patients should receive explanation about their injury, the treatment and their functional outcome.
- 17) Written notes in the medical records should provide evidence of the application of these guidelines.



OPEN FRACTURE MANAGEMENT



61- guideline number. Note: 61.4- internal fixation only if adequate tissue cover; 61.5- Amputation not to be done without consultation with another colleague unless life-threatening; **Contamination Levels: 1) clean; 2) moderate-foreign material in contact with wound e.g. bullet; 3) major- evidence of devitalised tissue or faecal matter

Figure 16. The open fracture management guidelines provide key guidance for locally available treatment options.



© Malawi consensus group, Chigumula, Malawi, September 2019.
Copyright: AO Alliance



CARE: CORE PROGRAMS

The 'Care' pillar of AO Alliance programs encompasses all its operational activities: the Fracture Solutions Program, country initiatives, and special programs. Support is provided through training in nonoperative and operative fracture care (courses, symposia, and seminars), fellowships and reverse fellowships, small-scale infrastructure support, as well as funding and mentorship for clinical research projects.

The Fracture Solutions Program

The Fracture Solutions Program (FSP) in Africa and Asia is the AO Alliance's flagship program in education and is the successor to AO SEC activities, although on a larger scale and with more uniform content and delivery.

The FSP is a three-year education program in its second cycle (2019–2021), following the success of the first cycle (2016–2018). The goal of this program is to reduce disabilities, morbidity, and mortality resulting from musculoskeletal trauma by improving clinical care provided by physicians, nurses, allied healthcare workers, and first interveners.

The program has five objectives:

- To develop national healthcare worker skills and motivation that can maximize the opportunities afforded by available physical resources for fracture care;
- To increase quantity and quality of fracture care in select sub-Saharan African and Asian countries in a way that is economical in its costs of human and physical resources;
- To promote a national and regional culture of fracture care which makes a priority of those in most clinical need;
- To promote local fracture care wherever possible, together with appropriate referral; and
- To measure the impact of AO Alliance initiatives on volume and quality of fracture care, based on appropriate and cost-effective strategies.

The following sections illustrate the respective activities in sub-Saharan Africa and Asia.

Fracture Solutions for Africa

Overview

The project covers 23 countries, of which 12 are in English-speaking Africa and 12 are in French-speaking Africa. (Cameroon is counted twice as it has both languages).

Budget

Since the beginning of the first cycle, up to end of 2019, the annual budget allocated to the project was CHF 1.33 million per year for the 2016–2018 period and CHF 1.8 million in 2019, amounting to a total of CHF 5.88 million.

For 2020 (some activities were postponed due to the coronavirus pandemic) and 2021, the budgetary allocations are CHF 1.8 million and CHF 1.9 million respectively, adjusted for the COVID-19 pandemic. → [📄] [📄]

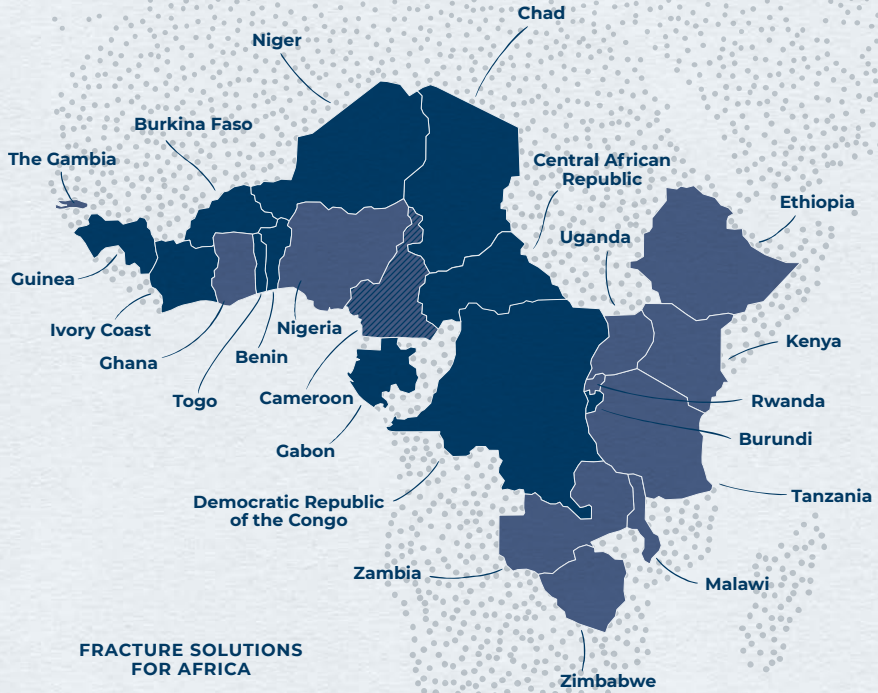
Impact

Between 2016 and 2019, 241 educational events were delivered, 25 percent of which were dedicated to training ORPs. Over 10,000 healthcare workers benefited from the events. The education and training still focus on nonoperative treatment of fractures. In addition, 10 faculty education events were organized, drawing a total of 127 surgeon-trainers who were able to develop and strengthen their teaching skills.



“My activities for the AO Alliance have required me to liaise with management (of other hospitals) and to work with nurses from the hospitals, and as a result I have developed relationships with many hospitals across the country. I have also come to associate with the AO Alliance family internationally, thus learning from other countries. The courses have involved OCOs, theatre nurses and theatre assistants. The improvements in their skills as a result of practical knowledge gained through the courses have improved the outcomes of surgical procedures.”

Forcina Mdala, Malawi.



FRACTURE SOLUTIONS FOR AFRICA

23

COUNTRIES

English-speaking	French-speaking
Cameroon	Benin
The Gambia	Burkina Faso
Ghana	Burundi
Ethiopia	Cameroon
Kenya	Central African Republic
Malawi	Chad
Nigeria	Democratic Republic of the Congo
Rwanda	Gabon
Tanzania	Guinea
Uganda	Ivory Coast
Zambia	Niger
Zimbabwe	Togo



© Claude Martin Jr instructing at the Nonoperative Fracture Management course, Mangochi, Malawi, September 2016. Copyright: AO Alliance



© Trauma and orthopedic resident practical teaching course, Lomé, Togo, 2018. Copyright: AO Alliance





© Forcina Mdala, CURE Malawi Hospital operating room personnel, reporting during a field visit by Hansjörg Wyss, Blantyre, Malawi, June 2017.
Copyright: AO Alliance

Under the project, 127 short-term² fellowships were awarded to healthcare workers to complement their fracture care training.

Meanwhile, the AO Alliance can count over 200 locally based African surgeons within its faculty network. → [📄]

Fracture Solutions for Asia

Overview

The project covers seven countries in Asia: Bangladesh, Cambodia, Laos, Myanmar, Nepal, Sri Lanka, and Vietnam.

Budget

Since the beginning of the first cycle, up to end of 2019, the yearly budget allocated to the project was CHF 889,000 in 2016, CHF 1.1 million in 2017, CHF 1.2 million in 2018, and CHF 1.2 million in 2019, amounting to a total of CHF 4.3 million.

For 2020 (some activities were postponed due to the coronavirus pandemic) and 2021, the budgetary allocations are CHF 1 million and CHF 1.2 million, respectively. → [📄] [📄]

Impact

From 2016 to 2019, 177 educational events were delivered. Of those events, 25 percent were designed for ORP. Just under 7,500 healthcare workers benefited from the events. The education curricula are mainly centered on nonoperative fracture care; however, the AO Alliance is steadily increasing operative fracture care training. The advanced operative courses are delivered in partnership with AO Trauma Asia Pacific, with the material support of DePuy Synthes for the practical exercises requiring synthetic bones, surgical training tools, and implants.

As part of the Faculty Education Program (FEP), six such educational events were organized, training 124 healthcare workers to further develop their training skills. Short-term fellowships were awarded to 118 healthcare workers in the region, to complement their professional training.

In its network, the AO Alliance has over 100 Asian faculty delivering AO Alliance courses to their regional colleagues. → [📄]

2 Short-term fellowships range from six weeks to three months.



“The AO alliance has enabled young healthcare professionals here in Nepal with cutting-edge orthopedic technology and training and empowered them to be able learn new techniques and go back and help their communities. The exchange of ideas between doctors across nations has built camaraderie and provided global exposure to young doctors here in Nepal.”

Ramesh P Singh, Nepal

Course evaluations

A study³ carried out at the AO Education Institute by Emma Bonhomme, utilizing the evaluation methodology designed for the AO Davos Courses for use by the AO clinical divisions, revealed a high degree of satisfaction with AO Alliance educational activities.

The evaluation study was based on a sample of 57 AO Alliance educational events across 13 countries in sub-Saharan Africa (eight) and Asia (five) between January 2018 and August 2019, comprising operative, operative ORP, and non-operative courses.

Faculty and participants completed online evaluation questionnaires at the end of each event. The questions asked and evaluated on a scale of one to five were:

- How useful was the content to your daily practice?
- To what degree were the stated objectives met?
- What was the overall impact of this educational event?
- How effective were faculty in the role they played?

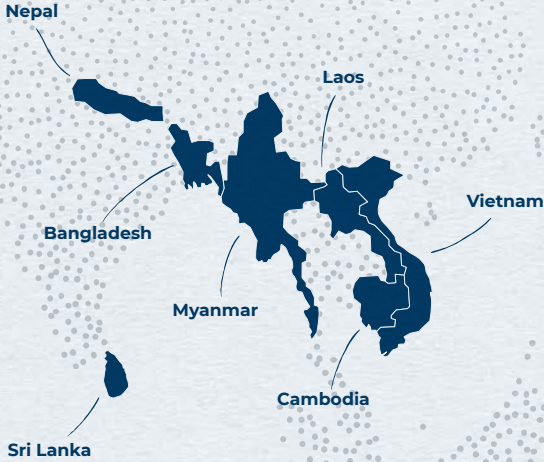
The study’s findings revealed that most participants felt the course content was useful to their daily practices, they acquired new knowledge and skills, and planned to use these in their practices, the stated objectives of the courses were met, and the faculty were effective.

3 The study was supported by Claude Martin Jr, Ramesh P Singh, Wilfred Addo, and Florent Anicet Lekina.





© Faculty instructing at the AO Alliance Basic Principles of Fracture Management course for Operating Room Personnel, Dhaka, Bangladesh, 2019.
Copyright: AO Alliance



**FRACTURE SOLUTIONS
FOR ASIA**

7

COUNTRIES

- Bangladesh
- Cambodia
- Laos
- Myanmar
- Nepal
- Sri Lanka
- Vietnam



© Participants at the AO Alliance Basic Principles of Fracture Management course, Dhaka, Bangladesh, 2019. Copyright: AO Alliance



© Ramesh P Singh delivering a lecture to trauma and orthopedic residents, Ho Chi Minh City, Vietnam, November 2018. Copyright: AO Alliance

All scores were rated well above average, especially scores on impact to their practices being particularly high. Areas for improvement included the request for longer events, more time for practical exercises, more lecture and discussion time, and addressing language barriers, especially for ORPs. Most course chairs have implemented the suggestions by extending discussion time and adapting the course content to local settings and participants, while maintaining the core content of the courses. Some suggestions could not be implemented due to the lack of resources, especially for the practical exercises.

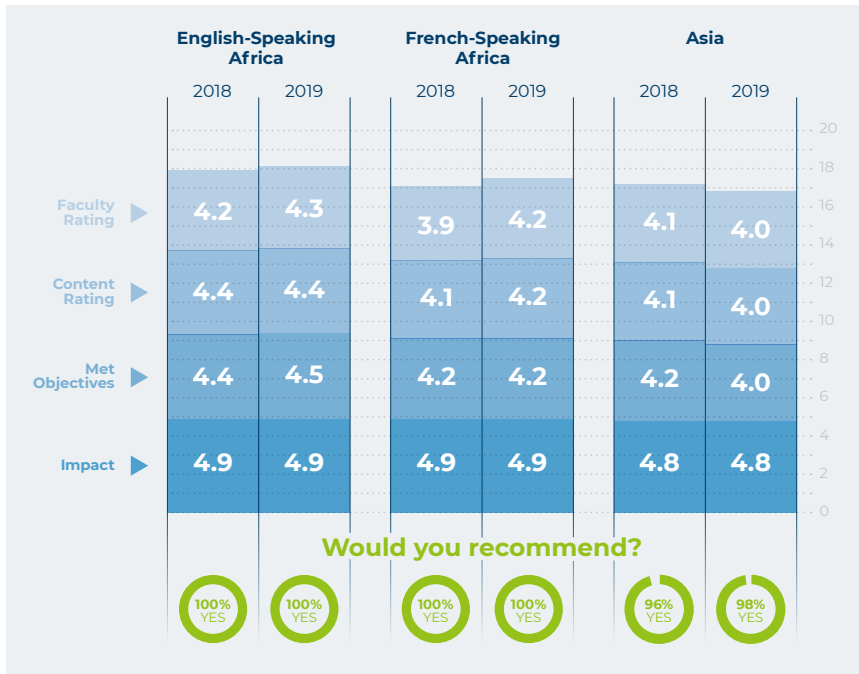


Figure 17. Results from the evaluation study revealed that an overwhelming majority of participants and faculty would recommend AO Alliance educational events.

The study confirmed that there is indeed a need for AO Alliance educational events and reaffirms that they are highly valued in LMICs by both participants and faculty. Offering more courses in sub-Saharan Africa would allow for smaller course settings, which could further improve the overall educational experience.

AO Davos Courses: Since 2016, the AO Alliance has been giving back to its sub-Saharan African and Asian faculty by providing educational opportunities at the world-renowned AO Davos Courses. Close to 40 faculty have been invited to attend

every year since 2015. In addition to the obvious opportunity to learn new surgical knowledge and skills, this event gives AO Alliance faculty a chance to meet other surgeons from around the world and share experiences, as well as discover technologies that are not yet available or easily accessible in their countries.



“This experience has not only been career changing but life changing, too. I have realized my passion extends beyond just acquiring skills in pediatric orthopedics but also to teaching others about proper management of orthopedic conditions,”

said Tongai Chitsamatanga (Zimbabwe), who attended the Pediatrics Musculoskeletal Injuries Management course in 2016.

In December 2018, our largest group yet from sub-Saharan Africa and Asia, gathered in Davos. This event gave the AO Alliance faculty a special chance to meet Joe Schatzker, past president of the AO and AO Alliance founder. Schatzker had released a book on the Maurice Edmond Müller – *In His Own Words*. A special signing ceremony took place for AO Alliance faculty. → [📖]

Conclusions

True to its promise during the transition from the AO SEC, the AO Alliance has continued to expand training of healthcare workers. The annual budget, CHF 3 million in 2019, far exceeded the total annual AO SEC budget, which stood at CHF 1.2 million at the time of transition. Local capacity building was considerably strengthened.

Local participation in sub-Saharan Africa and Asia has increased annually, as demonstrated not only by the increasing number of educational events (419), but also by the number of locally, well-trained healthcare workers (17,882). Particularly effective was the Faculty Education Program (FEP), under which 251 new teaching faculty were trained at a high level, and 245 healthcare workers benefited from short-term fellowships.

The complementary relationship between the Fracture Solutions Program and the country initiatives has further added to the positive impact of fracture care education. Additional local assistance (ie, building operating theatres and providing instruments and equipment) has helped to ensure that the trained surgeons and ORP can execute their jobs. This has added to their motivation, as during the

period under consideration, none of the AO Alliance ‘surgeon assets’ have left for greener pastures. → [👍]

	2015	2016	2017	2018	2019	Total to end 2019
Number of educational events						
Africa	36	41	50	53	61	241
Asia	19	31	40	44	43	177
Europe	0	0	0	0	1	1
Total	55	72	90	97	105	419
Number of healthcare workers trained						
Africa	1,459	1,685	2,416	2,248	2,613	10,421
Asia	701	1,165	1,906	1,890	1,799	7,461
Total	2,160	2,850	4,322	4,138	4,412	17,882
Number of faculty participating						
Africa	387	416	524	518	540	2,385
Asia	221	311	391	533	437	1,893
Total	608	727	915	1,051	977	4,278
Number of fellowships completed						
Africa	8	13	25	45	36	127
Asia	15	19	27	20	37	118
Total	23	32	52	65	73	245
Number of faculty attending FEP						
Africa	14	15	30	15	53	127
Asia	8	15	15	15	71	124
Total	22	30	45	30	124	251

Table 4: Summary of AO Alliance educational support in sub-Saharan Africa and Asia 2015–2019.

The COVID-19 pandemic will further expedite the need for digital and locally conducted educational events and training. Thanks to its local orientation, the AO Alliance is well positioned to deliver on its mission. But digitalization of its education will need to be more fervently developed and promoted.

“The AO Alliance not only helps to improve the quality of our orthopedic surgeons and ORP via many academic events per year, but also provides chances to enhance the competency of national faculty. The AO Alliance has trained more than 500 orthopedic surgeons and 100 ORP in Vietnam over the last five years.”

Nguyen Trung Hieu, Vietnam

Country initiatives

To go beyond providing fracture care management training to a significant number of countries as a continuation of AO SEC activities, the AO Alliance also focuses on select countries where additional specific training, fellowships, clinical research assistance, and infrastructure support can be provided over a defined period. This is usually for an initial cycle of four to five years, to maximize impact.

These countries belong to the LMIC category as defined by the World Bank (World Bank Country and Lending Groups). While the task force (see Chapter III), and later the AO Alliance Board of Directors, had initially identified eight eligible countries, four have so far been retained and are in different stages of maturity and implementation.

These countries are Malawi (2016), Ghana (2017), Ethiopia (2018) and more recently, the Gambia (2019). The Gambia country initiative is a joint program with AO Trauma through the AO clinical divisions' collaboration, while the others are a joint financing with the Hansjörg Wyss Medical Foundation.

Initial plans to develop a country initiative in Myanmar were placed on hold, on one hand because of the lack of response to the national trauma plan the AO Alliance had helped craft, and on the other hand due to the deteriorating political and human rights situation. Myanmar was in an election year in 2020, making any inroads with any government bodies difficult.

Country needs assessments were conducted in Nepal (2017) and Burkina Faso (2019), as they were considered potential beneficiaries. They could not be implemented due to limited financial resources and political constraints and instability.

Below is an overview of the objectives, activities, and results of the current four country initiatives.

📍 Joe Schatzker at the AO Alliance signing ceremony with AO Alliance faculty, Davos, Switzerland, December 2018.
Copyright: AO Alliance







© Nguyen Trung Hieu leading the faculty education training for ORPs, Ho Chi Minh City, Vietnam, November 2018.

Copyright: AO Alliance

Vít có một mũi



▼ = biểu thị tự ta-rô



Tròn chuẩn

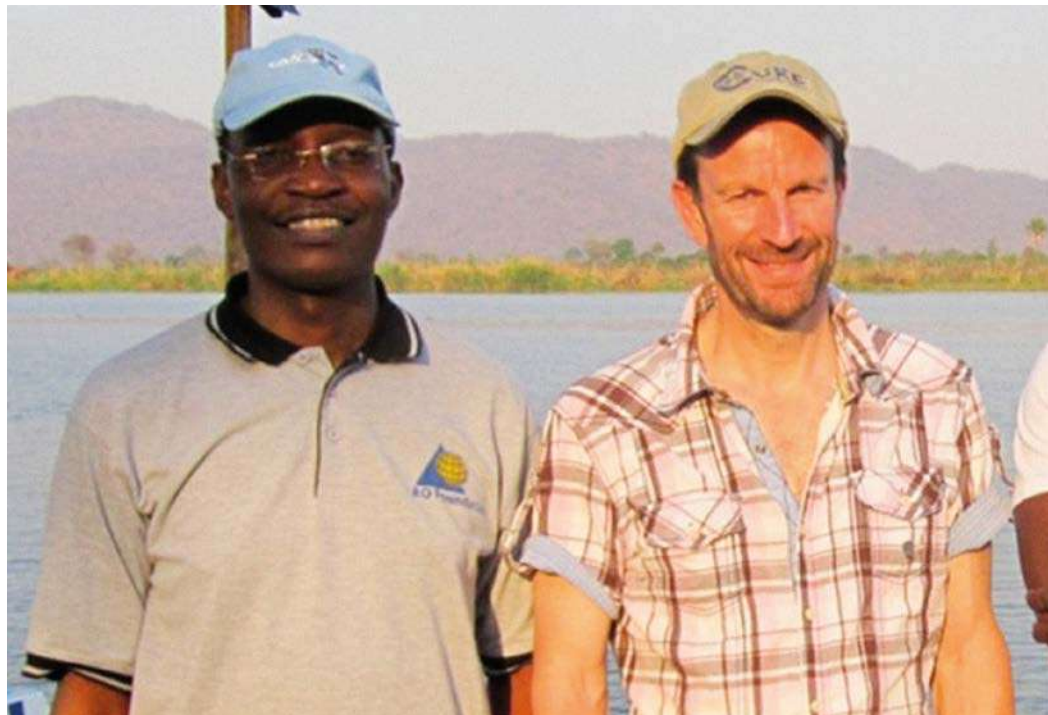


Tự ta-rô



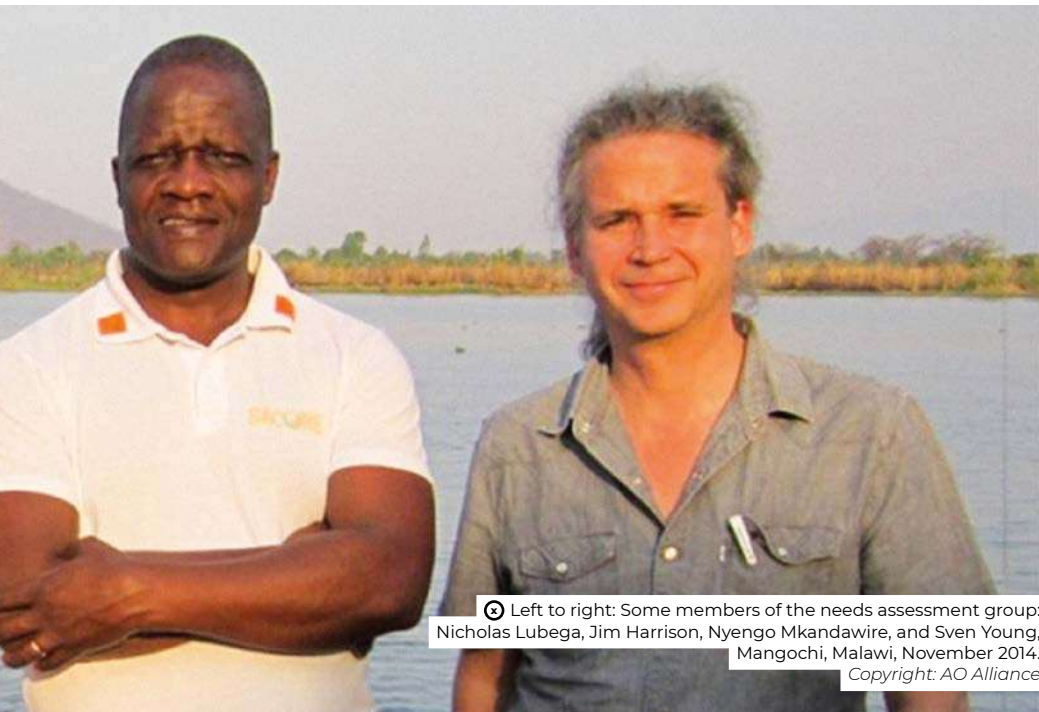
Tự khoan







© Needs assessment working group, Mangochi, Malawi, November 2014.
Copyright: AO Alliance



© Left to right: Some members of the needs assessment group: Nicholas Lubega, Jim Harrison, Nyengo Mkandawire, and Sven Young, Mangochi, Malawi, November 2014.
Copyright: AO Alliance

Malawi country initiative (2016–2020) ← [🌐] [📄]

Country situation and needs assessment

Malawi, a landlocked country in southern Africa with a population of 18 million and a per capita income of USD 517 (2018), is one of the poorest countries in the world. Road traffic accidents (RTAs) alone are responsible for 100,000 injuries a year. A large proportion of the population, about 400,000 people, lives with avoidable musculoskeletal disabilities due to the lack of adequate and timely access to T&O services. Malawi, like other LICs, faces the escalating problem of injuries which will result in increased burden of fractures.

As is always the case in selecting a country initiative candidate, a thorough needs assessment was conducted. Infrastructure and availability of resources to provide trauma care were assessed to identify opportunities and the priorities for providing support. The country's musculoskeletal trauma needs assessment was based on questionnaires and a meeting with 15 leading clinical stakeholders from Malawi in November 2014 in Mangochi. This was the basis of a bottom-up proposal for development of strategic and sustainable improvement initiatives. Initiatives of other organizations were respected, including the ministry of health and the potential new role of the AO Alliance was defined. Many of the structures necessary for trauma care were lacking in all hospitals in Malawi at the time. Weaknesses were in infrastructure, trauma systems, and training. Policies to improve hospital systems for care of fractures and their consequences had to be prioritized.

The following priorities were identified to be addressed under the main headings of education, fellowships, clinical research, and clinical infrastructure development:

- In 2014, there were only nine trained T&O surgeons serving Malawi in three institutions in two cities – only three of whom were Malawian nationals. The priority was to draw young doctors to T&O training and optimize that training, together with the successful conversion from training to productive and fruitful specialist practice;
- The second priority was to support orthopedic clinical officers (OCO) education at the diploma school. There was a need for more teachers and for hands-on mentors. OCOs would provide all trauma care at the district hospitals for the foreseeable future;
- Further development of the trauma curriculum and integration in education activities would continue in parallel, with Malawi contributing the spinal injury module to the overall curriculum for LMICs;
- Further enhancement and development of fellowships and reverse fellowships at the national, regional, and international levels for ORP, OCOs, trainees, and surgeons would be instituted;

- In clinical research, there was an immediate need for data sets on the burden of trauma and care given. These would provide context within which to measure progress. Clinical outcomes research and economic analysis in the cost-effectiveness of treatments would follow;
- The lack of capacity for surgical care at both Kamuzu Central Hospital (KCH) in Lilongwe and the Queen Elizabeth Central Hospital (QECH) in Blantyre was a significant bottleneck. Basic surgical equipment was lacking, particularly at the QECH. These needs equally hampered the possibility of postgraduate clinical training and diminished the attractiveness of T&O as a specialist career. In both Lilongwe and Blantyre, appropriate plans are afoot to address these needs but require further financial support in infrastructure; and
- A priority was to see QECH and KCH become highly active as operative and training centers, and thereafter to see the Mzuzu and Zomba Central Hospitals hire T&O surgeons and begin regular operative services with local surgeons.

Program goals and objectives

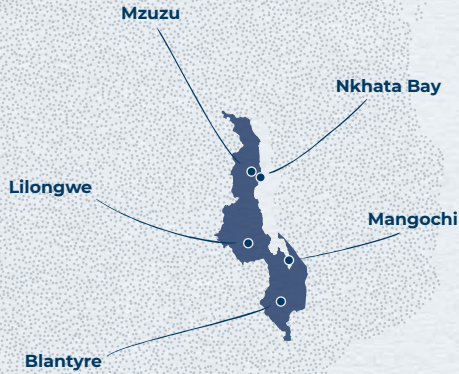
Increased human resource capacity

In 2014, there were only nine Malawian T&O surgeons and four residents. There were also only six OCOs at KCH. They fill much the same role as doctors in Malawi, including treatment of outpatients and patients on the hospital wards. They also perform basic surgical procedures, although their levels of knowledge and surgical skills vary considerably according to their experience and interest. By the end of 2019, those numbers had increased to eleven T&O surgeons and twelve T&O residents. The AO Alliance's ability to attract young candidates, especially for T&O surgery, was curtailed by funding promises from other surgical programs like general surgery, and obstetrics and gynecology. These programs offered greater financial incentives that the AO Alliance could not match or raise. Another reason for the slow increase was the attractiveness of public health medicine. Such posts are well remunerated, and the lifestyle is much more relaxed than that of a T&O surgeon.

This increased human resource capacity is crucial to ensuring trauma victims can access timely and appropriate treatment.

Specialist surgical workforce (per 100,000 population) in Malawi was reported at 0.43 in 2016, according to the World Bank collection of development indicators, compiled from officially recognized sources (Specialist Surgical Workforce).

Countries with fewer than 20 specialist surgeons, anesthetists, and obstetricians per 100,000 population have worse health outcomes. To achieve surgical workforce



MALAWI

2017 FIGURES*

Population: 17.2 million



1,028 Gross Domestic Product
GDP in USD



42 Surgeons



4.5 Fertility rate
number of children per woman



0.24 Surgeons
per 100,000



62 Literacy rate (%)
adults aged 15 and above



11 T&O
surgeons

* Institute for Health Metrics and Evaluation



Members of the AO Alliance Board of Directors visit the Queen Elizabeth Central Hospital, Blantyre, Malawi, September 2017.
Copyright: AO Alliance



Left: Hansjörg Wyss discussing surgical care with an anesthiologist at the Queen Elizabeth Central Hospital, Blantyre, Malawi, June 2017.
Copyright: AO Alliance





④ The two new Mafupa operating theatres at the Queen Elizabeth Central Hospital, Blantyre, Malawi, January 2020. Copyright: AO Alliance

densities of 20 per 100,000 by 2030, a scale up of the surgical workforce is required (Daniels et al, 2015).

The hope is that as these new surgeons will attract other young surgeons to specialize in trauma and orthopedics to meet the ever-rising burden of trauma.

Queen Elizabeth Central Hospital (QECH): two new operating theatres (Mafupa project) ← [🌐] [📄] [🗺️]

Expanding the government-run hospital's capacity to treat fractures operatively is part of the AO Alliance Malawi country initiative. When the needs assessment for Malawi was conducted, QECH had only one main T&O operating theatre, making it difficult to handle the ever-increasing volume of trauma and fractures. In addition, the old theatre did not allow a separation of 'clean' and 'infected' cases, which is considered vital and a basic principle of good surgical practices for patient safety. This inability to segregate the two types of cases put at risk patients that did not have an infection and required fracture fixation surgery. In 2016, the AO Alliance launched a project to build two new operating theatres at QECH in Blantyre that would double—from 1,000 to 2,000 annually—the number of trauma patients to receive life-changing surgeries. After some setbacks with faulty cement floors and defective epoxy paint, and overall delays in construction, the two theatres were in full operation in January 2019. Over the five-year program, the two new operating theatres were expected to drastically improve critical care of patients, reduce overcrowding, and shorten patient waiting time. The new facilities were set to transform the experience of trauma for many patients and surgeons. Jes Bates, T&O staff surgeon at the hospital, oversaw the project. His dedication to detail and getting things done made this infrastructure a reality.

Unfortunately, the shortage of anesthesia and ORP has so far prevented the full use of the increased capacity. A shortage of anesthesia clinical officers for the greater part of 2019 and 2020 has curtailed the projected increased capacity for surgical fixation of fractures until enough anesthesia clinical officers can be hired.

The Lilongwe Institute for Orthopaedics and Neurosurgery (LION) → [🌐] [📄]

The need for additional specialized surgical capacity

The idea to build a separate musculoskeletal hospital in Lilongwe has its background in many years of collaboration between Haukeland University Hospital (HUH), in Norway, and KCH in Lilongwe, Malawi, for the training of T&O specialists, and originated on the ground through the surgeons and trainees at the hospital. Through their experience, the lack of a dedicated musculoskeletal hospital was identified as the main constraint for sustainable teaching and service provision,

along with the lack of a modern teaching environment, and capacity for operations for musculoskeletal and neurosurgical trauma at KCH, one of only two postgraduate training sites for surgical specialists in the country. On request from the head of the orthopedic surgery division and the hospital director at KCH, HUH had agreed to assist KCH in developing a proposal for a musculoskeletal care center at KCH and to assist in raising the funds necessary for the project.

KCH is the referral hospital for 5.5 million people in the central region of Malawi. Despite being located in the capital city, Lilongwe, the hospital is drastically underfunded and lacks many basic facilities and human resources. Before 2008, there were no qualified T&O surgeons working there. From 2008, the Norwegian University Hospital program and Haukeland University Hospital seconded one T&O surgeon full-time, and from 2011, Christian Blind Mission seconded a second one. This has improved the quality and capacity of care. With this background, KCH has been working with HUH and the AO Alliance to establish a training program for Malawian surgeons in Lilongwe.

Timely surgical interventions can prevent musculoskeletal disabilities and are increasingly proving to be as cost-effective as other essential health interventions in LMICs. However, there is still a prevailing belief among many surgeons and policy makers that infection rates are too high to perform fracture fixation surgery in LMICs, and that results are disappointing. Research conducted at KCH has confirmed that good results can be achieved after T&O surgery in Malawi (Agwu et al, 2020), but that there still is considerable potential for quality improvement with training and infrastructure development.

There are just under 1,000 orthopedic operations performed at KCH every year. This is accomplished through effective use of the single theatre available to T&O surgeons. With the current capacity, only the very worst injuries can be treated. These include serious open fractures that otherwise would end with an amputation, and infections of the joints and bone in children that could have the same outcome. Other injuries that often lead to serious disabilities (such as fractures of the thigh bone and hip, fractures and infections of the spine, cancer of the bones, etc) cannot always be treated because of the lack of a sufficient number of designated T&O operating theatres.

As the ongoing surgical training program at KCH grows, there is a need for more teaching and research facilities to ensure the sustainability of the residency program. This has been shown to be an integral part of the development of sustainable healthcare systems. It is also essential to have a strong academic department and postgraduate training program to ensure retention of trained health workers.



© Architect's rendering of the LION Hospital, Lilongwe, Malawi.
Courtesy: Sven Young



© Aerial drone view of the LION Hospital's construction progress, Lilongwe, Malawi, September 2020.
Courtesy: Sven Young



As the Malawi government strives to educate more doctors and surgeons through the College of Medicine in Blantyre, more teachers and teaching facilities are needed to support this development. Research is an integral part of a modern hospital's workload. It ensures quality of service and the development of standard operating procedures appropriate to the specific situation of a country. Research can also be an important source of income to a well-functioning academic institution through research grants and by creating a positive spiral of increasing academic reputation, increasing demand for paying services, and increasing potential for in-house income generation. As such, it is essential that an academic institution remain an independent, autonomous entity with the administrative and institutional freedom to make use of these mechanisms for further development of the institution.

In addition to the lack of operating theatres, KCH has a severe lack of patient beds on the wards. The three surgical wards were constructed in 1977 for 40 patients each but at any time hold between 70 and 100 patients by using all available space on the veranda, floors, and corridors. In the pediatric surgical ward, there are 64 beds available for patients, but most of the time there are two, and at times three children in each bed. Crowded wards contribute to inferior results in T&O surgery. To an even higher degree than in other surgical specialties, one needs to avoid contact between patients undergoing 'clean' surgery and those with established infections. Infections occur easily in orthopedic surgery as metal implants are used. For the same reason, the treatment of an established infection is very difficult and can have disastrous results. With a high number of infected cases being treated, these patients need to be isolated from the other patients. This is not possible in the overcrowded and understaffed KCH wards today.

Success indicators identified during the needs assessment

Modern organizational structures must be in place for the sustainability of the institution in the future. One aspect of this is the necessity for in-hospital income generation through paying services to sustain nonpaying services, infrastructure and equipment investment and building-maintenance budgets. Within the current framework of government administration in Malawi, it is not possible to run a modern hospital unit as proposed. Hospital administration must have the independent power to hire and fire staff without the involvement of the ministry of health. Without these basic principles, it is not possible to sustain the tight discipline and integrity needed to run a modern hospital. Also, with paying services, patients will expect and demand that this is the case. If standards are not kept high, great potential for improved services and income generation will be lost.

During the country's needs assessment, one of the key initiatives recommended was to support clinical services to overcome the main hindrance, namely the lack

of facility for surgical care at both KCH and QECH (see above). The strategic goals were to:

- Increase the volume for the surgical care of trauma;
- Provide the necessary equipment needed to promote appropriate surgical care;
- Retain national T&O surgeons by providing an environment conducive to exercising their profession; and
- Improve the clinical training environment and attract more residents in T&O surgery.

The proposed plans for a new hospital were geared toward fulfilling these strategic goals.

AO Alliance participation

Despite the obvious needs demonstrated, much debate ensued during repeated meetings of the AO Alliance Board of Directors in 2015 and 2016 about the AO Alliance being involved in financing a new hospital in Malawi. History has proven such projects to be fraught with challenges. But this infrastructure support was one of the components of the overall country initiative proposal for Malawi. Additional preconditions set by the board were met:

- LION established a trust to manage the project independently;
- Committed partners, both institutional and funding ones, were secured. HUH and the Mohn family continue to support with funds and technical expertise. The AO Alliance was also able to bring another funding partner to the table, Medicor Foundation⁴;
- The project included a fee-paying model for private patients, increasing the hospital's income and cross-subsidizing patients treated for free. It was a pilot run for a trauma center concept, to be rolled out in other countries in case of success; and
- LION formed an integral part of the comprehensive country initiative.

The original Phase 1 of the LION project is valued at USD 5 million. Together with Medicor Foundation, the AO Alliance has committed USD 2 million (40 percent) of the total funding.

Construction began in November 2018 and is scheduled to be completed in the second half of 2021. Delays have been encountered, mainly due to heavy rains,

⁴ Medicor Foundation is an independent and charitable foundation based in Liechtenstein. It was founded in 1995 thanks to a generous private initiative. Medicor Foundation focuses on international development in countries within Latin America and the Caribbean, Africa and Eastern Europe.

unexpected findings about soil conditions, and most recently, the coronavirus pandemic. Tenders for equipment and hospital furnishings were initiated in September 2020. Recruitment of the staff to run the hospital is underway, especially for the key management positions. The recruitment is being carried out nationally with the hope of recruiting in Malawi for Malawi.

Fracture care registries

Effective improvement of fracture care requires baseline knowledge of what the needs are and what resources are available. Injury-related data that is routinely collected in hospitals in LMICs has significant quality problems. Without good-quality data, it is impossible to understand the need, monitor changes over time, and assess the impact of interventions. Fracture care registries were therefore established in 2017 at four facilities—KCH, QECH, Mangochi and Nkhata Bay district hospitals—to record data on fractures. The findings will assist in data-driven quality improvements. They help the AO Alliance to understand the epidemiology of fractures and how fractures are treated. Thus far, the data from the registries does not represent all fractures in Malawi, neither does it include all fracture cases seen in each participating facility during the study period. Additional improvements are needed and are underway.

A wealth of information was garnered from the 23,733 cases that were registered across the four health facilities from 2017 to the end of June 2020. Below are the highlights:

- The mean age of patients was 21.7 years;
- A third of the patients were in the economically active age group of 20–59 years;
- Most patients were male;
- Two-thirds of the cases were due to falls. Two-thirds of the falls were in patients who were less than 20 years old. Road traffic injuries were the second-most common cause and comprised 16.2 percent of the cases;
- The most common fractures were radius/ulna, tibia/fibula, and humerus (in that order). Radius/ulna and humerus fractures were the most common in those under 20 years of age, and tibia/fibula fractures were most common in those aged between 20 and 49 years;
- Open fractures comprised 6.3 percent of all fractures;
- Most fractures were treated with plaster of paris (POP) casting without the need for reduction under anesthesia. Fracture fixation surgeries were done in the central hospitals only;
- Most patients (90 percent) were treated and sent home on the same day. Forty-six patients died from their injuries; and
- Most cases were treated by OCOs in both district and central hospitals.

Fracture care registries have never gathered such precise data and to this magnitude. As of September 2020, the data is currently being analyzed and a paper will be submitted for publication in a peer-reviewed journal.

Ethiopia country initiative

Country situation and needs assessment

Ethiopia is the second-most populous country in sub-Saharan Africa with over 112 million people (2019). There were close to 5 million injuries and 35,000 deaths from causes likely to result in musculoskeletal injuries in Ethiopia. This resulted in 2 million disability-adjusted life years (DALYs) lost (2016).

Despite Ethiopia's low vehicle-to-population ratio, it ranks quite high among countries most severely affected by road traffic accidents (RTAs). The burden of RTAs on hospital emergency departments is still an under-researched area. Within the Black Lion Hospital (BLH) in Addis Ababa, a study by Getachew et al (2016) estimated that injuries caused by RTAs constituted 48 percent of all emergency department casualties.

From year one of the AO Alliance, a pilot project was implemented to develop the grounds for a country initiative in Ethiopia. In December 2015, the AO Alliance Board of Directors agreed to fund a pilot project to develop further education in collaboration with the Australian Doctors for Africa (ADFA). This would bring operative fracture care education to all first-year residents from the four T&O residency programs in the country.

The AO Alliance organized a needs assessment meeting in Hawassa, Ethiopia, on September 23–24, 2015. The attendees included 18 stakeholders, residents, surgeons, and healthcare executives, including the CEO of ADFA, Graham Forward. ADFA, a nonprofit organization based in Perth, Australia, had had a presence in Ethiopia for over 20 years, helping to develop fracture care, mainly by supporting infrastructure development and medical equipment. ← [📍]

The consensus at the meeting was that there were two large axes of intervention where the AO Alliance and other partners could make a difference:

1. **Education**

- Educational support for the BLH residency program: a five-year plan based on annually identified needs;
- Facilitation of various fellowships with emphasis on AO Alliance fellowships within regional referral centers;



© AO Alliance country initiative meeting in collaboration with the Ethiopian Federal Ministry of Health, Hawassa, Ethiopia, September 2015.
Copyright: AO Alliance



© Participants and faculty gather for the first combined AO Alliance/Australian Doctors for Africa Basic Principles of Fracture Management course for first-year trauma and orthopedic residents, Black Lion Hospital, Addis Ababa, Ethiopia, March 2016.
Copyright: AO Alliance



© National and international faculty for the first combined AO Alliance/Australian Doctors for Africa Basic Principles of Fracture Management course for first-year trauma and orthopedic residents, Black Lion Hospital, Addis Ababa, Ethiopia, March 2016. Copyright: AO Alliance

- Reverse fellowships with established terms of reference; and
 - ORP training support in regional hospitals.
2. **Infrastructure support** based on the strategic plan of the Federal Ministry of Health and in collaboration with ADFA, in the following cities:
- 2015: Bahir Dar
 - 2016: Hawassa, Mekelle, Harar
 - 2017: Addis Ababa

The following educational events were included:

- Bahir Dar: AO Alliance nonoperative course;
- Hawassa: AO Alliance operative course for ORP; and
- Addis Ababa (BLH): Pre-basic operative course for first-year residents.

The AO Alliance Board of Directors released funding for the first two years (CHF 650,000) and mandated a review in 2017 when, based on the positive first experiences and potential, it was submitted to the Hansjörg Wyss Medical Foundation as a five-year country initiative (2018–2022) to further expand the initial work that had been done. ← [©] [©] → [©] [©]

Program goals and objectives

To prepare the five-year, full-fledged country initiative, Jim Harrison and Claude Martin Jr returned to Ethiopia in April 2017 and visited five cities in one week to see about expanding the program, based on the strategic plan to decentralize T&O activities to regional referral centers (RRC). This model had been followed in Hawassa and was successful in attracting two young T&O surgeons to develop a trauma unit in Hawassa. It was this systematic approach of the government's health plan to develop RRCs, with a multiplier effect that had, indeed, encouraged the AO Alliance Board of Directors and management to engage in Ethiopia.

At the time, Hawassa University Comprehensive Specialized Hospital (HUCSH) was a rapidly growing teaching institution, available to 11 million residents in its catchment area. To this day, it has a young but well-established T&O department with a large trauma burden. Two graduates from the BLH orthopedic residency program returned to further develop the unit. In 2016, Ephrem Gebrehana and Mamo Deschasa grew the unit to increase its capacity and to teach young residents. The AO Alliance supported these two young surgeons with education opportunities, and tutelage was also provided for ORP by ADFA. Through a reverse fellowship arrangement with Wrightington, Wigan and Leigh NHS Foundation Trust in the United Kingdom, and the Northwest Orthopaedic Trauma Alliance for Africa (NOTAA), Tony Clayson and Henry Wynn Jones provided mentorship support on

four separate trips. These yearly trips have continued, each time bringing additional competencies needed for a modern T&O clinical care unit.

As new residency programs in T&O were springing up fast in Ethiopia (two in Addis Ababa and two peripheral ones), resident graduates were not feeling bonded to the original destinations to which they had committed. A unit that is equipped to function would be a big attraction to motivated graduates. Residents training peripherally probably would have a greater chance of staying out of Addis Ababa. → [O]

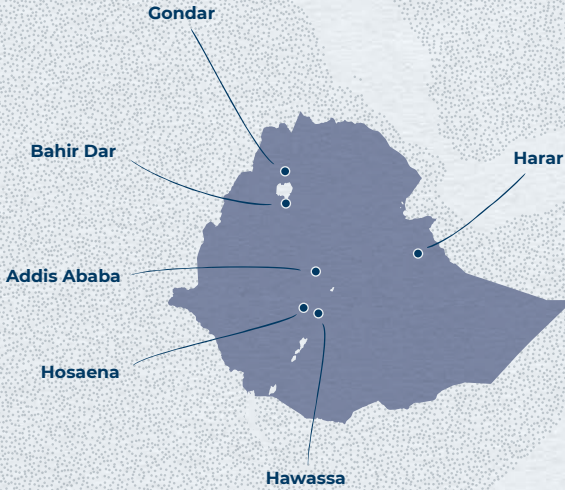
Program goals and targets (2018–2022):

- Develop five RRCs outside Addis Ababa;
- Provide all first-year T&O residents with attendance to operative fracture care courses;
- Provide senior T&O residents with access to pediatric orthopedic proficiency;
- Establish and fund trauma registries in two hospitals with the WHO;
- Collaborate with the Ethiopian Society of Orthopaedics and Traumatology (ESOT) to promote excellence in T&O surgery; and
- Support workforce culture embracing excellence and accountability through COSECSA fellowship certification.

The AO Alliance proposed the following developments in Ethiopia for 2018–2022 based on the success of the initial two years of the initiative and succeeded in attracting the Hansjörg Wyss Medical Foundation to this program. In particular, the program also foresaw:

- Continuing input to Hawassa through NOTAA reverse fellowship partnership;
- Commitment to data collection (trauma registries);
- Continuing educational support of the residency program at the BLH;
- Developing the RRC in Bahir Dar, based on the model established for Hawassa;
- Further contributing to establishing residency programs in Hawassa and strengthening the one in Bahir Dar; and
- Evaluation trips to select a city or cities that could be added as an RRC.

The overall budget for the five years is CHF 3 million.



ETHIOPIA

2017 FIGURES*

Population: 102.9 million



1,715 Gross Domestic Product
GDP in USD



392 Surgeons



4.8 Fertility rate
number of children per woman



0.41 Surgeons
per 100,000

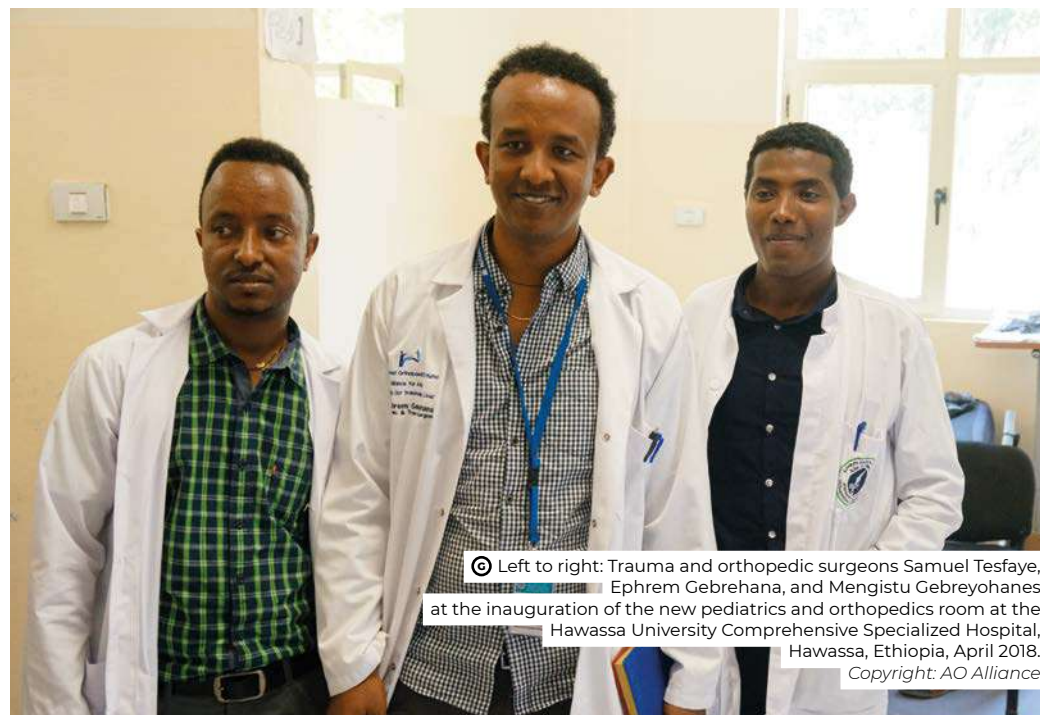


52 Literacy rate (%)
adults aged 15 and above



66 T&O
surgeons

* Institute for Health Metrics and Evaluation



© Left to right: Trauma and orthopedic surgeons Samuel Tesfaye, Ephrem Gebrehana, and Mengistu Gebreyohanes at the inauguration of the new pediatrics and orthopedics room at the Hawassa University Comprehensive Specialized Hospital, Hawassa, Ethiopia, April 2018.
Copyright: AO Alliance



© Trauma and orthopedic surgeons operating in Harar, Ethiopia, April 2018.
Copyright: AO Alliance



AO ALLIANCE



AO Alliance Course on Basic Principles of Fracture Management for Residents

March 25-27, 2019 Addis Ababa, Ethiopia
Course venue: Saro Maria Hotel, Addis Ababa, Ethiopia

① Faculty and participants at the AO Alliance Basic Principles of Fracture Management for Residents course in Addis Ababa, Ethiopia, March 2019.
Copyright: AO Alliance



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TIKUR ANBESSA
SPECIALIZED HOSPITAL SINCE 1953



*Ethiopian Society of
Orthopedics and Traumatology*

**Basic Principles of
for Residents**

Ethiopia

Ethiopia

Achievements

By the end of 2019, progress on the targets had exceeded expectations. Bahir Dar, Gondar, Hawassa, and Hosaena were being developed as regional referral centers.

Operative fracture care education was provided to 100 first-year T&O residents from all four national training programs. Pediatric orthopedic training was provided to 24 residents at the CURE Ethiopia Children's Hospital in Addis Ababa.

Trauma registries were established and funded at the Hawassa University Referral Hospital and as well as the Addis Ababa Burn Emergency and Trauma (AaBET) Hospital.

Per the initiative's goals, collaboration was fostered with ESOT, which led to a generous donation of 15 orthopedic instrument sets to RRCs by Naton Medical Group.

In supporting workforce culture that embraces excellence and accountability, 40 senior T&O residents have passed the COSECSA fellowship examination.

Ghana country initiative

Country situation and needs assessment

Ghana has a population of 28 million (2019) and a per capita income of USD \$1,600 per year. Priorities of the healthcare system have leaned toward communicable diseases, and maternal, newborn and child health (MNCH). Only in the last few years has awareness of trauma and fracture care needs increased.

Some data is available for RTAs and shows an increasing incidence nationally and a high rate of morbidity and mortality (329,535 dead or injured between 1991 and 2014). Injury is expected to rise to third place in the ranking of causes of death in Ghana over the next five years. It already outstrips HIV/AIDS, tuberculosis, and malaria combined as a cause of death.

The country operates a national health insurance system to which 60 to 70 percent of the population subscribe. However, insurance coverage is very limited when it comes to the treatment of fractures. The insurance rarely pays for fracture care implants. → [©]

The AO Alliance prides itself on its capacity and capability to perform a detailed needs assessment concerning care of the injured in order to maximize the collaborations with like-minded partners, as well as governmental and other nongovernmental agencies. The Ghana needs assessment took place in February 2016 in the town of Cape Coast, Ghana.

The group met from February 24–26, 2016, in Elmina, near Cape Coast in the western part of Ghana.

The working group also visited two hospitals: Winneba Trauma Hospital, one of the government's new trauma centers, and Cape Coast Teaching Hospital (CCTH).

Of note, the team was complemented by input from the AO Alliance Board of Directors member Abdoulie Janneh and from Michel Orsinger, former worldwide president of DePuy Synthes. (See Annex 6 for full list of participants.)

The ministry of health raised concerns regarding RTAs and designated ten hospitals as regional trauma centers. These centers had quite good physical infrastructure but were poorly serviced with manpower, lacking in specialist T&O trained staff and inefficient systems of care.

There are five medical schools with an annual output of about 300 graduates. Historically, specialists trained overseas and the brain drain to HICs were commonplace. There are only 34 Ghanaian T&O surgeons serving in 14 institutions across the country.

Seventeen residents were in training, which was spread over the seven-year training period. The country had only two current T&O residency training hospitals in Accra and Kumasi, inhibiting the possibility of training more T&O surgeons. Although there was one ORP specialist training program in Accra, it did not teach the specifics of T&O surgical care and equipment use.

There was no specialized school for plaster technicians, nor was there a designated cadre of paramedics trained to deliver basic fracture care.

The AO Alliance proposed to the Ghanaian government to partner with the Ghana College of Physicians and Surgeons (GCPS) to increase the capacity for training surgeons through the focused development of two additional sites as T&O residency training programs.

The proposal included providing further education to all T&O residents and the development of clinical research and audit techniques.

The AO Alliance also proposed to focus on two other cadres of healthcare workers—essential to the provision of trauma care—namely, ORPs and plaster technicians.

→ [📍]

Tragically, Jacob Plange-Rhule, rector of the GCPS, died on Friday April 10, 2020. He was being treated for COVID-19.

Plange-Rhule was a dear friend of the AO Alliance. He was instrumental in the implementation of many AO Alliance programs, as chair of the Ghana country initiative steering committee, implementing the Pediatric Fracture Solutions for Ghana program, the new plaster technicians' school, and the accreditation of Cape Coast and Tamale T&O residency programs, to name a few. The AO Alliance has lost a true friend who will be sorely missed by all who knew him. He was a visionary leader who helped make a difference in care of the injured in Ghana.

Program goals and objectives

When the Ghana country initiative was launched in 2017, it had the following objectives to:

- Establish a hub in Accra, to serve as a coordination and distribution point for AO Alliance operative courses in sub-Saharan Africa (workstations for practical exercises);
- Expand T&O residency programs, adding two certified programs;
- Increase the number of Ghanaian doctors taking up T&O residency training;
- Establish the first plaster technician orthopedic training school; and
- Fund trauma registries at four hospitals. → [©] [©]

Achievements

By the end of 2019, almost midway through the initiative's cycle, substantial progress toward meeting the objectives had been made. The results were the following:

- The sub-Saharan equipment hub was established in Accra, coordinating the distribution of 30 workstations for use in the practical exercises of the AO Alliance operative courses. Four technicians are employed part-time to service the equipment and travel to support AO Alliance courses;
- T&O residency programs were created at two teaching hospitals in Cape Coast and Tamale;
- The number of doctors taking up T&O residency programs was increased by six; and
- Trauma registries were set up at four hospitals across the country: Cape Coast Teaching Hospital, Tamale Teaching Hospital, Komfo Anokye Teaching Hospital (KATH), and Korle-Bu Teaching Hospital.

The total approved budget for 2017-2021 amounts to CHF 3 million.

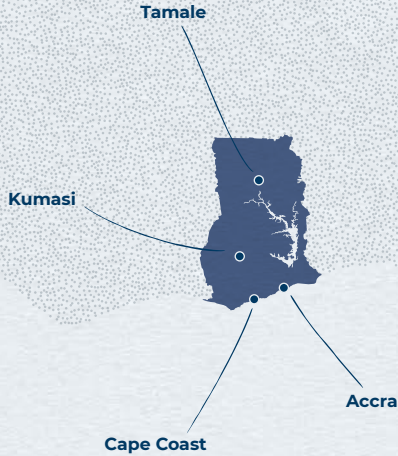


© The late Jacob Plange-Rhule, rector of the Ghana College of Physicians and Surgeons, Ghana country initiative launch, Accra, Ghana, September 13, 2017. (Copyright: AO Alliance)



“The importance of injury care in Ghana has always been in the backyard of the health services. Since the AO Alliance appeared on the scene there has been a sudden interest in trauma and related issues by all stakeholders. Residency interest by doctors keeps growing day by day. I am confident that the next five years will see a big improvement in the management and outcomes of our injured patients. There is reference to the AO Alliance anywhere trauma and injury care is discussed.”

Wilfred Addo, Ghana




GHANA

2017 FIGURES*
Population: 30.2 million

 **3,966** Gross Domestic Product
GDP in USD

 **263** Surgeons

 **3.5** Fertility rate
number of children per woman

 **0.73** Surgeons
per 100,000

 **79** Literacy rate (%)
adults aged 15 and above

 **50** T&O
surgeons

* Institute for Health Metrics and Evaluation



📍 Ghana country initiative needs assessment working group, Cape Coast, Ghana, February 2016.
Copyright: AO Alliance



📍 First-year trauma and orthopedic resident John Daleku at the AO Alliance Pre-Basic Principles of Fracture Management course, Accra, Ghana, 2019.
Copyright: AO Alliance





© AO Alliance technician William Neny-Jenkins (Ghana) waiting for the retrieval of workstation equipment, Addis Ababa, Ethiopia, 2019. Copyright: AO Alliance

The Gambia country initiative → [🌐] [🌐] [🌐]

Country situation and needs assessment

The Gambia is one of Africa's smallest and poorest countries with a population of 2.4 million (2020). Unlike many of its West African neighbors, it has enjoyed long spells of stability since independence. AO SEC activities began as recently as 2014 and continued from 2015 onward under the AO Alliance. As the Gambia fulfilled all the eligibility criteria for a country initiative, then minister of health, Isatou Touray showed particular interest and support at the CoDA meeting in Addis Ababa in September 2018, and thereafter to improve the fracture care system. She is now the Gambia's vice president.

The Gambia represents a challenge and an opportunity for the AO Alliance. The Gambian government, having recognized enormous deficits that exist within the healthcare system, has tried to provide citizens with improved access to surgical and anesthetic care. More system-wide changes would be needed to create a sustainable mechanism for procuring and maintaining the supplies and technical skills required to perform T&O surgery safely.

Abdoulie Janneh, AO Alliance Board of Directors member and a native of the Gambia, reinforced these relationships to ensure full buy-in by the government. Hence, it was agreed to conduct a needs assessment. The AO Alliance's managing director performed a preliminary one with Wilfred Addo, AO Alliance English-speaking Africa steering committee chair, in October 2017; this was then followed by a full needs assessment in September 2019 in collaboration with AO Trauma Middle East and Northern Africa (AO TMENA). Priorities for a country initiative were defined under the leadership of Kebba Marenah, lead T&O surgeon at the Edward Francis Small Teaching Hospital (EFSTH), in consultation with the government and with the input of the chair.

Under the three headings of gaps in T&O training/education, gaps in patient access to care, and gaps in access to implants and equipment, the group was able to recommend both short-term and long-term solutions for improving the quality and quantity of musculoskeletal care in the country.

Training and education:

- To introduce musculoskeletal education in the medical school curriculum;
- To implement the pending West Africa College of Physicians/West Africa College of Surgeons' accreditation process for postgraduate medical and surgical education
- To introduce an education program for T&O ward nurses;

- To identify suitable Gambian T&O surgical talent at the level of house officers and send them abroad for their training, preferably to another African country to avoid brain drain;
- To review the orthopedic clinical officer model in Malawi to train medical officers on basic treatments of musculoskeletal trauma in district hospitals;
- To train a spine surgeon; and
- To increase the number of nonoperative courses for fracture care to the smaller rural hospitals.

Access to care:

- To develop a national ambulance system to reinforce prehospital care for the injured;
- To develop a national healthcare insurance plan to make healthcare accessible as part of universal healthcare;
- To improve the digital X-ray system at the main teaching institution; and
- To improve the poor perception of care provided in the Gambia.

Equipment, implants and infrastructure:

- To establish, develop and fund EFSTH as the central trauma center;
- To refurbish two operating theatres;
- To supply all hospitals in the country with plaster of paris; and
- To develop a supply chain for a reliable source of T&O implants based on a model to be proposed and developed by the AO Alliance.

Program overview

With only one national trauma surgeon practicing in the Gambia, a large proportion of trauma victims live with avoidable disability due to a lack of timely and appropriate T&O care. The Gambia country initiative was launched in 2019 to address this critical shortage of T&O specialists, with assistance from the AO and AO Trauma Middle East and Northern Africa. This three-year initiative (2019–2021) seeks to develop a comprehensive trauma system for improved patient outcomes by fostering an enabling environment for cooperation between the government, researchers, healthcare workers, NGOs, and the WHO.

Partnership with AO Trauma

The Gambia was upgraded to a country initiative, from being a beneficiary of the educational activities under the Fracture Solutions Program, thanks to AO Trauma's commitment under a joint AO Trauma/AO Alliance program funded by the AO. AO Trauma faculty and network were to provide reverse fellowship expertise and trauma systems development guidance.





© The Gambia needs assessment working group, Brufut, the Gambia, September 2019. Copyright: AO Alliance





© Trauma and orthopedic patient ward at the Edward Francis Small Teaching Hospital, Banjul, the Gambia, October 2017.
Copyright: AO Alliance

Banjul



THE GAMBIA

2017 FIGURES*

Population: 2.2 million



777.81 **Gross Domestic Product**
GDP in USD



4.0 **Fertility rate**
number of children per woman



50.8 **Literacy rate (%)**
adults aged 15 and above



2 **T&O**
surgeons

* Institute for Health Metrics and Evaluation



© Khalid Khoshhal, AO Trauma Middle East and Northern Africa (AO TMENA) chair; Saeed Al-Thani, AO TMENA Education Committee chair; and Kebba Marenah, Gambian trauma and orthopedic surgeon and the Gambia country initiative lead, Brufut, the Gambia, September 2019.
Copyright: AO Alliance



© Kebba Marenah (red cap) and colleagues performing surgery for a patient's fractured tibia, Banjul, the Gambia, September 2019.
Copyright: AO Alliance

First results ← [📄]

At the end of 2019, a reverse fellowship partnership was set up with a United Kingdom-based teaching institution. Philip Henman, a consultant surgeon based at the Royal Victoria Infirmary in Newcastle upon Tyne, has volunteered through the Sandy Gall Afghanistan Appeal (SGAA) for over ten years in the field of children's orthopedics. Unfortunately, the trip scheduled for March 2020 was postponed due to the coronavirus pandemic.

The number of local T&O surgeons was increased from one to two, and operative fracture care education was delivered to all T&O staff and residents. A direct line of communication with the vice president and the minister of health was created to help strengthen trauma care legislation. And lastly, as part of the objective of participating in infrastructure upgrade, an operating theatre was refurbished, and two surgical equipment sets were donated by Naton Medical Group.

With the COVID-19 pandemic in 2020, no international travel could take place. But some locally coordinated projects did advance. Residency funding support was continued with a young resident reintegrating his training program in Russia. A young T&O surgeon found employment at the EFSTH with support from this initiative. ORP clinical teaching modules (CTM) were integrated into the ORP educational development strategy. A structural upgrade for a small operating theatre was also completed. This provided segregation of clean and infected surgical cases.

The AO Alliance hopes for rapid implementation of its various activities. The leadership is on the ground and the situation is ripe for the capacity building needed to advance care of the injured in the Gambia.

Special initiatives ---

While the bulk of AO Alliance work focuses on the Fracture Solutions Program and country initiatives, there is room for specially designed programs or projects, usually limited in duration and supported by individual donors. They consist of the AO surgeons' initiative, the PIOA Initiative, the Pediatric Fracture Solutions for Ghana project, the AO clinical divisions' collaboration, the Orthopedic Research Collaborative in Africa (ORCA) clinical research initiative, and efforts to mitigate the impact of the pandemic on AO Alliance activities under the COVID-19 response program.

West Africa Trauma Education Program (WATEP)

Geographic scale

In May 2019, the AO Alliance concluded a three-year agreement with the Johnson & Johnson Foundation to improve the quality of and access to fracture care in certain West African countries. → [R] [G] [T] [O] [V]

Objective

The pilot countries selected for this initial three-year cycle were Ghana, Ivory Coast, and Nigeria. It enabled the AO Alliance to bring the Fracture Solutions Program (FSP) to the Ivory Coast, to further strengthen the country initiative in Ghana, and to conduct additional activities in Nigeria (in close collaboration with AO Trauma) where the AO Alliance had ceased delivering FSP courses.

The WATEP aims to improve health outcomes for patients by building long-term local capacity for injury and fracture care and to sustainably strengthen local health-care systems, including essential surgery. It will bring measurable benefits of return to function across a population of 260 million in West Africa. It also includes faculty development (train-the-trainer) programs, to further develop regional faculty with excellent understanding of fracture management and educational expertise to communicate and propagate these.

The program also allows the AO Alliance to include spine and craniomaxillofacial (CMF) training in its education portfolio.

Program and deliverables

The defined activities are to:

- Deliver fracture care education and training to 900 healthcare workers;
- Deliver quality education to improve the teaching skills of surgeons and operating room personnel for operative and nonoperative treatment; and
- Develop training modules in the fields of spine and CMF trauma adapted to LMICs to be piloted in the three countries.

The budget, fully funded by the Johnson & Johnson Foundation, is USD 500,000 annually for three years. In 2019, 15 educational events were conducted (seven in Nigeria, three in Ghana, and three in the Ivory Coast). A total of 447 healthcare workers were trained. Eighteen faculty were selected to attend the FEP, preparing and training them to further act as trainers of trainers. The governance structure comprises a joint steering committee and local project implementors with oversight by the AO Alliance Board of Directors.





© Front row: Ram K Shah, Abdoulie Janneh, Claude Martin Jr, Alissa Lynch (vice president, Johnson & Johnson Medical Devices EMEA), Rolf M Jeker, Cinzia Muggiasca, and Manjul Joshipura. Back row: Tobias Hüttli, Jim Harrison, Nikolaus Renner, Michael del Prado (Essential Surgery, Ethicon), and Ian Walker (senior director, Global Community Impact, Johnson & Johnson Foundation) at the official launch of the WATEP, Aarau, Switzerland, May 2019.

Copyright: AO Alliance



© AO Alliance faculty at the WATEP faculty education program, Lagos, Nigeria, November 2019.

Copyright: AO Alliance





© Temiloluwa Olufemi (AO Alliance Nigeria lead) at the WATEP Nigeria consensus meeting, Abuja, Nigeria, January 2020.
Copyright: AO Alliance



Ⓢ AO Alliance surgeon educator Narayan Ramachandran at the Faculty Education Program in Lagos, Nigeria, November 2019.
Copyright: AO Alliance



Ⓢ Claude Martin Jr at the Faculty Education Program in Lagos, Nigeria, November 2019
Copyright: AO Alliance



© Course participants at an AO Alliance operative course practical exercise, Abuja, Nigeria, undated.
Copyright: AO Alliance



Unfortunately, due to the COVID-19 pandemic, the program was placed on hold in 2020. It will resume when conditions permit the safe delivery of courses. Thanks to the Johnson & Johnson Foundation, the budget allocation for 2020 could be deferred. ← [🔒]

Pediatric Fracture Solutions for Ghana

Children in need

Children in LMICs often receive care outside the formal medical sector. Improving prehospital first aid has proven to be highly cost-effective in lowering trauma mortality and fracture morbidity.

A 2015 study by Gyedu et al (2015) in Ghana reported on the practices administered for fractures by primary caregivers and first aid providers. It was determined that fractures had the lowest percent of recommended practice (eg, immediately bringing the child to a healthcare facility). The paucity of adequate centers to manage pediatric trauma and fractures, both nonoperatively and operatively, coupled with a workforce that is lacking properly trained pediatric T&O surgeons, compounds the burden of this significant disease. The strong role of traditional bonesetters and poverty frequently had led to many poor outcomes, including pediatric amputations, a devastating clinical and usually avoidable outcome.

Prevent and treat

In 2016, the AO Alliance launched a project in Ghana, in collaboration with the Ghana College of Physicians and Surgeons (GCPS). The USD 1.5 million project aimed to improve fracture care for the children of Ghana. The project was funded through a grant secured from the UBS Optimus Foundation. The AO Alliance is grateful for the professional input and guidance by Chris Colton, AO Alliance founder and AO past president. → [🔒]

The objectives of the project were to instill knowledge of trauma prevention strategies among parents and primary caregivers, as well as to deliver pediatric fracture care education to the traditional bonesetters and medical providers from the community level up to tertiary care trauma centers.

The project duration was four years, and its original tenure closed in the second half of 2020. The project legacy continues, as some of its collateral programs have been taken over by the Community Health Department of Ghana, as well as some of the teaching hospitals, and are coordinated with the ongoing AO Alliance country initiative.

Objectives and key performance indicators

The goals of the project were to increase the number of children receiving timely and appropriate care by 20 percent, decrease the number of children with late presentations and complicated cases by 20 percent, and decrease the number of pediatric amputations due to initial mismanagement and/or late presentation by 20 percent.

The objectives were further broken down into key performance indicators (KPIs) to be met:

Number of healthcare professionals able to manage pediatric fractures	720
Number of public awareness campaigns launched on pediatric fractures	5
Injury prevention protocols for the pediatric population	4
Clinical research projects initiated relating to pediatric fractures	6
FEP delivered to selected surgeons and others	2

Table 5. Key performance indicators for the Pediatric Fracture Solutions for Ghana program.



⊗ Chris Colton at the Pediatric Fracture Solutions for Ghana project launch, Accra, Ghana, October 2016.
Copyright: AO Alliance

Achievements

By the end of 2019, the following results were achieved:

- Three-hundred seventy-two healthcare workers attended courses on the basic principles of pediatric fracture management for ORP, nonoperative pediatric fracture treatment, and basic principles of pediatric fracture management. These included residents, practicing ORPs, and practicing surgeons in various levels of health institutions in different parts of the country;
- The public awareness campaign resulted in a workshop for journalists about the neglected epidemic of childhood injuries as well as a guiding manual;
- Trauma registries were established in four teaching hospitals: KATH, Korle Bu, Tamale and Cape Coast;
- A first aid treatment algorithm for pediatric limb fractures and a general treatment algorithm for the project were developed;
- Six clinical research projects were completed but not published so far; and
- A faculty education program for selected surgeons and other healthcare workers took place. An additional 19 faculty have been trained.

Pacific Islands Orthopaedic Association initiative

The Pacific Islands have a population of 10 million—Papua New Guinea has the largest population with 7 million—with limited T&O services and large volumes of injuries following road traffic accidents, and violence often involving machetes. The region is known for difficult access to care. Late presentations, limited manpower, and migration of the workforce to HICs make it difficult to provide a sustainable level of T&O care.

The AO Alliance has been supporting the Pacific Islands Orthopaedic Association (PIOA) since 2015. The PIOA was established in Honiara, Solomon Islands, in 2012 to develop and promote T&O care in the South Pacific islands. The AO Alliance's collaboration with the PIOA began as a small and successful project under its AO surgeons' initiative, which was then expanded.

The PIOA has been training surgeons from nine Pacific island countries (Papua New Guinea, the Solomon Islands, Fiji, Samoa, American Samoa, Kiribati, Federated States of Micronesia, Timor Leste, and Vanuatu). The PIOA training program is completed over a three-year period. Face-to-face modules are delivered twice a year. The modules consist of ward rounds, lectures, and practical session using artificial bones.

Since 2013, 30 candidates have been admitted to the PIOA program: Five have completed the program and passed the certification exam. There are currently 19 surgeons actively enrolled. The PIOA expects 16 more trainees to graduate over the next three years. → [🌐] [🌐]

In 2015, the AO Alliance committed CHF 45,000 for three years through the AO surgeons' initiative. At the AO Alliance Board of Directors meeting held in Davos, Switzerland, on December 5, 2016, Hermann Oberli presented his proposal for continuing the project under a full partnership with the AO Alliance, upon which the annual financial commitment, with the Hansjörg Wyss Medical Foundation, was increased to CHF 150,000 per year.

Board members expressed concerns from the outset about the long-term viability of the project as it was based on international faculty from Australasia and Europe to donate their time and travel to the Pacific Islands. The sustainability of this model relied on the volunteers remaining as such and not becoming paid consultants. The credible ongoing work to increase the number of local surgeons and the intended purpose that general surgeons with the newly acquired competencies would stay in the region to treat the injured, convinced the board to continue its support.

Oberli wanted to assure that this legacy and the sustainability of the project would continue. In November 2019, Martin Walliser from the Glarus Kantonspital (chief) in Switzerland was recruited as his successor for the project. He will be supported by Philipp Stillhard from Chur, Switzerland.

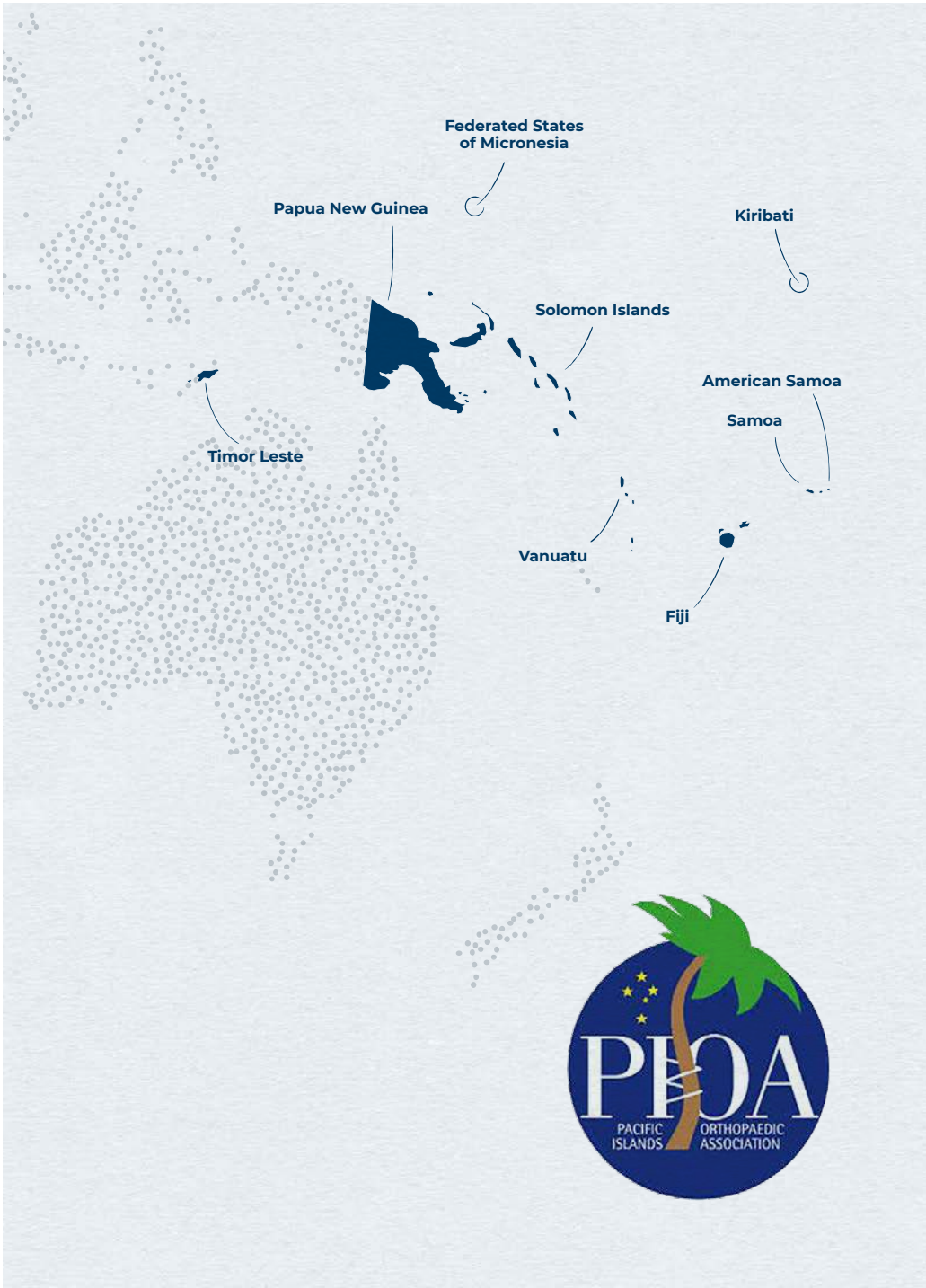
The AO Alliance committed USD 150,000 to the program annually for the 2019–2021 period. The objective to build local capacity in the region has been fully met. Very importantly, the next step in the program is to further assist the countries towards sustainable self-sufficiency regionally and locally.

Clinical research ---

Clinical research is an important component in improving trauma care in LMICs. Information arising from research is used to identify needs and helps to develop policies and interventions—with the aim of improving health.

The AO Alliance has been active on various fronts, namely:

- Financing clinical research surveys in T&O;
- Supporting clinical research projects, including trauma and fracture care registries;





① PIOA Director of Training, Des Soares (third from the right), supervises Raymond Saulep (Papua New Guinea) on the use of the SIGN nail system, Honiara, Solomon Islands, September 2017.
Copyright: AO Alliance



② Trauma and orthopedic patient ward at the Trauma National Referral Hospital, Honiara, Solomon Islands, September 2017.
Copyright: AO Alliance

- Creating collaborative research networks in Africa (ORCA); and
- Building local research capacity for individuals to conduct their own clinical research.

Current clinical research surveys

Surveys being currently conducted are the following:



POINT Study logo.

- The POINT Survey on the clinical research priorities and objectives relating to T&O in Africa (completed), yet to be published;
- A survey on the need for hand surgery in sub-Saharan Africa, in collaboration with Harvard Global Surgery and Social Change Program (due in 2021);
- A call to action on care of the injured in LMICs through The Lancet Global Health (in development);
- A COVID-19 survey on the impact of the pandemic on healthcare systems in Africa; and
- A snapshot survey on fracture care in sub-Saharan Africa (due end 2021).

Supporting clinical research projects and building clinical research capacity

Clinical research projects being undertaken include:

- Improving outcomes for open tibia fractures in Malawi, by Alex Schade through the Wellcome Trust PhD program;
- The impact of traditional bonesetters and opportunities for change in Ethiopia and Ghana (PhD project for Mengistu Gebreyohanes, Hawassa); and
- Fracture care and trauma registries in Malawi led by Linda Chokotho (trauma registries have also been supported in Ghana and Ethiopia and are pending). → [Fig. 18]

Creating a research collaborative network in Africa

Clinical research studies require a cross-country, cross-regional, or even cross-continental approach to create useful knowledge for action, especially for scaling and spreading knowledge across Africa. To achieve this objective, the AO Alliance was the key driver in launching the Orthopedic Research Collaborative in Africa (ORCA). It aims primarily to coordinate large-scale studies in countries where the AO Alliance is active in sub-Saharan Africa, in order to increase awareness and recognition of the burden of injuries. In addition to the AO Alliance's network of surgeons, partners include the University of Cape Town, the Institute for Global Orthopaedics and Traumatology (IGOT), Harvard Medical School Program in Global Surgery and Social Change, Oxford University, the Liverpool School of Tropical Medicine, and the Royal College of Surgeons of Ireland and COSECSA. → [🌐]

The collaborative, coordinated by Jim Harrison and Simon Matthew Graham, encompasses over 400 surgeons active with the AO Alliance, SIGN, IGOT, and COSECSA.

Building a network of local T&O surgeons

Building a network of local T&O surgeons is the most important and noble task the AO Alliance needs to fulfill to ensure long-term sustainability. To overcome this, the AO Alliance sponsors clinical research projects in LMICs. It has also implemented good clinical practice (GCP) research courses in many countries to develop those skills. With the assistance of the AO Innovation Translation Center (AO ITC) Clinical Operations and Ivo Schauwecker (manager Clinical Services and quality manager, AO ITC Clinical Operations), and Denise Hess (senior project manager, AO Program for Education and Excellence in Research [AO PEER], AO Education Institute), national clinical research instructors are now available in ten AO Alliance countries to guide the much-needed clinical research projects. ← [🌐]

A wide range of skilled individuals is critical to creating clinical research and knowledge and to serving as a link between knowledge gained and new approaches to improve health. To understand the challenges and opportunities facing those engaged in clinical research in LMICs, it is necessary to recognize the existing capabilities and capacities of trained and active clinical researchers within a country or geographic region. This information would be used to identify needs and help to develop policies and interventions to strengthen clinical research capacities, with the aim of improving health.

AO TRAUMA

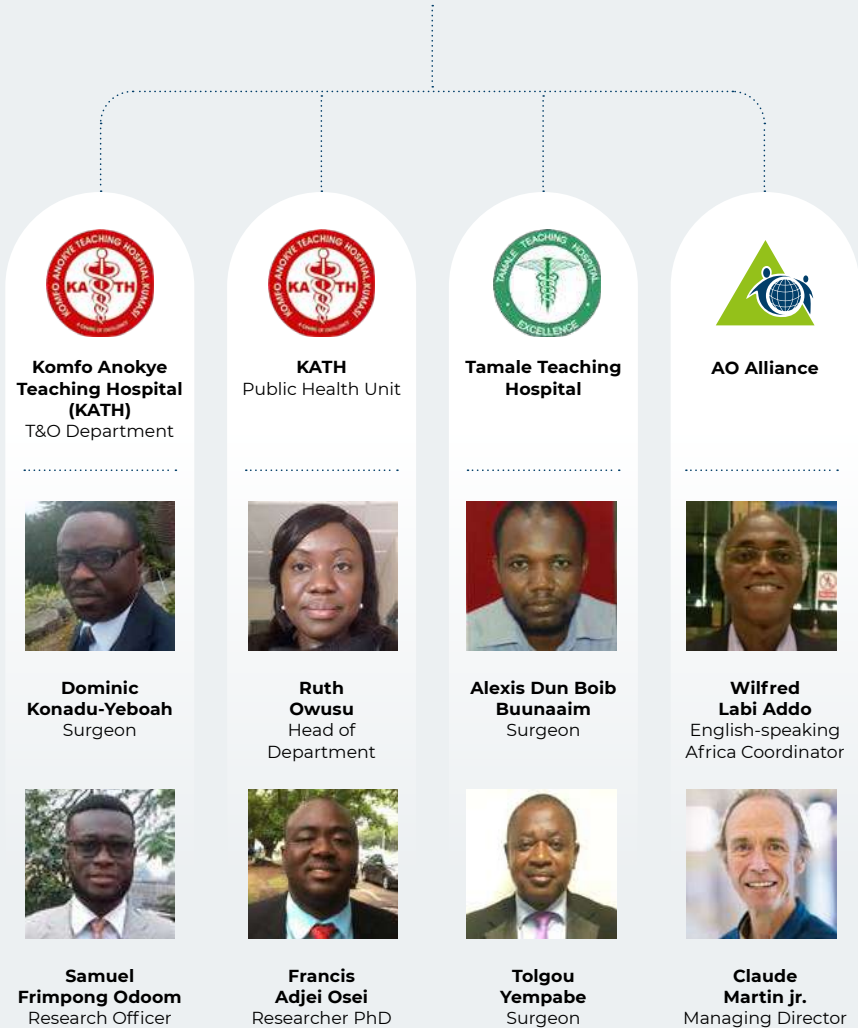


Figure 18. The clinical research team has been established for the AO Strategy Fund initiative to reduce amputations in children resulting from activities of traditional bonesetters in Ghana.



Left to right: David Shearer (IGOT), Simon Matthew Graham (Liverpool School of Tropical Medicine), Saam Morshed (IGOT), Grace Drury (Oxford University), Maritz Laubscher (University of Cape Town), Kampala, Uganda, December 2019. Copyright: AO Alliance



Faculty and participants at the AOPEER Principles of Clinical Research course, Kathmandu, Nepal, May 2018. Copyright: AO Alliance

COOPERATION WITH AO CLINICAL DIVISIONS

Chapter III outlined the interest of the AO clinical divisions in AO Alliance countries and the creation of various financial instruments, such as the AO clinical divisions' initiative, and the AO Jubilee Fund (not part of the AO Alliance).

During the start-up period, the following AO clinical division programs were financed by the AO Alliance:

- CMF basic fracture care curriculum; and
- Spinal trauma and infection curriculum.

CMF basic fracture care curriculum

Overview → [🔍] [🔍] [🔍] [🔍]

The design of healthcare education curricula is evolving from what and how learners are taught toward competency-based curricula. These competencies are the performance of an end product, measurable, defined outside of the approved training program, judged to a standard independent of other students, and informing learners of what is expected of them. Competency-based education models hold promise for healthcare education in low-resource settings, where the health needs and provider training backgrounds can vary widely.

While examples of short courses in LMICs are plentiful in the field of long bone trauma management, there had yet to be a course focused on essential facial injury care or CMF trauma in LMICs. Yet CMF trauma is one of the most injured anatomical regions in road traffic accidents in LMICs.

Although CMF trauma courses exist in HICs, directly transferring them to LMICs fails to account for the widely disparate training backgrounds of healthcare workers, lack of equipment, diagnostic, and therapeutic equipment availability, and severity of disease.

Deliverables and achievements

The project aimed to produce a competency-based curriculum for CMF treatment in LMICs.

Under the leadership of David Shaye (Massachusetts Eye and Ear Infirmary, Harvard Medical School, Boston, Massachusetts, United States) and Travis Tollefson (University of California, Davis, Sacramento, California, United States), CMF surgeons were recruited from seven low, lower-middle, upper-middle, and high-income countries. All surgeons from HICs had experience working in LICs. The curriculum development process was completed over three days in a closed setting.

Unlike traditional curricula where topics are grouped by anatomy, the problems encountered every day by patients in LMICs were used to define the topics for the course. A target audience for the proposed educational activities was generated specifically for those healthcare workers who treat CMF trauma in LMICs.

The result was a four-module curriculum comprised of small group discussions, short lectures, and practical exercises grouped by problem areas.

With the help and facilitation of the Department of Otolaryngology, Central University Teaching Hospital in Kigali, Rwanda, and additional faculty from AO CMF, the initial rollout of the core facial injuries course began in two countries over a three-month period in which 23 learners participated in the facial trauma management courses (Rwanda: 17 and Zimbabwe: 6). Post-course testing scores had improved by 30 percent compared to pre-course test scores. Preliminary course evaluations are encouraging. The downstream effects of improved facial injury care will be more difficult to measure. But the problem is a recurrent and significant cause of morbidity and mortality over time and across continents.

Since the proof of concept of the course, it has been deployed in additional sub-Saharan and Asian LMICs, including Ethiopia, Tanzania, and Cambodia. Ghana and the Ivory Coast are next for 2021.

Spinal trauma and infection curriculum

Spinal cord injury (SCI) is a devastating neurological injury, resulting in varying degrees of paralysis, sensory loss, and basic functions which can be permanent and irreversible in many cases. Individuals with SCI in LMICs face serious challenges in their daily lives.



© Participants at an AO Alliance CMF course in Kigali, Rwanda, February 2017.
Copyright: AO Alliance





© Travis Tollefson (AO CMF faculty) giving a lecture on facial injuries at the Rwanda Military Hospital, Kigali, Rwanda, February 2016.
Copyright: AO Alliance



© Cambodian plastic surgeons, maxillofacial surgeons, oculo-plastic surgeons, dentists, trauma surgeons, and general surgeons attended the Essentials in Facial Injuries Course at the Khmer-Soviet Friendship Hospital. Theavy Mok hosted Warren Schubert and other AO Alliance faculty. Phnom Penh, Cambodia, 2018.
Copyright: AO Alliance





David Shaye (AO CMF faculty) guiding a participant through a practical exercise for facial fracture fixation, Kigali, Rwanda, February 2019.
Copyright: AO Alliance

In 2016, the AO Alliance commissioned AO Spine to work in tandem with Chris Lavy from Oxford University to review existing material and develop a template appropriate for sub-Saharan Africa and Asia for spinal trauma and treatment of SCI. The initial project called for the following:

- Proofing the template by identified surgeons with knowledge and experience in LMICs;
- Develop the supporting education materials;
- Identify certain countries in sub-Saharan Africa for a pilot; and
- Scale up the implementation as an add-on to the Fracture Solutions Program if the pilots were successful.

This course is an instructional course with the objective to provide physicians and other healthcare workers with guidelines for basic nonoperative treatment of common post-traumatic spinal conditions and to enable them to recognize those fractures that need operative treatment in a specialized unit.

The development and knowledge input came from AO Spine faculty Alex van der Horst (Namibia) and Norman Fisher-Jeffes (South Africa). Significant leadership input came from Michael Grevitt, AO Spine Education Commission chair, Mohammed El-Sharkawi (Egypt), Middle East and Northern Africa regional board chair, and AO Spine faculty Atiq Uz Zaman (Pakistan). Kate de Boer provided project management support. The course curriculum could be finalized in 2018.

Two AO Alliance spine courses were executed in 2019. The three-day spine course for surgical trainees from sub-Saharan Africa achieved its objectives to:

- Describe the initial management of the spine injured patient;
- Provide an overview of spine conditions requiring emergency treatment;
- Improve the knowledge and skills of trainees to manage SCIs in LMICs; and
- Outline how common spinal traumatic conditions are best treated, including indications, operative techniques, and complications. → [📄] [📄] [📄]

AO clinical divisions' initiative

With the adoption of the AO clinical division/AO Alliance cooperation in 2018, the relationship was considerably strengthened, before being halted by the COVID-19 pandemic.

A proposal was presented to the AO Foundation Board (AOFB) in September 2018 to further strengthen cooperation and enhance the role of the AO clinical divisions in LMICs. The proposed approach foresaw the AO contributing financially directly to the AO Alliance with the funding being exclusively earmarked for AO clinical division joint activities with the AO Alliance. The proposal called for:

- A clinical needs-specific program to complement activities in LMICs where the three AO clinical divisions would like to be active but where needs for capacity building activities are equally important;
- Clear distinction between the traditional AO clinical division education guidelines and those under the AO Alliance;
- Different territories, broader range of activities, comprehensive programs, and emphasis on local capacity building; and
- Objectives, eligible activities, and processes to be jointly decided upon following AO Alliance objectives, policies, and processes.

The three-year program of CHF 1.1 million launched in 2019. Funding for the first year was set at CHF 250,000 – to be increased to CHF 350,000 in the second year, and CHF 500,000 in the third year. Each clinical division approached the project differently.

AO Trauma adopted the Gambia as a country initiative, building on the existing work done by the AO Alliance. The plan was outlined at the AO Trauma International Board meeting in March 2019 in Madrid, Spain, and approved at the Assembly of AO Trustees in June 2019. One T&O surgeon has since been added to the surgical capacity of this small West African country.

The mandate to elaborate the plan for this additional opportunity was given by the AO Spine International Board to AO Spine Europe, Middle East, and Northern Africa. The AO Alliance had funded in 2017 a project to develop a course to teach the basics of nonoperative and operative treatments of spinal injuries. Alex van der Horst from Windhoek, Namibia, and Norman Fisher-Jeffes from Cape Town, South Africa, were instrumental in developing and implementing the course. The program was heavily supported by AO Spine project manager Mary Anne Smith, whose work and conviction made it possible to deliver this education in selected LMICs in sub-Saharan Africa.

AO CMF, with the tremendous work being done initially by David Shaye and Travis Tollefson, continued to expand its educational program in sub-Saharan Africa and Asia. They recognized the continuing advancements in craniomaxillofacial treatment and the need to keep abreast of these developments for continued educational



⑨ Regional and national faculty, AO Alliance Spine Basic Principles Course—Trauma and Infections, Nairobi, Kenya, October 2019. Copyright: AO Alliance



⑩ Regional Course Chair Mohammad El-Sharkawi, leading a practical exercise, Nairobi, Kenya, October 2019. Copyright: AO Alliance



① Atiq Uz Zaman (Pakistan) demonstrating cervical spinal immobilization techniques, Nairobi, Kenya, October 2019. Copyright: AO Alliance

and professional development, as well as the need for international collaboration. Additional activities will be conducted, thanks to Joachim Prein's donation. Unfortunately, the COVID-19 pandemic interrupted the planned events.

ADAPTING TO THE NEW NORMAL: OVERCOMING COVID-19 PANDEMIC OBSTACLES

As the AO Alliance embarked on a pivotal year in 2020, it had plans to focus on and further develop evaluation of its activities. All face-to-face events were postponed as of March 9, 2020 because of the coronavirus disease (COVID-19) pandemic. While many aspects of this new infection remain uncertain, COVID-19 could have the greatest impact where healthcare systems are weak and resources scarce.

The coronavirus pandemic is unprecedented in scale and need. Almost every household, community, organization, sector, and every nation is reeling from its impacts on health, the economy and society.

Lockdowns and travel bans made the implementation of a large part of the programs during 2020 impossible. The AO Alliance Board of Directors and management had to look at alternative measures. These can be divided into three categories: keeping the AO Alliance network safe and healthy, transitional activities for the AO Alliance network, and adaptation of assets for the longer term. The AO Alliance Board of Directors allocated CHF 250,000 to the COVID-19 response program. The Hansjörg Wyss Medical Foundation agreed to contribute CHF 150,000. The Johnson & Johnson Foundation also allowed for some of the WATEP funds to be used for the pivoting of activities in 2020.

COVID-19 response program

The AO Alliance does not have the competencies to be involved in the clinical response to the pandemic. But injuries do continue to happen. Personal protective equipment (PPE) needed for all frontline healthcare workers was being diverted to emergency rooms and intensive care units. This left T&O surgeons and ORPs in the AO Alliance network unprotected in the operating theatres.

In May 2020, the AO Alliance launched a GoFundMe campaign to raise funds to commission the production of reusable PPE sets and face masks, made in Blantyre, Malawi, by a local nonprofit organization, Kids' World Tailoring. One complete set costs USD 20. Not only would this help to protect AO Alliance surgeons, nurses, and patients, it would provide local employment.

A total of 200 PPE sets (cap, mask, gown, apron, face shield) and 800 reusable face masks were produced and delivered to KCH, QECH and Mzuzu Central Hospital, and face shields to Beit CURE International Hospital in Blantyre. → [O] [O]



“The number of COVID-19 cases continues rising in the country. If I catch it as a surgeon, who will treat my patients? I would have to go into isolation for three weeks. The demand for these resources (PPE) is so high that the hospitals and the ministry of health cannot afford them. These PPE sets will help with the continuity of service delivery.”

Leonard Banza, chief of T&O at Kamuzu Central Hospital

Following the success of this project, USD 5,000 per country (for 250 sets) was allocated where the AO Alliance could identify a local manufacturing partner. In addition to this initiative, the WATEP funds could be used to supply PPE. → [O]

Contingency planning with the AO Alliance African and Asian networks

With its central and regional teams, the AO Alliance is monitoring the local sanitary conditions and preparing to deliver as many educational events as possible provided health and safety measures can be met. The AO Alliance's three regional coordinators—Wilfred Addo, Florent Anicet Lekina and Ramesh P Singh—are engaging the faculty network through various social media platforms. AO Trauma memberships have been purchased and distributed to allow access to webinars and online educational material. National courses and events will probably be the ones that the AO Alliance can execute in 2020, especially the nonoperative courses and seminars. Digital presence at the virtual AO Davos Courses, in December 2020, figured prominently. These measures do not require any travel for regional and international faculty, or transport of equipment.



① A tailor at Kid's World Tailoring sewing PPE for healthcare workers, Blantyre, Malawi, June 2020.
Copyright: AO Alliance



② COVID-19 personal protective equipment (PPE) initiative, Malawi, May 2020.
Copyright: AO Alliance

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OR.I



① Surgical team members wearing PPE donated by the AO Alliance, Vientiane, Laos, 2020. Copyright: AO Alliance

Module	Thème	Ouverture	
Module 1	Les fractures malléolaires et entorses de la cheville	02/05/2020	Commencer
Module 2	La fracture ouverte de jambe	18/05/2020	Commencer
Module 3	Le syndrome des loges	15/06/2020	Commencer
Module 4	La fracture de la diaphyse fémorale	19/07/2020	Commencer
Module 5	La luxation de l'épaule	26/09/2020	Commencer

Screenshot of the online education platform, AO Alliance French-speaking Africa website. Accessed on September 15, 2020. (Copyright: AO Alliance)

From the moment all face-to-face educational events were put on hold due to the COVID-19 pandemic in March 2020, the AO Alliance pivoted to mobilize its network of faculty to design quality online educational resources and events to care for the injured.

AO Alliance French-speaking Africa faculty—Florent Anicet Lekina (Cameroon), Patrick Dakouré (Burkina Faso), and Abalo Anani (Togo)—applied for the AO Trauma Innovation in Education Award for online educational content.

Under the supervision of Lekina and Martin, the team put in place an *online education platform* consisting of ten modules on fracture care in French starting in May 2020.

The content showcases ten musculoskeletal trauma themes relevant to LMICs, with each module comprising a short bibliography, a recorded lecture on the topic, practical videos, and a knowledge evaluation quiz. The platform has been of great value for keeping surgeons, residents and ORPs in French-speaking sub-Saharan Africa engaged and interested in the field of trauma during these challenging times for all.

Digitalization of educational assets

The COVID-19 pandemic is singular in many ways. First, in terms of number of people infected, transmissibility, and spectrum of clinical severity, it has had a greater impact to date than previous epidemics. Indeed, the COVID-19 pandemic is occurring in an era of massive technological advancement. Digital tools can effectively support institutions during a pandemic by facilitating the immediate widespread distribution of information, tracking transmission in real time, creating virtual venues for meetings or day-to-day operations, and providing telemedicine visits for patients. However, some digital health strategies and tools face challenges in terms of availability of infrastructure, acceptability, and ethical issues.

Several potential scenarios exist to inform current decision-making about the future provision of teaching and learning. As surgeons and ORPs embrace online learning, this pandemic provides the AO Alliance with an opportunity to review its education model and analyze the possible restructuring of fracture care learning. On the one hand, the AO Alliance network wants face-to-face education. Many are not ready for online education for many different reasons—internet connectivity being one. Everything will not go online. The AO Education Institute, with AO Trauma, has developed an excellent online platform called AO Trauma Surgical Training and Assessment for Residents (STaRT), an online fracture care education program. The current downtime is an opportunity for the AO Alliance to investigate the professional digitalization of its nonoperative fracture care curriculum. The project would evaluate the costs and feasibility, as well as to whether the need is warranted. The AO Education Institute and AO Trauma are willing partners.

While working on a broader solution, the AO Alliance's faculty have organized various ad hoc online events, namely online trauma care course modules for French-speaking Africa, as well as webinars in Nepal and Bangladesh, and a hybrid seminar in Vietnam. As this book was being written, a learning management system was purchased for the development of online education.

EXPANSION OF SCOPE: PRIMARY TRAUMA CARE FOUNDATION

The mission of the AO Alliance is to improve fracture care in LMICs. The focus lies in education and training of frontline healthcare workers. Within the continuum of trauma care systems, which consist of prehospital care, emergency and hospital-based care, and rehabilitation, the AO Alliance has given itself a focus on the hospital care theme (operative and nonoperative) treatment. It is, however, evident that in the improvement of patient care, all three components of the trauma system play an important role and reinforce each other. The AO Alliance is, therefore, keen to give attention to the full cycle of fracture care, particularly when it comes to awareness building and providing advisory services.

Prehospital care is particularly relevant in LMICs with no quick and easy access to hospitals. Immediate attendance to an injured person during what is known as the 'golden hour' can be lifesaving and prevent a lifelong disability.

The Primary Trauma Care Foundation (PTCF) is a United Kingdom-based nonprofit organization that trains local healthcare workers in LMICs to provide essential first aid services, to perform cardiopulmonary resuscitation (CPR), and to provide early management of severe injuries with limited resources. Developed for use in weak healthcare systems, the program is cost-efficient with built-in design sustainability by way of early transfer of ownership to local partners to affect a cascade of trauma courses in their communities. The model is very much in line with the AO Alliance model of promoting local capacity building adapted to the resources available in that country and would help to enhance the impact of the AO Alliance's work in substance and geographically.

An initial encounter had taken place in Geneva in May 2015 at the inaugural G4 Alliance permanent council meeting. The PTCF is also a founding member of the G4 Alliance. They were seeking additional funding to expand their activities.

As there was interest from both parties, a merger between the AO Alliance and the PTCF was envisioned. The activities of both were complementary in the continuum of trauma systems.

Due diligence meetings between members of the AO Alliance Board of Directors and PTCF Trustees took place to discuss terms of a memorandum of understanding for collaboration. The AO Alliance management team spent two days in October 2018 in Oxford, United Kingdom, conducting managerial due diligence in preparation for a board presentation and decision.

In the end, the two organizations were unable to come to a common understanding to carry the merger forward.

While the AO Alliance missed out on a promising opportunity to strengthen its scope, the animated discussions within the AO Alliance Board of Directors and management cemented the recognition of the importance of primary trauma care. It was decided to address this stage of trauma care in future programs, when relevant in 2021 to be introduced to strengthen a country or special initiative (ie, the WA-TEP). One of the available primary trauma-care educational modules, best suited for this purpose, would be selected ad hoc, while the AO Alliance might develop its own primary trauma care initiative in the long run.

IMPROVING ORTHOPEDIC SUPPLY-CHAIN MANAGEMENT

The need for implants and instruments _____

Trauma and orthopedic surgery, whether it is ‘cold’ reconstructive orthopedics or ‘hot’ trauma and fracture fixation orthopedics, is a gadget-rich specialty. Add the rapid advance of technology, minimally invasive soft tissue preservation techniques, and endless newer implant designs, and the list gets overwhelming. Not only does the list get longer and longer, but the maintenance of this equipment is also a challenge in all environments, just more so in those with limited resources.

The routine treatment of fractures remains nonoperative with either plaster of paris or fiberglass casting. In more severe cases, casting may be accompanied by a closed reduction and manipulation, traction and/or surgical fixation using orthopedic implants such as external fixators, pins, plates and screws, intramedullary nails, etc. Compared to skeletal traction, implant fixation, especially internal fixation, reduces the hospital length of stay, is cost-effective, and the return to function is

much shorter. Due to the limited availability of orthopedic implants in many LMICs, nonoperative fracture management remains the current standard of care in most LMICs. But this is suboptimal.

Distribution and access models ---

Pathway 1: donation model

Visiting surgeons mostly from HICs often request implant donations from established overseas companies to be used on short-term surgical missions. The unused implants are often left behind and stockpiled at the hospital. Patients usually receive donated implants on a first come, first served basis depending on type and availability of the implant needed. The donation relationship often continues upon return of the surgical team to provide top-ups until the next visit by the mission team.

Pathway 2: negotiated prescription model at public/governmental hospitals

This is a model where patients are required to purchase and supply their own implants through external suppliers. Usually, private suppliers and distributors sell surgical implants through sales representatives. A surgeon provides a prescription for the required implant. The hospital plays no role in the purchase of implants by patients; rather, the patient or a family member contacts the sales representative directly and agrees on the payment terms. Surgeons often recommend a vendor to the patient, depending on the type of implant required for the injury sustained.

Pathway 3: hospital or physician-mediated procurement in private hospitals

The implant supply chain in certain public and private institutions can also pass through local suppliers and distributors. But the patient plays no direct role in negotiating the purchase of the implant. In certain countries, there is a central procurement process established with no flexibility to go outside of the established vendors. Hospitals procure and store implants from which the surgeon selects implants for their patients. This is the one that most closely resembles the surgeon-centered implant procurement pathway in HICs. But even this model has evolved to be less and less in the control of surgeons and providers due to the high cost of implants.

AO Alliance facilitation ---

Besides the United States, European, and Japanese manufacturers, orthopedic equipment is now manufactured by companies in India, China, and other middle-income countries. Some items that are considered obsolete in HICs are shipped to LMICs at a reduced cost or sometimes no cost.

The AO Alliance realizes that improving care of the injured in LMICs is much more complicated than delivering high-quality, adapted fracture care education to those providing patient care. In December 2016, a large, AO Alliance-sponsored stakeholder meeting took place in Davos, Switzerland. The aim was to create a global alliance of key players and influencers able to make a difference in this neglected epidemic of musculoskeletal injuries in LMICs. One serious roadblock identified was the need to resolve the implant supply problems in developing economies.

While recognizing its importance, the AO Alliance does not finance or provide implants as a general policy but has channeled some in-kind donations to improve access. The long-term policy of the AO Alliance is to facilitate, develop, and support solutions that are sustainable for LMICs.

The AO Alliance managing director has always wanted to tackle this implant issue, as during his travels to LMICs, he was always asked to bring implants with him. During conversations with executives for HIC implant suppliers and previous work with them to make their surplus inventory available, he noted that unused implants were warehoused and ready to be destroyed or discarded. In thinking about the problem, he relayed his vision to the AO Alliance Board of Directors. Indeed, this sounded like a supply chain problem. The project sat on the shelf until June 2020. After several brainstorming sessions with Manjul Joshipura and Florin Gheorghe, former CEO and cofounder of Arbutus Medical Inc, the three are developing the OrthoAccess platform (working title). An integral part of the model requires identifying facilities in developing countries with enough infrastructure, including operating theatres, access to anesthesiology and radiography, the ability to conduct follow-up processes, and surgeons with the appropriate skills sets to perform the procedures. The AO Alliance is in an excellent position to be this conduit with its vast network in LMICs.

The OrthoAccess initiative

The COVID-19 pandemic that hit the world in the early part of 2020 was thought to become a devastating situation for sub-Saharan African countries. Early on, even in HICs, personal protective equipment was difficult to find and frontline healthcare workers were being denied even the most basic of protective equipment. Africa was able to come up with an innovative COVID-19 response: the Africa Medical Supplies Platform (AMSP).

The AMSP is a nonprofit, continental, online procurement platform designed to resolve Africa's COVID-19 medical supply predicament. Besides strengthening Africa's supply management system and bolstering local production of pharmaceuticals,

the main objective of the platform is to provide equitable access to medicines and medical supplies for all participating countries. The platform pools certified medical suppliers and aggregates demand, thereby creating a larger market that saves time, enables competitive pricing, and ensures the security of the supplies. Sourced and donated medical supplies are distributed proportionately by considering the population, disease burden, and vulnerability level of member states. After quotas are designated, member states are required to make payment into a holding account at Africa's Export-Import Bank (Afreximbank) within a stipulated number of days and then the supplies are delivered by designated commercial carriers.

OrthoAccess is an initiative intended to improve access to safe, affordable, timely orthopedic surgery in LMICs, with a specific focus on implant access as a critical barrier to care. This project aims to use a market-shaping approach to create increased access to essential orthopedic products. This approach is inspired by the success of market shaping in reducing prices and increasing access to healthcare commodities ranging from HIV drugs to diagnostics and vaccines.

Previous attempts at increasing access to orthopedic implants have focused on donation of excess or expired supply from hospitals or companies through volunteer missions, nonprofit coordinating organizations, and corporate social responsibility programs. While this approach is worthwhile and has generated impact, the OrthoAccess project's focus is on making orthopedic markets work more efficiently for LMIC patients, clinicians, and hospitals.

Phase 1 had been approved by the AO Alliance Board of Directors. With the help and input of Dalberg Consultants, the AO Alliance is looking to articulate a compelling value proposition for pooled procurement in LMICs to incentivize governments, suppliers, and donors. It will build an impact case and articulate potential health impact of increased access to surgical implants and how pooled procurement can unlock critical access barriers.

To support this value proposition, the AO Alliance will assess the impact and business case in four target countries: Ethiopia, Nigeria, Kenya, and Tanzania.

CONCLUSION

Since 2015, the AO Alliance had made important progress to improve its ability to meet the needs of frontline healthcare workers and communities where it is involved. AO Alliance educational events, fellowships, expanded country initiatives and efforts to engage health ministries and other partners, are bettering care of the injured. The AO Alliance has been able to advance care of the injured, thanks to its generous donors and partners in raising awareness and implementing programs, which are further detailed in Chapters V and VI.



Participants at the Nonoperative Fracture Management course, Mangochi, Malawi, September 2016.
Copyright: AO Alliance



CHAPTER V

Funding

Rolf M Jeker and Cinzia Muggiasca

“*Alone we can do so little;
together we can do so much.*”

— Helen Keller —

CHAPTER V

FUNDING

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FINANCIAL DEVELOPMENTS

Income

The AO Alliance was fortunate to receive significant funding from the outset from the AO and the Hansjörg Wyss Medical Foundation, allowing it to become active on a substantial scale from its inception, as described in Chapters III and IV.

Over the first five years, the AO Alliance was able to not only significantly increase its income, but also diversify its donor base. From the initial funding income of CHF 4.2 million in 2015, income increased steadily to reach CHF 7.6 million by 2019, and an expected CHF 8.3 million for 2020. Due to the COVID-19 pandemic and reduced activity in 2020, that amount was lowered to CHF 5.5 million.

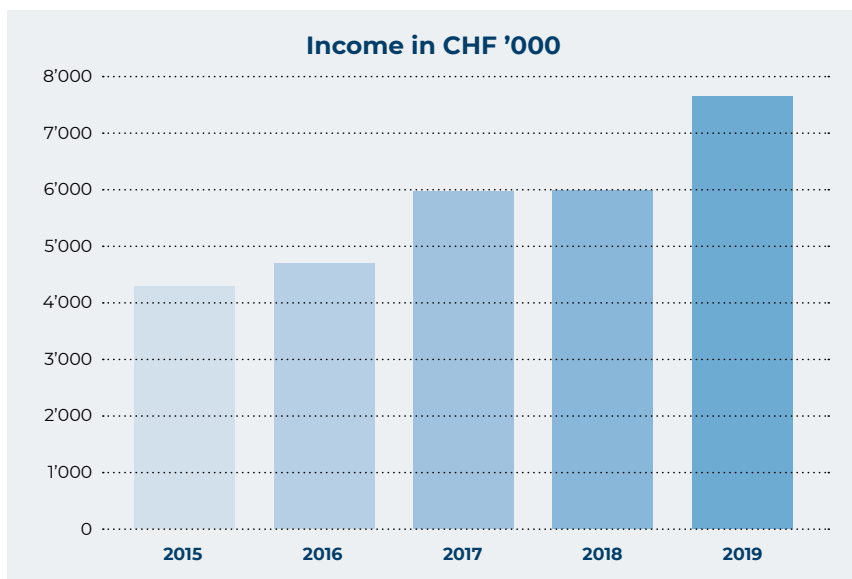


Figure 19: AO Alliance income (2015–2019).

Thanks to the funding agreement with the AO and the Hansjörg Wyss Medical Foundation, the AO Alliance has been able to raise triple the amount provided from its agreement with the AO by attracting additional donors.

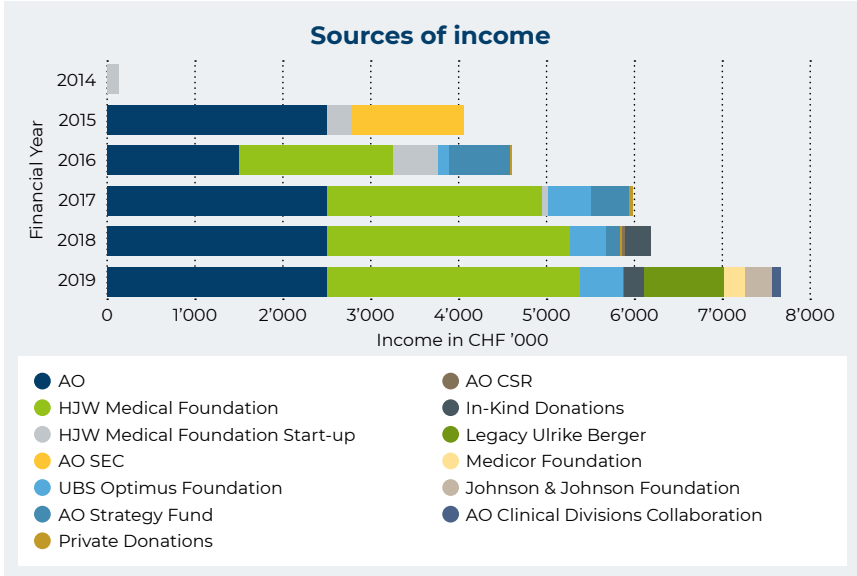


Figure 20. AO Alliance sources of income (2015–2019).

The Hansjörg Wyss Medical Foundation¹ had already donated CHF 1 million as start-up funding in 2014. This immediately provided money for the AO Alliance to set up its operational infrastructure. The AO added CHF 0.5 million in 2015 for the same purpose, but the funds were not drawn from the AO as no further start-up investment was needed.

In March 2015, the AO Alliance benefited from the first budget contribution of the AO (CHF 2.5 million) as agreed under the 10-year collaboration agreement. Additionally, the AO Alliance was allocated CHF 1.3 million that had been already budgeted as a one-time transitional measure to the ongoing AO SEC education program for that year. The former AO SEC activities were fully financed out of the regular AO Alliance budget, and became part of a substantially increased newly designed Fracture Solutions Program. From 2016 until end 2019, between CHF 1.8 and CHF 3 million were annually allocated to this flagship education program, of which two thirds were contributed by the Hansjörg Wyss Medical Foundation.


In 2016, the AO Alliance received a first contribution amounting to CHF 0.5 million under the agreement with the Hansjörg Wyss Medical Foundation (see Chapter III) for a project-specific expenditure incurred under the Malawi country initiative. The

1 Established by Hansjörg Wyss to support health-related issues.

agreement foresees that expenditures be shared on a 1:2 allocation, with the larger amount coming from the Hansjörg Wyss Medical Foundation.

From 2016 onward, increasing yearly contributions by the Hansjörg Wyss Medical Foundation were received as additional country initiatives were launched (2017: Ghana, 2018: Ethiopia). The yearly contributions received amounted to CHF 1.1 million in 2017, CHF 1.5 million in 2018 and CHF 1.2 million in 2019. All contributions required annual approval based on project implementation progress reports submitted directly to Hansjörg Wyss.

In 2016, the AO Alliance brought on board the UBS Optimus Foundation², with a total of CHF 1.5 million in funding for Pediatric Fracture Solutions for Ghana (three-year project starting 2016 to 2019). The condition set by the UBS Optimus Foundation was that it would contribute CHF 500,000 if a third party contributed CHF 1 million. Fortunately, the AO Alliance was able to enlist the AO. The AO agreed to allocate CHF 1 million of the yearly CHF 2.5 million budget contribution of 2016 directly to the UBS Optimus Foundation project in Ghana.

An additional new source was the AO Strategy Fund. Claude Martin Jr, in his previous role as AO Trauma executive director and personal capacity, had submitted a project proposal for “Play Safe with Sisimpur^{3, 4}” to the AO Strategy Fund to develop with Sesame Workshop (the world’s largest informal educator of children) a childhood accident and injury prevention program in selected communities in Bangladesh. The project duration was 30 months, and the budget was CHF 1.3 million. The AO Strategy Fund agreed to finance the project in full and delegate the implementation to the AO Alliance under Martin’s guidance. → 

No new donors were identified in 2017, as the AO Alliance raised additional funding from existing donors.

In 2018, the AO Alliance launched a joint project with the AO and its jubilee fund (this was presented during AO’s 60th Jubilee). The project intended to create a robust and compelling report describing and quantifying the burden of musculoskeletal trauma in low- and middle-income countries (LMICs). The report was mandated to The Economist Intelligence Unit (EIU) Healthcare, a unit of The Economist (United Kingdom), in order to identify important interventions to reduce morbidity

2 UBS Optimus Foundation is the corporate social responsibility institution of UBS. It supports major issues, including health, by leveraging by multiplier contributions by third parties.

3 Sisimpur is the Bangladeshi version of the children’s television series Sesame Street.




4 Findings of a study on the effectiveness of the “Play Safe with Sisimpur” program reveal significant improvements in knowledge related to injury prevention and treatment in both child and adult participants in the school-based mentorship program. See Foulds et al (2020).



© Rolf M Jeker, Claude Martin Jr, and Sherry Westin (president, Sesame Workshop Global Impact and Philanthropy), celebrate the signing of the contract at the Sesame Workshop headquarters, New York, United States, April 2016. Copyright: AO Alliance



and mortality and discuss differences in how health care systems respond to musculoskeletal trauma compared to other priority conditions such as communicable diseases and chronic noncommunicable diseases (NCDs) (eg, cancers and diabetes). The project budget of CHF 100,000 was fully funded by the AO. → [©] [©]

The Economist	INTELLIGENCE UNIT	HEALTHCARE
<h1>At breaking point</h1> <h2>Understanding the impact of musculoskeletal injuries in low- and middle-income countries</h2>		
<p>A report by The Economist Intelligence Unit</p>		
		
<p>Sponsored by  AO ALLIANCE  AO Foundation</p>		

[©] Cover page of The Economist Intelligence Unit report commissioned by the AO Alliance and the AO. December 2018.

Thanks to an existing personal connection with the president of the Naton Medical Group⁵ (a Chinese medical technology company that offers a range of comprehensive trauma and orthopedic products), the AO Alliance received an equipment and implant donation valued at CHF 735,000. Forty sets of orthopedic implants and instruments were shipped to five countries in sub-Saharan Africa, with focus on Ghana and Ethiopia, and were distributed to selected T&O surgeons in the AO Alliance network under the condition that they report on their use and the cases treated, for the purpose of recording clinical evidence and transparency. Such donations continued on an annual basis up to and including 2020, particularly during the COVID-19 pandemic; in the midst of which the Naton Medical Group donated a total of 100,000 protective surgical masks with a value of CHF 20,000.

In 2019, the AO Alliance received two further contributions, mainly for the construction of the Lilongwe Institute for Orthopaedics and Neurosurgery (LION) Hospital, in which the AO Alliance is a major partner with the Haukeland University Hospital (HUH) and the Mohn family⁶, under the Malawi country initiative. Medicor Foundation contributed USD 750,000 to the AO Alliance over a period of two years (2019–2020) towards construction of the LION Hospital. A significant part of a contribution of CHF 1 million from the legacy of Ulrike Berger will be allocated to the construction of an operating theatre at the LION Hospital.

Three AO clinical divisions (AO Trauma, AO Spine and AO CMF) had already shown interest in activities in LMICs. In 2019, the collaboration with them was strengthened, and a three-year funding agreement was established. The agreement foresees total funding of CHF 1,100,000 (2019–2021) for joint activities in countries where the AO Alliance is active.

The year 2019 was also pivotal as the AO Alliance announced a collaboration with the Johnson & Johnson Foundation. After several attempts to interest the corporate social responsibility funds of Johnson & Johnson, funding of USD 1.5 million was granted for the West Africa Trauma Education Program (WATEP) thanks to the efforts and persistence of Michelle Brennan, then company group chair, Medical Devices, Europe, Middle East, and Africa (EMEA).

The AO Alliance also received CHF 50,000 in the form of an unrestricted grant from the Pictet Fondation de Bienfaisance⁷, which the AO Alliance Board of Directors specifically allocated to the Faculty Education Program (FEP). An additional contribution of CHF 60,000 from Joachim Prein was received for joint educational programs with AO CMF in sub-Saharan Africa.

5 Naton Medical Group also acts as a distributor for DePuy Synthes.

6 Norwegian philanthropic family.

7 Charitable foundation implementing the corporate social responsibility strategy of the Pictet Group.



AO Foundation
AO Strategy Fund





© AO Strategy Fund committee. Left to right: Craig Cooper (project manager), Neal Futran (member), Florian Gebhard (chair), and Jean-Pierre Cabassu (member), Davos, Switzerland, December 2015.
Copyright: AO Foundation

Expenditure

As a matter of policy, the AO Alliance never invests in a program or project unless financing is fully secured for the duration of the proposal. Continuous monitoring ensures commitments entered into are in line with actual and unforeseen costs. This avoids potential over-indebtedness of the AO Alliance and acts as a barrier against unrealistic expectations and ambitions by management, the board, and beneficiaries.

Between its launch and the end of 2019, the AO Alliance invested CHF 26.6 million, of which up to 95 percent went toward ‘Care’ activities. Required amounts for awareness and policy advisory services have been small, consisting of the organization of events and background studies. About 85 percent of funds invested in ‘Care’ goes toward fracture care management education, 10 percent goes towards clinical research projects, and 5 percent to clinical services support (infrastructure and equipment). The main projects funded under infrastructure support were the construction of the LION Hospital and two operating theatres at the Queen Elisabeth Central Hospital in Malawi.

For the country initiatives, CHF 4.6 million was allocated to Malawi, CHF 1.2 million to Ethiopia, and CHF 1.6 million to Ghana. The special initiatives were allocated CHF 501,000, CHF 480,000, and CHF 1,500,000 respectively for the AO surgeons’ initiative, the Pacific Islands Orthopaedic Association’s initiative, and Pediatric Fracture Solutions for Ghana.

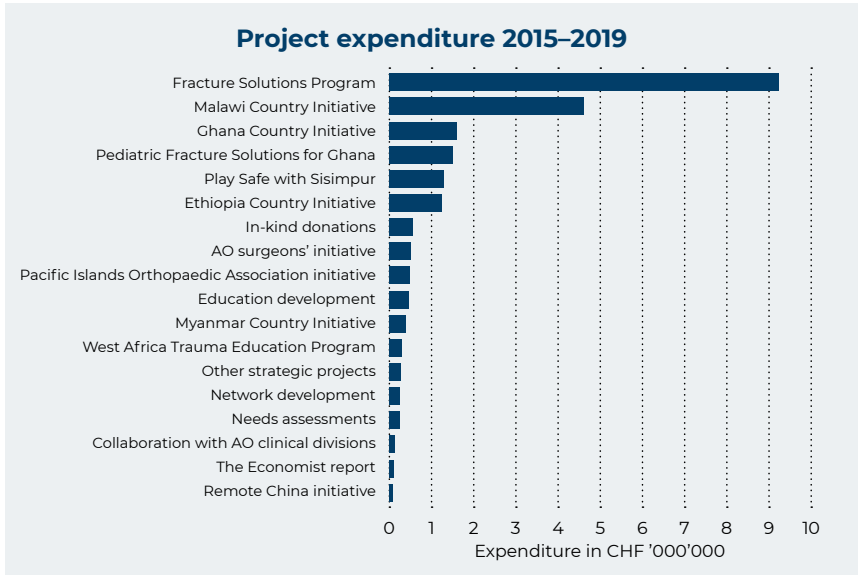


Figure 21. Project expenditure 2015–2019.

INITIAL FINANCIAL IMPLEMENTATION HURDLES

Three major hurdles had to be tackled and resolved in the start-up phase.

The first was to receive tax-exempt status. This could be achieved as the non-commercial, nonprofit objective could clearly be demonstrated.

Secondly, when asking for a ruling by the Swiss tax authorities on value-added tax (VAT) exemption, the decision first communicated to the AO Alliance was that the AO contribution would incur a VAT rate of 8 percent, while the contribution by the Hansjörg Wyss Medical Foundation would be exempt. In its submission, the consulting firm employed had made a reference to the collaboration agreement between the AO Alliance and the AO, which was interpreted by the tax authorities as a conditionality set by the AO for its contribution to the AO Alliance. This would therefore have classified the AO contribution not as a donation, but as a service to the AO to improve the AO brand and image through AO Alliance activities. The interpretation reflected neither the intended nature of AO's contribution, nor the intention of the collaboration agreement. The only relevant commitment in the collaboration agreement was AO's right to occupy two seats on the AO Alliance Board of Directors, and in particular, allowing the AO Alliance to use the AO brand. This was linked to stringent obligations the AO Alliance has to observe to retain the right to use the AO name.

In a detailed letter to the Swiss tax authorities, the arguments were contested and clarified upon which they accepted the VAT exemption request, requiring only small adjustments to the collaboration agreement.

Thirdly, for governance reasons and to ensure legal independence from the AO, the AO Alliance had to choose its own auditors. This was done through a procurement process and BDO Chur was appointed as its independent auditor.

The question came up as to whether the AO should consolidate the AO Alliance as an AO participation. To consolidate the AO Alliance into the AO as a minority donor would have meant that all third-party donor contributions would have become part of the AO accounts.

The AO has no ownership or participation in the AO Alliance that could be consolidated. With only two out of potentially seven seats on the AO Alliance Board of Directors, it can neither carry a decision nor exercise a veto.

FUNDING STRATEGY AND DONOR COMMUNITY

The funding strategy was initially developed with Dalberg Advisors in June 2015, and further refined with the AO Alliance Board of Directors over time. The strategy built on various pillars to define the target groups the AO Alliance wanted to approach as potential donors.

A key consideration was to have diverse donors, as well as a good mix between project-based contributions (restricted funds) and budget-based contributions (unrestricted funds), in order to maintain budgetary flexibility to capture opportunities as they arose.

From the outset, the idea to present the AO Alliance as an emergency relief or humanitarian organization calling on a broad community of individuals to make small donations by showing personal or community tragedies, was rejected.

The AO Alliance defines itself as a “development nonprofit organization in the healthcare sector” with a positive and credible message of building sustainable local capacity to provide better care of the injured in LMICs.

Donors have to be convinced the AO Alliance is dealing with a relevant global health problem—and in particular that it can provide effective solutions to it. AO Alliance funding partners are typically professionals trained and experienced in assessing assistance programs and proposals and are normally confronted with a myriad of proposals competing for limited available funds.

Foundations and philanthropists

The AO and the Hansjörg Wyss Medical Foundation are anchor donors, who during the first five years provided the majority of the funding.

Additional donors include the UBS Optimus Foundation, Medicor Foundation, and the Johnson & Johnson Foundation⁸ on a multiannual program basis. Contributions have also been received from the estate of Ulrike Berger, the Fondation de Bienfaisance de Pictet, and Joachim Prein.

The objective is to further broaden and diversify the donor community with the support of Globalance Philanthropy to drive the implementation of the funding and partnership strategy.

Corporate sponsors

A second component of the funding strategy is to address and identify corporate sponsors. A detailed corporate sponsorship policy and action plan is in development to attract leading companies to donate between CHF 5,000 and CHF 20,000 on an annual basis.

According to the AO Alliance definition, a donor contributes funding of a certain magnitude to the AO Alliance budget (unrestricted funds) or actual programs and projects (restricted funds). A sponsor, on the other hand, would support the objectives and activities of the organization more generally, with a recurring annual contribution. They would benefit from the AO Alliance's geographic reach, to make themselves known in countries and in areas of current or future interest to them, or simply to fulfil their corporate social responsibility (CSR) objectives.

The AO Alliance is already a beneficiary of the AO CSR program, which is funded by AO surgeons who forego their per diems—50 percent of which are allocated to the AO Alliance. The annual amount ranges between CHF 10,000 and CHF 20,000. The AO Alliance plans to increasingly qualify for CSR contributions from other companies and foundations.

Potential sponsors are in industries associated positively or negatively with the topic of care of the injured, including inter alia insurance, automobile, and mining as well as medtech and pharmaceutical companies.

In 2019, the AO Alliance entered into a sponsorship agreement with Essity India Private Ltd⁹, which began to cosponsor some nonoperative courses in Nepal and Bangladesh in the form of an unrestricted educational grant. Essity also partnered in developing a webinar series for T&O surgeons in LMICs during the coronavirus

8 The J&J Foundation is the social trust fund of the Johnson & Johnson company – independent of its commercial divisions.

9 Essity is a global hygiene and health company dedicated to improving well-being through their products and solutions, essentials for everyday life.

pandemic. These webinars were unique, as not many outfits targeted LMICs and nonoperative fracture care treatment principles.

Private donations

General considerations

The funding strategy never foresaw multiple small private donations becoming a major funding source. Therefore, little effort was made to send letters asking for money to private households, as many NGOs repeatedly do. The cost-benefit ratio would likely be very modest.

However, the ever-changing technology environment offers low-cost options through social media and crowdfunding networks that can be tapped into for this purpose.

The website 'Donate' button and other private contributions

A detailed study was submitted to the AO Alliance Board of Directors outlining various options, from crowdfunding to a simple 'Donate' button on the website.

The latter option, which could be installed for under CHF 10,000, was chosen and has been in existence since 2018.

The results so far have been modest, with contributions averaging CHF 20,000 annually, often by board members and AO Alliance staff themselves.

Although the amounts have been somewhat lower than hoped for, there was no disappointment or any intention to significantly change this by investing in advertising.

Private donations through the website, however, did help to achieve a broader, intended purpose, namely, to inform friends of the AO Alliance of its activities through the newsletter and stories around which donations could be made.

Private donations have also been received by channels. Among other private donors are Joachim Prein, AO Alliance staff and board members, as well as AO and AO Alliance faculty who have forgone their per diems.

Event-based fundraising

Organizing events to raise funds has become a source of regular income for many NGOs. These include gala dinners, keynote speaking, and sporting events. The

AO Alliance has not been active in this respect so far, apart from the participation of some AO Alliance surgeons in the Kigali International Peace Marathon in June 2019. Organized by Jim Harrison, AO Alliance regional director for Africa, approximately CHF 36,000 was raised through private donations. Additionally, a significant number of faculty and board members donated their per diems in order to contribute to the cause (approximately CHF 44,000). The faculty contributions in particular show that the whole community from Asia and Africa stands behind the concept of providing training to countries that are not part of regular AO Alliance programs, but that are also in dire need. The total amount of approximately CHF 80,000 allows for the financing of fracture care training to be held in Liberia and Sierra Leone, two countries with great needs but which have not been beneficiaries of the regular Fracture Solutions Program.

Legacy (planned) giving

The AO Alliance is not proactively seeking legacy gifts as many other well-known NGOs have started to do. Yet the AO Alliance was fortunate to obtain a CHF 1 million contribution from the estate of Ulrike Berger. → [📍]



[📍] Ulrike Berger

This was thanks to Andrea von Rechenberg, who had advised Ulrike Berger, and to the AO Foundation Board, which wanted the money to be used for development through the AO Alliance. A significant amount was allocated to the construction of the new LION Hospital in Lilongwe, Malawi, where an operating theatre will carry her name.

The AO Alliance welcomes donations from generous individuals wanting to bequeath money to a worthy cause, inviting them to join the AO Alliance donor community and witness the impact of their giving during their lifetimes.

No deliberate attempts will be made, however, to advertise or promote legacy donations as many NGOs have come to aggressively do through TV advertisements and other methods.

In-kind contributions

There is a definite lack of medical equipment in hospitals in LMICs. This is not any different for surgical devices, such as orthopedic implants and surgical instruments. The lack of these devices can be detrimental to treatment outcomes. The AO Alliance, as a matter of principle, does not fund equipment and implants as part of its core activities. It does recognize the dire need for them, though.

The AO Alliance realized at an early stage that in-kind donations could have a significant impact on the healthcare sector. There is a need, however, to avoid potential downsides; namely to receive unfit goods that could cause more harm than good, and to create a dependence on qualitatively acceptable but unaffordable products at a larger scale over time.

In the early days, the AO Alliance attempted to set up an equipment donation platform with the Société Générale de Surveillance (SGS). The idea was to connect potential donors with recipients in LMICs (ie, hospitals). To ensure quality and sustainability, donation requests would be assessed and then publicly displayed on the platform for donors to see and make offers. These, again, would be validated to meet quality and sustainability criteria. In this respect, the platform would have been unique, and its scope could have been extended over time.

The due diligence process quickly revealed that there were three important bottlenecks that in-kind equipment donations generally entail:

- Shipping costs are considerable, and donors are usually not willing to cover them;
- There are high importing hurdles in many of the potential target countries, caused by import and customs regulations, as well as complex application processes; and
- Industry donors are afraid to continue carrying legacy product liabilities.

The donation platform project was abandoned after the feasibility study revealed those obstacles, and a decision was made to seek and accept in-kind donations on an ad hoc basis. This would be contingent on a set of criteria being fully met, including for product certification. In this regard, the AO Alliance also follows WHO guidelines on medical donations:

- Healthcare equipment donations should benefit the recipient to the maximum extent possible;

- Donations should be given with due respect for the wishes and authority of the recipient, and in conformity with the government policies and administrative arrangements of the recipient country;
- There should be no double standard in quality. If the quality of an item is unacceptable in the donor country, it is also unacceptable as a donation; and
- There should be effective communication between the donor and the recipient, with all donations made accordingly.

In practice, the only, but highly successful and valuable in-kind donation that could be concluded so far was with the Naton Medical Group, a well-known Chinese medical device company that manufactures locally and acts as a distributor for DePuy Synthes (DPS) in China.

Over a period of two years, 40 medical device sets were distributed to the AO Alliance's partner hospitals in sub-Saharan Africa. All costs incurred, including shipping, were covered by the Naton Medical Group. The hospitals and surgeons are required to report on their use and the cases treated, for the purpose of having clinical evidence and transparency.

While the AO Alliance gladly accepts such donations from any company meeting financial, quality, and arm's-length relationship requirements, the AO Alliance policy objective is to develop and participate in a supply chain management program that will allow governments to procure equipment and implants under optimum conditions on a regular basis (see Chapter IV).

More recently, Synthes GmbH, a company of the Johnson & Johnson family, graciously donated implants and instruments to the AO Alliance for hands-on training in sub-Saharan Africa. This is an open-ended agreement for the AO Alliance to request such product donations, to be used for educational purposes only. This provides an excellent opportunity to augment the AO Alliance's workstation capacity. Implementation is on its way.

GOVERNANCE

Donors are particularly keen to ensure their contributions are well spent, especially in countries where oversight is challenging, and where governance may be weak. They also want to see that their philanthropic investment is impactful to and sustainable for the individuals and communities served.

Several factors give donors confidence to partner with the AO Alliance:

Low overhead spending

Donors want their funds to be spent directly on activities to ensure impact, and not on administrative overhead costs. The AO Alliance has been particularly successful in that regard, with an overhead ratio below 13 percent measured in terms of total expenses, a low figure by international standards. Ten to 15 percent on overhead would be considered healthy and ideal, and from 15 to 25 percent would be acceptable depending on the nature and scale of activities. Indeed, over time with increasing expenses for program activities, the ratio declined from 33 percent in 2015, to 12.9 percent in 2016, 10.7 percent in 2017, and fell below 10 percent in 2018 (9 percent) and 2019 (8.9 percent). The COVID-19 period in 2020 with drastically reduced program expenses will exceptionally allow the ratio to rise again.

The staffing level is lean and only a core staff is kept at the helm of the organization in Switzerland; while local oversight capacity is built up in target countries, with the double dividend of lower cost (but above local average salaries) and supporting local capacity and ownership. Building local capacity and ownership was a key success factor over the first five years as successful controls and verifications can only be done in the field, where in-depth knowledge of the local situation and service providers is mandatory to avoid fraud and/or noncompliant use of funds.

Commitment to transparency

Transparency is key to running activities, both internally to the AO Alliance Board of Directors and externally to donors. Local activities, expenses, and funding flows need to be documented and checked.

Having several local project officers on the ground allows the AO Alliance to monitor activities and compliance on use of funds.

Additionally, the AO Alliance introduced a new software platform in 2019 that tracks all educational events and fellowships. This new software solution (AidImpact) collects all information from the local project consultants (attendance data, expenses, budgets, etc) centrally so that at any time, management can access the data and proceed with additional controls and verifications.

Rigorous control and external verification

Transparency also requires controls to ensure proper implementation. The AO Alliance goes beyond the gold-standard control mechanisms by subjecting its activities to independent external verification on a recurrent basis by Société Générale de Surveillance SA (SGS)¹⁰.

This is to physically verify that expenses have actually occurred and were justified (eg, number of participants, cost of venues, meals, per diems, etc). This procedure also has a preventive effect, as potential beneficiaries and administrators know that there are controls in place.

In this context, not only are expenses validated, but procurement procedures and tender attributions are externally cross-checked. An important point to mention is that all monetary transactions are always handled centrally and paid directly for services rendered.

With very few exceptions, the amounts disbursed are small and are used to make payments for approved and documented expenses, and no cash advances are going to governments or individuals. Additionally, the AO Alliance implements a strict rule about the use of funds: no expense is accepted unless it is approved during the budgeting process and is fully documented.

Continuous monitoring, evaluation, and reporting

The AO Alliance follows project implementation very closely, especially deviations from the original plan—both in terms of expenses and timing. Such variations regularly trigger corrective measures. While ongoing spending controls are essential, evaluations of cost-effectiveness and impact are equally relevant.

10 SGS is the world's leading inspection, verification, testing and certification company.

Some of these evaluations need to be done internally (ie, for educational events), but very importantly, the AO Alliance allows for external, independent evaluations from time to time. These can apply to the overall goal and activities of the organization or to specific projects, such as infrastructure projects or country initiatives. Donors typically receive customized impact reports, the frequency of which are agreed upon in terms of a memorandum of understanding.

FUNDING OUTLOOK

While the AO Alliance has been successful in raising substantial funding from various sources over the first five years, priority will continue to be given to ensuring sufficient and stable financing for the future.

Valued funding partners have enabled the AO Alliance to establish a credible track record, to which this book bears testimony. Together with respected donors and implementation partners, the AO Alliance now has a solid foundation to amplify awareness of the burden of injury, to build an ambassador network, and to expand the donor and partnership community.



Participants at the Faculty Education Program,
Lomé, Togo, March 2019
Copyright: AO Alliance

CHAPTER VI

Partnerships

Rolf M Jeker and Claude Martin Jr

“*If you want to go fast,
go alone; if you want to go far,
go together.*”

– African proverb –

CHAPTER VI

PARTNERSHIPS

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THE MANDATE: 'NOMEN EST OMEN'

The choice of the name 'AO Alliance' defines the mandate: To create and be part of alliances and partnerships—locally, regionally and globally—that promote care of the injured in LMICs.

On the one hand, it is linked to awareness building, and on the other hand to implementation of 'Care' activities locally.

PARTNERSHIPS BUILDING AWARENESS

In its attempt to promote awareness for the burden of injury and associated disability in LMICs, the AO Alliance has succeeded in developing core partnerships with strategically important global and local organizations.

The World Health Organization (WHO) and the Global Alliance for Care of the Injured (GACI) _____

The WHO is the most important global body promoting attention to a specific health issue. Unless the topic is high on the WHO's political agenda, there is little chance of a breakthrough of attention by political decision-makers in a country, or by funding organizations, particularly those that are government-based.

The WHO's role is to bring much needed awareness into the political arena, as well as to help LMICs put proper healthcare systems in place to successfully address health problems and the burden of disease. The World Health Assembly (WHA) passed some resolutions in 2007 and 2009 with recommendations to promote improved services for care of the injured. These conditions can be referred to as framework conditions or the macro-framework.

In May 2019, the WHA took a big step in elevating emergency and trauma care to the world stage by passing an additional resolution. Among other things, this was made possible through a major joint partnership with the AO. This program,

funded with CHF 10 million over five years, allows the technical arm of the WHO to support the establishment of relevant local healthcare systems, including strategy, structure, and staffing, inter alia, to properly address care of the injured.

While the AO Alliance is not part of this joint partnership, its present and future local activities are likely to benefit from it: The AO Alliance training activities can only sustainably bear fruit if the government creates an enabling environment.

Within the WHO, the Global Alliance for Care of the Injured (GACI) was established in 2012 to promote the strengthening of trauma systems (prehospital care, hospital-based care, and rehabilitation). The AO and the AO Alliance became active members of this network, which brings governments and intergovernmental organizations together to promote care of the injured and collaborate with each other. Of particular value was the close working relationship that developed with its director, Teri Reynolds, and Etienne Krug, director of the Department for Management of NCDs, Violence and Injury Prevention at the WHO. The AO Alliance, with some of its representatives, including Claude Martin Jr, Pierre Hoffmeyer and Manjul Josphipura, played an active role in developing this working relationship. → [C]

Coalition for Dialogue on Africa (CoDA) _____

Founded in 2009, the Coalition for Dialogue on Africa (CoDA) exists as a special initiative of the three convening organizations—the African Union Commission, the Economic Commission for Africa (ECA), and the African Development Bank—to place special attention on priority policy issues in Africa. → [C]

The AO Alliance was able to make a rare breakthrough when it developed a partnership with CoDA through the intermediation of Abdoulie Janneh, prominent AO Alliance Board of Directors member and also vice president of CoDA.

As the board of CoDA consists of former presidents, prime ministers, various ministers, and other high-ranking public officials, it has a powerful link to the African Union to propose policy changes. It was a big win and step forward for the AO Alliance to be able to include its topic among the three major policy issues identified.

A one-day joint meeting in September 2018 in Addis Ababa, Ethiopia, under the chairmanship of former president Obasanjo from Nigeria, brought together AO Alliance professionals, the WHO, and a large number of health ministers and government officials.

The introductory statement by the former president of Ghana, John Dramani Mahama, was telling, reflecting on the lack of transparency on the magnitude of the injury epidemic.

“Before I came to this meeting, I asked officials for statistics on deaths and disabilities from injuries. I realized that during my presidency, and at present, deaths from injuries represent the equivalent of seven 747 planes crashes annually on my territory every year, causing thousands of people to die,” he said. “What do you think the policy reaction would have been by my government under such circumstances?”

Participants came away from the meeting with strong recommendations (as outlined in Chapter IV) and plans to be further provided through the African Union network. These recommendations find entry into numerous other initiatives, locally or regionally, and will hopefully generate more attention and funding for care of the injured. See Annex 7 for the full list of participants.

The chair of CoDA, Olusegun Obasanjo, former president of Nigeria, greatly appreciated the role of the AO Alliance.

“CoDA thanks the AO Alliance Foundation for carrying the torch on the issue of trauma and care of the injured in addition to many other development issues for a long time now. Our collaboration with the AO Alliance on this dialogue indicates the depth of our partnership and its critical timeliness, given the importance of this agenda,” he said. “It is only through partnerships like this and by extension other key stakeholders become a part of this important discussion to curb the burden of trauma in Africa, that we will begin to see positive changes on the matter.”

African colleges of surgeons _____

Institutional arrangements with local professional associations are critical to joining forces as a means to pursue the objective of addressing surgical shortages in Africa, including for T&O surgery. Through them, awareness promotion and capacity building can be conducted by supporting their programs and certifications. They become, therefore, increasingly important players for the AO Alliance as they act as impact multipliers throughout the regions. Strengthening these organizations provides a real impact to local capacity building by increasing the number of local surgeons and improving their level of training.

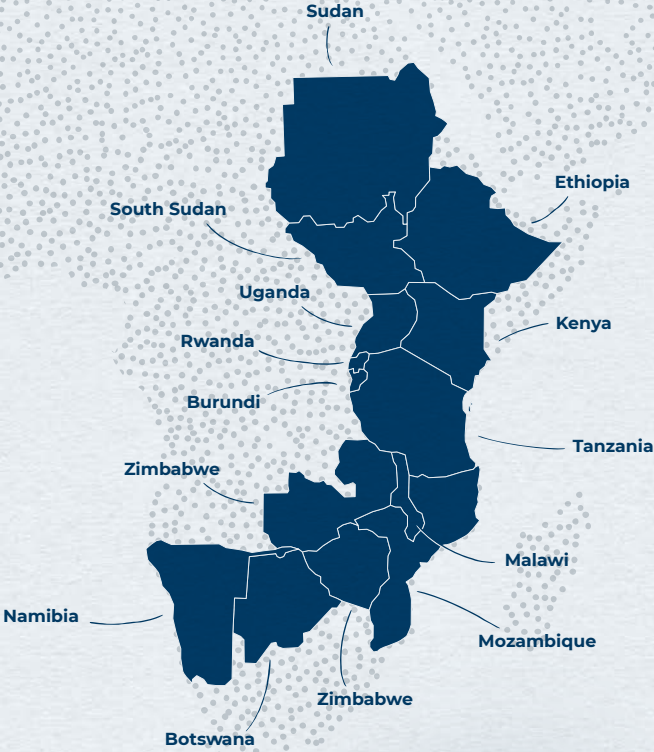


Figure 22. College of Surgeons of East, Central and Southern Africa (COSECSA) member countries. Accessed March, 2021



② Etienne Krug addressing the Assembly of AO Trustees during the AO Alliance breakout session, Basel, Switzerland, July 2018.
Copyright: AO Foundation



② Left to right: Rolf M Jeker, Thomas Kwesi Quarter (deputy chair, AUC), Olusegun Obasanjo (former president of Nigeria, chair of CoDA Board of Directors), John Mahama (former president of Ghana), Abdalla Hamdok (prime minister of Sudan, deputy executive secretary, ECA), at the meeting of the Coalition for Dialogue on Africa, Addis Ababa, Ethiopia, September 2018.
Copyright: AO Alliance

The College of Surgeons of East, Central and Southern Africa

The College of Surgeons of East, Central and Southern Africa (COSECSA) was founded in 1999. COSECSA is a not-for-profit organization that operates in 14 countries in sub-Saharan Africa and is an independent body that fosters postgraduate education in surgery and provides surgical training throughout sub-Saharan Africa. COSECSA's primary objectives are to advance education, training, standards, research, and practice in surgical care in this region. More specifically, COSECSA shapes and leads the training of surgeons in East, Central, and Southern (ECSA) Africa. The College offers a surgical training program with a standardized examination that is internationally recognized.

The COSECSA region is facing one of the greatest surgical workforce shortage crises in the world. It is of paramount importance that the organization's partnerships focus on workforce development. Support and collaborative partnership with surgical organizations from high-income countries and nongovernmental organizations dedicated to improving care of the surgical patient will help achieve the goal of graduating 500 surgeons by 2020.



“The AO Alliance has worked synergistically with other surgical capacity building initiatives in supporting COSECSA to facilitate access to its certification and fellowship programs for surgeons of the region. Nurses and other operating room personnel have also benefitted from regional fellowships. It has greatly benefitted the entire regional trauma and orthopedics ecosystem at all levels”

Nyengo C Mkwandawire, T&O surgeon, dean of the College of Medicine, University of Malawi. →

The AO Alliance has supported many young graduating trainees from Ethiopia and Malawi, during the period 2015–2019, who have satisfactorily completed their higher surgical training and have passed the prescribed examinations in T&O surgery and related specialties of COSECSA to become Fellows. The AO Alliance is working with COSECSA to improve the quality of trainees, as well as scaling up the overall number of trainees. →

Ghana College of Physicians and Surgeons (GCPS)

The GCPS is a national postgraduate medical college established by an act of parliament in 2003 to train specialist doctors in medicine, surgery, and other related disciplines. The AO Alliance had identified, as part of the needs assessment performed for the Ghana country initiative (see Chapter IV) that T&O residency training capacity needed to be increased. As well, many projects related to the country initiative required close oversight by the regulatory body, such as the creation of a new plaster technician school and curriculum, the establishment of trauma registries, and the social science program aimed at changing health care-seeking behaviors for immediate responsible family members when injuries occur in children.

The late Jacob Plange-Rhule had been the head of nephrology services at Komfo Anokye Teaching Hospital (KATH) in Kumasi prior to taking up the position of rector at the College. He has helped train and educate Ghanaian doctors for more than two decades. The AO Alliance realized that the GCPS, being well entrenched in the healthcare systems in Ghana and recognized as a world-class medical regulatory body, was the perfect oversight partner it needed for Ghana.

The college not only provided leadership and influence to advance the Ghana country initiative, it also assisted in advocating for improved injury prevention measures to the Ghanaian ministry of health. It continues to support the AO Alliance in its quest to involve traditional healers in caring for musculoskeletal injuries in Ghana.

G4 Alliance

The Global Alliance for Surgical, Obstetric, Trauma and Anaesthesia Care (G4 Alliance) was established in 2015 in response to the publication of *The Lancet* Commission on Global Surgery 2030 by Meara and Greenberg (2015).

The G4 Alliance has strived to get the WHO's attention for safe surgery and emergency care in LMICs. The AO Alliance is one of the original member organizations of the G4 Alliance, as trauma is one of the four pillars identified for surgery. The G4 Alliance mission statement says, "The G4 Alliance is committed to advocating for the neglected surgical patient and is driven by a mission of providing a collective voice for increasing access to safe, essential and timely surgical, obstetric, trauma and anaesthesia care..." The AO Alliance sees this organization as a significant partner to advance its competencies in awareness and policy advisory services.

The AO Alliance, through its managing director, actively participates in its activities and recently delegated one of its board members, Manjul Joshipura, as a member



© Nyengo C Mkandawire, Global Spine Congress, Dubai, UAE, April 2016. Copyright: AO Foundation



© Left to right: Mahder Eshete (Ethiopia), Deepa Bose (United Kingdom), Nardos Worku (Ethiopia), and Samson Tule (Ethiopia) at the COSECSA graduation, Maputo, Mozambique, December 2017. Copyright: AO Alliance

© Jean Todt's video address at the AO Alliance breakout session at the Assembly of AO Trustees, Basel, Switzerland, July 2018.
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1. Scale of the issue

WORLD HEALTH ORGANIZATION CALL TO ACTION

INJURIES



4.6m deaths globally from injuries
4.1m 90% in LMICs
1.6m 40% are in the young (18-25)

Death rates are 3x higher in LMICs



1.2m 25% deaths from road traffic crashes (RTCs)

For every death from injuries



10 survive with a disability
41m disabled in LMICs
34m 75% with MSK disabilities

WORLD HEALTH ASSEMBLY MAY 2019



World Health Organization

"United Nations and WHO call for urgent action to strengthen emergency and trauma care systems to help advance many SDGs"



Dr. Tedros Adhanom Ghebreyesus
WHO Director-General, Ethiopia

Annual deaths from the WHO Global Health Observatory 2018
*2018 United Nations Sustainable Development Goals



© Jim Harrison delivers a presentation during the panel session on surgery and trauma care in LMICs during the virtual World Health Summit, 2020. Top to bottom: Ifereimi Wagainabete (Fiji), John Meara (Harvard Medical School), Teri Reynolds (WHO), Jim Harrison, Lubna Samad (Pakistan).
Copyright: AO Alliance

of the G4 board of directors, amplifying AO Alliance efforts to advance awareness and policy advisory activities.

Fédération International de l'Automobile (FIA) _____

The FIA's initial aim was to bring coherent governance and safety to motor sport. Through the expertise gained in that arena, the FIA has since grown into a global organization that not only promotes motor sport, but also safe, sustainable and accessible mobility for all road users across the world. The promotion of safe and sustainable forms of mobility has in turn led the FIA to commit to global sustainability initiatives and to fund its own major response to road safety concerns, FIA Action for Road Safety. This worldwide campaign, in support of the UN's Decade of Action for Road Safety, aims to reduce fatalities on the roads by five million before 2020.

Through the FIA Foundation, the FIA supports an international program of activities promoting road safety, the environment and sustainable mobility. The Foundation has consultative status with the Economic & Social Council of the United Nations, participates in various UN road safety and environment related working parties and is a member of the UN Global Road Safety Collaboration.

The FIA also provides the secretariat for the Make Roads Safe campaign and the independent Commission for Global Road Safety. To support the implementation of the United Nations Decade of Action for Road Safety, the FIA Foundation manages the Road Safety Fund with the WHO.

An initial contact was made in December 2017 with Niall Carty (head of Road Safety Advocacy at the FIA), through the introduction of the World Economic Forum (WEF). The FIA at the time was in the process of considering hosting an event on road safety on the sidelines of the main WEF Davos event in 2017, together with a company called Emotiv which has developed technology to monitor brain activity while driving, providing interesting insights on issues such as driver distractions. This introduction eventually led to a meeting with Jean Todt, president of the FIA, at FIA headquarters in Paris, France, in March 2018. Rolf M Jeker and Claude Martin Jr made the trip to discuss with Todt possible avenues of collaboration. Todt felt compelled to address the post-crash issue as FIA had put prime emphasis on prevention measures. He recommended attracting direct support through national automobile associations, where, according to him, the funding would have to be obtained.

He was scheduled to attend the Annual Assembly of AO Trustees in July 2018 in Basel, Switzerland. This coincided with the AO Alliance plenary and small-group consultation conducted at the meeting. Due to last-minute changes of plans, he

could not attend. But he delivered, via a video, a powerful message asking the AO Alliance and the AO to engage in achieving the United Nations (UN) Sustainable Development Goals (SDGs) related to road safety and better care of the injured. ← [©]



“Insufficient resources have been allocated to post-crash care for the injured in LMICs. ...By all working together, we can make a difference.”

Jean Todt

The AO Alliance continues to dialogue with the FIA on improving care of the injured in road traffic crashes through awareness building, emphasizing the importance of prevention, as well as post-crash treatment.

World Health Summit (WHS) and Harvard School of Medicine

The WHS was founded in 2009 by Charité – Universitätsmedizin Berlin, in Berlin, Germany. Its goals are to improve health worldwide by finding solutions to major health challenges and to set health agendas internationally. Participants consist of national health authorities (ie, ministries of health), international organizations (WHO), and industry, science, and civil society actors.

The WHS takes place every year in October in Berlin, with some regionally centered events (eg, Uganda 2021) taking place during the year.

The AO Alliance, represented by the chair of the AO Alliance Board of Directors, participated for the first time in 2019, thanks to Norbert Haas, past president of the AO, founding member of the AO Alliance, and former director for musculoskeletal surgery at Charité. The entry was facilitated by Haas’s personal introduction of the AO Alliance to the president and managing director, both colleagues of his from Charité.



“The WHS is a perfect platform where the AO Alliance’s participation can make a significant impact in further supporting care of the injured.”

Norbert Haas

The main theme of the event was health and climate change, as well as noncommunicable diseases (NCDs). The latter topic was of particular interest and relevance to the AO Alliance, as injuries fall into that category.

It turned out, however, that trauma and injury were only marginally referred to; maternal, newborn and child health (MNCH) and diabetes, both sponsored through industry-supported workshops, were the dominant issues. It was up to the AO Alliance representative, over the course of two to three workshops, to raise the importance of injuries by confronting the panel with poignant questions.

The ministers of health of Uganda and Myanmar did not refer to the burden of injury as an important element of NCDs in their opening statements. When directly questioned about the issue in the plenary session, they made a strong case for supporting efforts to improve trauma care, recognizing it as one of the major issues in their countries.

The WHO and the United Nations Institute for Training and Research (UNITAR) representatives similarly needed to be specifically challenged to bring the burden of injury to the forefront of the NCD agenda.

The AO Alliance's interventions were supported by the Harvard Medical School Program in Global Surgery and Social Change representative, who insistently also brought up the topic of essential surgery and equally questioned why this issue—overlapping with injury—was neglected.

The positive outcome was the promise by the WHS to feature the issue of injuries in a prominent fashion at future summits. The Harvard program and the AO Alliance took the initiative to propose an agenda and a panel of speakers for the following summit in October 2020 in Berlin, with a proposed side event on trauma and essential surgery in Uganda in the spring of 2020. Unfortunately, the COVID-19 pandemic made it necessary to postpone the event in Uganda until 2021.

The 2020 WHS was conducted as an online conference where the issues of injuries and essential surgery were prominently featured. The Essential Surgical and Trauma Care session was facilitated by the AO Alliance, the Harvard Medical School Program in Global Surgery and Social Change, the Global Surgery Foundation and UNITAR. The AO Alliance was represented by Jim Harrison. ← [O]

The collaboration between the WHS, the Harvard program, and the AO Alliance is a promising platform for further awareness building.

Société Internationale de Chirurgie Orthopédique et de Traumatologie

The Société Internationale de Chirurgie Orthopédique et de Traumatologie (SICOT) is an international nonprofit association. Its mission is to promote the advancement of the science and art of orthopedics and traumatology at an international level, in particular for the improvement of patient care, and to foster and develop teaching, research and education. It maintains the philosophy that orthopedic education should be available, accessible and appropriate for surgeons no matter their background, culture or resources.

Through the work of Jim Harrison and Simon Matthew Graham, both consultants to the AO Alliance, links were developed starting in 2015 with SICOT. Harrison and Graham published an article in SICOT J, the open access online journal of SICOT titled: “Global trauma: The great divide” (Paniker et al, 2015). The article aimed to create awareness of the scale of the problem of road trauma and the inequality in the resources available to address this problem. It also describes the responses from the international organizations and the orthopedic community in dealing with this issue. The international orthopedic community had a unique opportunity and moral obligation to play a part in changing this trend of global trauma.

This set the stage for AO Alliance to have a regular presence at the SICOT Annual Orthopaedic World Congress. In 2017, during the meeting in Cape Town, South Africa, Doron Frantzen, then member of the AO Alliance English-speaking Africa steering committee chaired a symposium on trauma and orthopedics in low-income countries. Topics ranging from economic loss due to musculoskeletal injuries to capacity building through fellowships in sub-Saharan Africa were presented. The AO Alliance would then become involved with World Orthopaedic Concern International (WOC (Int)) within SICOT. A project called ‘Bridging the Gap’ called for capacity building in Sierra Leone and Laos. The AO Alliance was involved in both needs assessments performed.

The AO Alliance managing director, Claude Martin Jr., was selected to receive the 2019 TKS Gold Medal for his significant contribution to LMICs with limited healthcare resources. WOC (Int) awards every year the TKS Gold medal to one person who has made significant contributions in advancing orthopedics in LMICs.

PARTNERSHIPS FOR IMPLEMENTATION

Important partnerships were also forged to jointly implement 'Care' activities in the field.

Haukeland University Hospital (HUH)

Helse Bergen HUH is in Bergen, Norway, and has been active in Malawi since 2007, supporting the Kamuzu Central Hospital (KCH) in the fields of general and orthopedic surgery, and maternal health, in collaboration with Oslo University Hospital and the University Hospital of Northern Norway. The projects were financed by the Norwegian Embassy in Lilongwe and by Fredskorpset (FK Norway) and private donors, especially the Mohn family.

While HUH, backed by the Mohn family, invested up to USD 10 million for various hospital components and equipment, HUH became a major implementation partner of the AO Alliance. In 2018, the AO Alliance and HUH decided to support the construction of a new trauma center in Lilongwe, the Lilongwe Institute of Orthopedics and Neurosurgery (LION) Hospital, which fits into the broader Malawi country initiative that began in 2016. The AO Alliance is contributing USD 2 million toward the establishment of four state-of-the-art operating theatres to be dedicated to T&O surgery, including a significant contribution from Medicor Foundation and a legacy donation from Ulrike Berger. → [\[O\]](#) [\[O\]](#) [\[O\]](#)


Australian Doctors for Africa

In November 2014, when Claude Martin Jr was still the AO Trauma executive director, he travelled to Melbourne, Australia, to attend the Australia Orthopaedic Association (AOA) Annual Meeting. He was hosting a meeting to look at improving fracture care in some of the Pacific Islands and had contacted AOA Orthopaedic Outreach. At that meeting, he met an Australian surgeon, Michael Wren, from Melbourne. Wren discussed with Martin the work he was doing with an NGO called Australian Doctors for Africa (ADFA).

Established in 2005, ADFA is a not-for-profit community-based organization with its headquarters located in Perth, Western Australia. ADFA plays a critical role in providing medical assistance and training in Madagascar, Ethiopia, Somaliland

and Comoros through its humanitarian and volunteer medical operations. Graham Forward has been the driving force behind Australian Doctors for Africa since the first official medical team arrived in Somalia in February 2005.

Wren convinced Martin to attend the Cambodia Society of Surgery's annual meeting in Phnom Penh in November 2014. Wren was presenting at the meeting. This provided an opportunity to better understand the breadth of involvement of ADFA and possible avenues of future collaborations.

Since 2006, the ADFA has been supporting the Black Lion Hospital in Addis Ababa, Ethiopia, where the AO SEC, and later the AO Alliance, also engaged in training T&O residents. One of their teaching programs involved basic operative fracture care education for all first-year T&O residents. In March 2015, Martin attended in Addis Ababa as an observer. The following year, he was invited as faculty. After this event, ADFA and AO Alliance set out to create a new course curriculum aimed at first- and second-year T&O residents to equip them with the basic knowledge needed to efficiently function in their new environment. The Pre-Basic Course was implemented in March 2016. AO Alliance faculty and ADFA team members conduct an annual three-day course for first year residents in Addis Ababa. The course involves perioperative medical lectures and participation in the delivery of the practical applications of T&O surgical procedures. The course is now attended annually by about 40 first-year residents of the teaching programs in Ethiopia: Black Lion Hospital (Addis Ababa University), St. Paul's Millennium College, Mekelle University, and Bahir Dar University. → 

The ADFA was a very active and contributing entity at the AO Alliance's Ethiopia needs assessment meeting in September 2016 in Hawassa, Ethiopia. At this meeting, the concept of regional referral centers (RRC) was developed, as well as a capacity-building strategic plan to advance care of the injured in Ethiopia.

Providing intensive training courses to T&O surgeons, residents, and ORPs is a sustainable way to advance skills and improve services to patients on an ongoing basis.

The ADFA has equipped orthopedic theatres at the Black Lion Hospital in Addis Ababa, the Felege Hiwot Referral Hospital in Bahir Dar, and the Hawassa University Comprehensive Specialized Hospital in Hawassa. The ADFA is an ideal partner as its infrastructure development capabilities complement the educational capabilities of the AO Alliance.



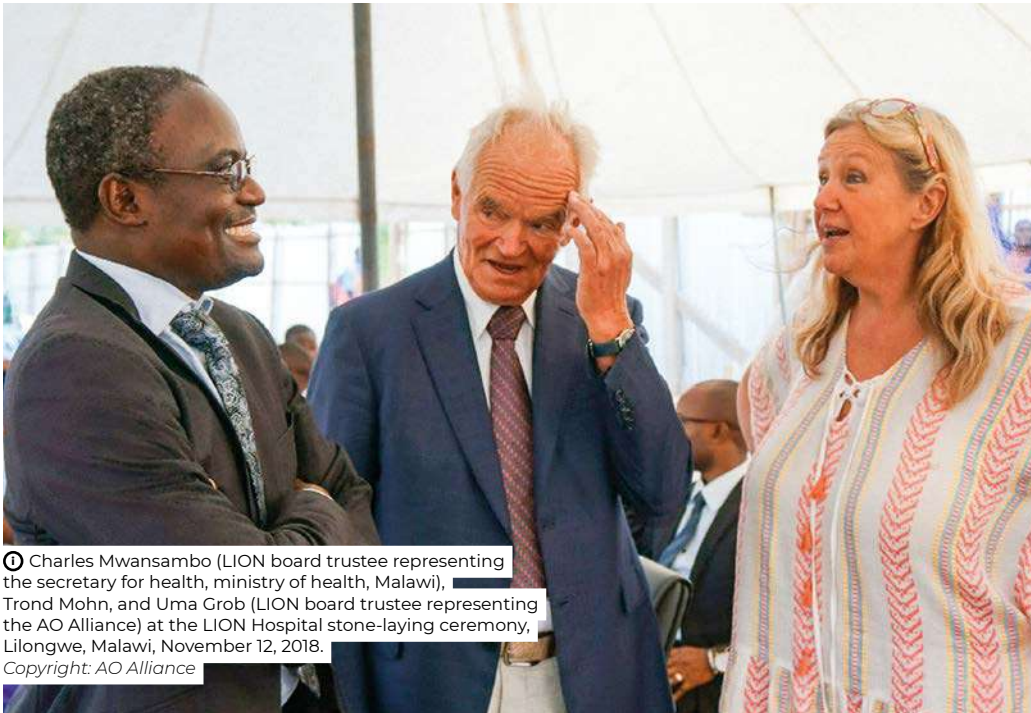
⑨ LION Hospital stone-laying ceremony: commemorative plaque for the hospital, Lilongwe, Malawi, November 12, 2018.
Copyright: AO Alliance





© Trond Mohn and Atupele Muluzi, minister of health of Malawi, at the foundation stone-laying ceremony, officially launching construction for the LION Hospital, Lilongwe, Malawi, November 12, 2018.
Copyright: AO Alliance





① Charles Mwansambo (LION board trustee representing the secretary for health, ministry of health, Malawi), Trond Mohn, and Uma Grob (LION board trustee representing the AO Alliance) at the LION Hospital stone-laying ceremony, Lilongwe, Malawi, November 12, 2018.

Copyright: AO Alliance



① Graham Forward (founder and CEO, Australian Doctors for Africa), Ephrem Gebrehana, Jim Harrison, and Gelataw Tessema at a course planning exercise, Addis Ababa, Ethiopia, March 2019.

Copyright: AO Alliance





① Lewis Zirkle (founder and president, SIGN Fracture Care International) giving an impromptu consultation on a hospital veranda. Phnom Penh, Cambodia, August 2015. Copyright: AO Alliance



① Lewis Zirkle performing a SIGN nail insertion with a local Cambodian surgeon, Phnom Penh, Cambodia, August 2015. Copyright: AO Alliance

SIGN Fracture Care International

SIGN is a humanitarian organization that enables the injured poor in developing countries to receive orthopedic surgical care. They design, manufacture, and donate orthopedic surgical implants and instruments and provide education at minimal or no cost to surgeons in emerging countries, so that they can treat their patients swiftly and effectively to prevent orthopedic disabilities.

The advantage in austere environments is that the SIGN intramedullary nails can be used without imaging or electricity. ←  

According to Zirkle (2014): “The system is currently used in 273 hospitals in 53 of the poorest countries in the world. Surgeons committed to the SIGN technique are supplied with implants at little or no cost for use in treating the poor. The SIGN technique has expanded to include the development of implants to treat hip fractures and children’s femur fractures. Five thousand doctors have been trained in the SIGN surgical technique. They report patient outcomes, including X-rays, to the SIGN surgical database, the largest database of fracture treatment in the world. About 112,000 patients have received the SIGN IM nail with results equivalent to surgery done anywhere in the world.”

The AO Alliance reached out early on to SIGN founder and CEO Zirkle.

The AO Alliance has integrated a module that teaches the SIGN intramedullary nail techniques in its Basic Principles of Operative Fracture Management course. The AO Alliance also sponsors an AO Alliance/SIGN visiting scholarship in Richland, Washington, United States. Every year, the AO Alliance sponsors surgeons to attend the SIGN Conference to exchange knowledge and skills in dealing with fractures under diverse circumstances in developing countries where resources are often scarce and access to specialists is often limited.

Closer collaboration is welcome as there is an alignment of objectives, and one of the AO Alliance’s main donors, the Hansjörg Wyss Medical Foundation, also supports SIGN.

Institute for Global Orthopaedics and Traumatology

The Institute for Global Orthopaedics and Traumatology (IGOT) was founded in 2006 by the faculty and residents of the University of California, San Francisco (UCSF) Department of Orthopaedic Surgery.

IGOT has embarked on an innovative and comprehensive academic approach to addressing global orthopedic needs. The focus of the organization's efforts is targeted on the development of a sustainable model to improve musculoskeletal care in the developing world. Academic partnerships are actively being developed to act as the means to build infrastructure, allowing each country to build its own capacity, to address its own problems, and to answer its own clinical and policy questions. To date, partnerships have been established in Nicaragua, Uganda, and South Africa, working toward mutual beneficial goals. Along the way, efforts are being made to monitor the efficacy of each initiative in order to ascertain whether such efforts truly result in sustainable changes in orthopedic care (Phillips et al, 2009).

IGOT's Surgical Education pillar strives to provide orthopedic surgeons from low-to-middle income countries (LMICs) with the training and educational resources needed to save limbs and lives. To prevent amputations in LMICs, IGOT has created the Surgical Management and Reconstructive Training (SMART) Course, which is hosted locally in San Francisco, and internationally, in Tanzania, Nepal, and Guadalajara annually.

The AO Alliance has contributed to educating IGOT faculty in Tanzania with its Faculty Education Program (FEP) to support the objective of preventing amputations.

Orthopedic Research Collaborative in Africa _____

The AO Alliance has also created the Orthopedic Research Collaborative in Africa (ORCA), of which IGOT is an important contributor (see Chapter IV).

The goal of ORCA is to enable orthopedic surgeons from LMICs to conduct high-quality clinical research studies on how to reduce the burden of musculoskeletal disease in resource-poor environments.

This clinical research initiative targeting clinicians in LMICs is spearheaded by Simon Matthew Graham (consultant orthopedic trauma surgeon and Wellcome Trust research fellow) under the wise leadership of Jim Harrison.

CONCLUDING REMARKS

Partnering in awareness building and implementation is an essential focus of AO Alliance work to achieve impact. True to the African proverb, "If you want to go fast, go alone; if you want to go far, go together."



Pediatric patient with a tibia fracture treated with an external fixator, Black Lion Hospital, Addis Ababa, Ethiopia, March 2015.
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CHAPTER VII

Looking ahead

Rolf M Jeker

“*The future belongs
to those who believe in the beauty
of their dreams.*”

– Eleanor Roosevelt –

CHAPTER VII

LOOKING AHEAD

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DEATH AND DISABILITY FROM INJURY AS A GLOBAL PUBLIC HEALTH ISSUE

As the numbers of deaths from injury continue to grow, the sheer impact of the statistics will also draw increasing attention to the problem. Projections show that deaths from injury, especially those related to road traffic accidents, are predicted to become the seventh leading cause by 2030 (WHO, 2013). The shortcomings addressed and solutions proposed in Chapter II remain the same for the foreseeable future and serve as guidance for the AO Alliance in its policy-making and operational activities.

Yet, one should be encouraged by the fact that today's high-income countries (HICs) with similar trauma situations have been successful in controlling the injury epidemic. Solutions are available. Their success was based on using several interventions through a system's approach—on prevention and road safety, law enforcement, improving prehospital care, education and training of healthcare workers and creating trauma centers, inter alia, and developing rehabilitation services. The solutions are known, and guidance is available from the WHO and other knowledgeable organizations for low- and middle-income countries (LMICs) to customize these interventions to local needs. The challenge is prioritizing care of the injured in LMICs relative to other health priorities in the burden of disease, and including it explicitly in national healthcare plans, to be accepted by the competent authorities, such as ministries of health, planning, justice, and finance.

The global COVID-19 pandemic, however, brings the problematic again to everyone's attention: it is the communicable diseases that create attention—even panic. They attract financial support which is needed for successful interventions.

In terms of deaths, the global impact of communicable diseases might be relatively modest in comparison to deaths from injury. This also seems to apply to the COVID-19 situation. China's coronavirus lockdown likely saved tens of thousands of lives by reducing air pollution from factories and vehicles. Two months of pollution reduction has saved the lives of 4,000 children under 5 and 73,000 adults over 70 in China. Over the course of this pandemic, deaths from injuries will decline substantially due to the lockdowns. Coupled with a ban on alcohol sales, the number of trauma-related deaths avoided in South Africa was greater than the

increase in deaths caused by COVID-19 (Morris et al, 2020). That is not to say that the pandemic is a blessing in disguise, with all the suffering it has imposed on people. At the most, it shows it is easy to overlook chronic, long-term health threats such as air pollution, and thus, it is harder to muster an adequate response. It also illustrates that certain diseases are hidden in the shadows of others—and despite the ever-growing burden of injury, it remains neglected¹.

Death and disability from injury is geographically isolated with significant economic impact. The lesson should be clear to individual countries: They are locally affected and, therefore, measures have to be local, with limited incentives for large-scale support from the global donor community.

Nevertheless, it must remain the objective of the WHO to create awareness and provide policy support, while organizations such as the AO Alliance and its partners support those efforts but continue to primarily strengthen local education and training initiatives tailored to local and regional needs.

It cannot be sufficiently emphasized how important, in fact decisive, it is to put trauma systems into practice. The same way an economy and its enterprises cannot succeed without a sound macroeconomic framework in place, care of the injured cannot succeed without an appropriate trauma system in place, as part of a broader healthcare system and a sound national surgical, obstetric, and anesthesia plan (NSOAP). Only where there are policies, structures, organizations, and people in place can care activities, like the ones of the AO Alliance, produce optimal results. The support given by the AO at its 60th anniversary in a joint AO/WHO initiative was destined to do just that: Provide the basis for successful training and treatment of patients, including the beneficial use of implants and instruments.

Local governments have an increasing role to play in prevention as well. This is still a lot of low-hanging fruits. In contrast to treatment efforts, more organizations support prevention programs. While supportive of these programs and acting in coordination when possible, the AO Alliance will continue to support and collaborate in awareness building and injury prevention efforts.

1 At the time of writing, an estimated 1.7 million deaths from COVID-19 were reported for 2020.

FILLING A GAP: THE ROLE OF THE AO ALLIANCE

Continuous improvement

Lessons learned over the first five years by the AO Alliance have to be constantly reviewed and revalidated to see whether improvements can be made.

Creating awareness and providing policy advice

The AO Alliance will need to consider further efforts to help raise awareness of the global injury issue, alongside its partners. Interaction with advocacy groups pursuing similar objectives, such as noncommunicable diseases (NCDs) including trauma and essential surgery, the United Nations (UN) Sustainable Development Goals (SDGs) can be further strengthened (see Chapter III).

Although policy advisory services mainly belong to the realm of larger international organizations, the AO Alliance might offer further policy advisory services specifically for trauma plans. Governments in LMICs often lack enough capacity to develop trauma systems planning. The AO Alliance facilitated such planning with multiple stakeholders in Myanmar. Similarly, adapted clinical guidelines for open fracture management and fracture care registries were implemented in Malawi. The AO Alliance can scale this experience to establish similar planning in other LMICs expressing interest and a will to implement systems change.

Education

The experience from the first five years has not only confirmed the need for the AO Alliance's support, but also the need to focus on training and education embedded in a comprehensive approach to ensure healthcare workers can indeed apply what they have learned. This implies add-ons for infrastructure support (upgraded operating theatres, smaller equipment, inter alia) and clinical research to validate progress and define resources needed.

Education delivery channels need constant review to generate the highest impact at the lowest cost. Should more training be done in selected hospitals? Could establishing specific trauma centers help to instill best practice and spread throughout the regions and countries? Such trauma centers could become focal points for all

actors providing support, including in implant and surgical instrument provision, as well as training and conducting research. The Lilongwe Institute for Orthopaedics and Neurosurgery (LION) Hospital (Malawi), once operational, could give some answers to these questions.

The debate is ongoing about establishing a ‘Davos in Africa’ concept along the lines of the annual AO Davos Courses. The aim would be to create a sub-Saharan Africa focal point for education, clinical research, development, and innovation. If linked to a conference center and/or tourism hub, it could become self-sustaining.

These centers could also become points to attract reverse fellowship arrangements or even partnerships with other hospitals and universities, globally and/or regionally, as was practiced in Ethiopia with a multiplier effect throughout the country. The potential extension of scope should not be ruled out if the need exists and the environment lends itself to such an extension. The Primary Trauma Care Foundation endeavor was such an opportunity that could have provided an effective, low-cost and complementary impact.

Given the overriding importance of functioning trauma systems, the AO Alliance should revisit the idea of offering trauma system planning courses to senior policy makers (government officials, hospital heads, inter alia) across competent ministries—health, planning, and finance—who generally do not get formally exposed to the importance of trauma as a public health issue. Yet, they are critical to any solutions in strengthening care of the injured across Africa and LMICs (see Annex 8).

Traditional healers play a pivotal role within the healthcare system, particularly in sub-Saharan Africa with traditional bonesetters active in the domain of fracture care. Often, however, they do more harm than good and violate the most basic rule in medicine: First do no harm. Yet, communities often have great confidence in the bonesetters, a trend that will continue if the existing formal medical structure in a country cannot serve underprivileged sections of the population. Indeed, bonesetters fill the gap in timely and affordable care, but not always appropriate care.

Would it, therefore, be worth a test to provide some additional basic nonoperative treatment knowledge to the willing in the community of bonesetters? Previous programs involving traditional birth attendants have been largely successful. Success could already be measured if the objective to avoid harm were to be achieved. The problem will not disappear—and sufficient access to hospitals as an alternative is a long-term rather than short-term possibility. Hopefully, the AO Alliance can play a role in this field. If the two pilot programs attempted in Ghana and Ethiopia are successful, even by modest standards, the effects for patients across sub-Saharan

Africa would be considerable. It would, in particular, reduce a large number of amputations and other disabilities suffered mainly by children.

Partnerships

The intent should continue to be to identify awareness building and implementation partners that share the goals of the AO Alliance, but focus on a complementary theme, for example, infrastructure, implants, and equipment. A successful example is the AO Alliance partnership with Australian Doctors for Africa (ADFA), or the AO Alliance's cooperation with the Haukeland University Hospital (HUH) and its donors. Expanding the partnerships network will remain a priority.

Infrastructure and clinical support measures

Investments of the magnitude provided to construct the LION Hospital in Malawi should remain the exception for the AO Alliance, as investing in brick-and-mortar projects is neither a prime objective of the organization, nor within its core competencies. With its significant involvement, however, the LION project (under the AO Alliance Malawi country initiative) reached the critical mass required to get started. The AO Alliance knows this will be a game changer for the treatment of the injured in Malawi. This was made possible by an arrangement with the AO Alliance's Norwegian funding partners leveraging the AO Alliance contribution by a 5:1 ratio.

Availability of orthopedic instruments and implants is a great obstacle that needs to be overcome to improve patient care where fractures that require surgical intervention are concerned. Despite the relatively low cost of certified implants from China and India (often copies of reputed brands like DePuy Synthes), they tend to be unavailable as government budgetary allocations go to privileged community-based health policies. Yet, surgical treatment is cost-effective, and implants represent less than 10 percent of the direct and indirect cost of surgical intervention. While the AO Alliance itself cannot become a supplier as part of its activities, it uses its reach to improve the situation by attracting donations and helping to forge long-term solutions with other partners, industry, and governments. Indeed, education becomes futile if support structures to provide clinical care are deficient.

Clinical research

During its first five years, the AO Alliance has supported various clinical research initiatives that can be upgraded and expanded.

Clinical research aligns with two AO Alliance objectives:

- Establish and assess evidence that help to create awareness and improve effectiveness; and
- Create local clinical research capacity to encourage African and Asian surgeons to conduct research and publish, and to foster a healthy culture of clinical governance and accountability.

Being part of research networks such as Orthopaedic Research Collaboration in Africa (ORCA) is relevant regionally, and cooperating with organizations like the Program in Global Surgery and Social Change at Harvard University and the Institute for Global Orthopaedics and Traumatology (IGOT) is of the utmost importance globally.

Taking a lead in promoting clinical research in trauma, supported by the creation of an online African journal of trauma and orthopedics, might sound ambitious but it might also open the door to clinical research funding opportunities.

Most importantly, the AO Alliance needs to further work on monitoring and evaluation tools or approach to estimate and assess the health and socioeconomic impact of its activities. Guidance can be sought from *The impact of the AO Foundation on fracture care: An evaluation of 60 years AO Foundation* by Joeris et al (2019). While the measurement tool was applied retroactively, it should be adapted to serve proactively and reveal the set of data to be collected over time. Looking to the future, a further theme of interest to donors is how healthcare interventions enhance societal resilience and how this can be measured.

Funding diversification ---

The AO Alliance has been successful in attracting additional donors and partners during the first five-year period. Going forward, it is planned to increase diversification of funding sources by identifying additional Swiss-based funders, more corporate partners, as well as African and Asian foundations and philanthropists. This will ensure the sustainability of the AO Alliance and emphasize distinctive local and regional footprints.

An additional focus area going forward is to identify and recruit champions and ambassadors for the global injury problem, both philanthropic and inspirational with significant influence, as there exist for communicable diseases.

Whether, and to what extent, targeted government assistance and support from international financing organizations should be sought in future, is under review within the AO Alliance.

SECURING SUSTAINABILITY: GOVERNANCE, OPERATIONS, AND FUNDING

Relationship with the AO

The current organizational and financial arrangements reflect the needs and necessities at the time of the creation of the AO Alliance. These required complete legal independence from the AO, while ensuring close cooperation.

This contractually agreed-upon model of collaboration with the AO was planned for an initial ten-year period, ending in 2024. By 2022, continued collaboration with the AO needs to be discussed.

The AO Alliance fits perfectly with the AO mission of “promoting excellence in patient care and outcomes in trauma and musculoskeletal disorders.”

Today’s situation in LMICs largely reflects the situation in Switzerland 60 years ago, as illustrated by a passage from Martin Allgöwer in “Cinderella of Surgery-Fractures?” published by the Surgical Clinics of North America in 1978.



“Twenty years ago, at least in Switzerland, the surgical profession had no reason to be proud of its success in treatment of fractures, yet Switzerland could not be regarded as below average in surgical standards. Our national accident insurance had to pay compensations for partial disablement to approximately one third of the patients with tibial fractures, two thirds of those with femur fractures, and to practically all those with fractures of the weight bearing joints.”

Martin Allgöwer

If the AO pioneers saw today's burden of injury in LMICs, this is where they would have turned their attention in order to make a major impact. → [🌐]

Expanding the existing cooperation model _____

This model has proven its worth in providing excellent education and training activities supporting the creation of sustainable, local capacity, while:

- Fully meeting the AO's and the AO Alliance's missions to improve patient care in the musculoskeletal scope;
- Attracting additional funding in a ratio of 3:1 relative to the AO seed money (or even 5:1 including co-financing activities);
- Cooperating closely with the AO, involving its clinical divisions, institutes, and units in AO Alliance activities; and
- Having direct representation of the AO in the AO Alliance Board of Directors.

Hopefully, with a view toward the future, the funding level can be further increased and the initial task force idea to create an endowment revived. An endowment would provide the needed long-term operational stability and financial sustainability.

The AO Alliance as a social entrepreneur _____

The AO Alliance has established a name for itself in supporting development activities in LMICs. It has a track record of its actions being effective both in terms of impact and cost. A major fundraising effort to attract new funding partners, and to identify other sources of revenue, would be of the essence.

The healthcare sector—even in developed economies—lends itself only in part to commercial investment cases. In low-income settings, it will need to be subsidized or fully financed by donations or state budgets. These sources are, however, also limited. Donations might not flow forever, and state budgets are under severe pressure. Patient-pay schemes and health insurance programs might somehow alleviate the pressure, but for the foreseeable future, external support will be needed. For the AO Alliance, the question of its own financial sustainability also arises—and might require new approaches beyond the current donor contributions. Several approaches might be pursued to increasingly achieve this sustainability.



© Martin Allgöwer teaching at the AO Davos Courses, Davos, Switzerland, undated.
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Creation of a social enterprise

General considerations and examples

The idea of using the social entrepreneur model is to generate revenues from a commercial business which are then used toward financing the activities of a non-profit organization. Three examples can illustrate this approach:

- The AO itself is the striking example of a successful social entrepreneur approach. This has been the subject of *Leading a Surgical Revolution: The AO Foundation – Social Entrepreneurs in the Treatment of Bone Trauma* by Jeannet (2019). With the innovation generated by AO surgeons and the royalties from patents it owned and licensed to its industrial partners, the AO, over a period of 60 years, developed high earning power and attraction. The socioeconomic benefits generated from the innovation of new surgical techniques for surgical management of fractures is conservatively estimated at USD 800 billion. No public funds or donations were ever required (Joeris et al, 2019).
- At its June 2015 meeting in Phnom Penh, Cambodia, the AO Alliance Board of Directors had the opportunity to meet a Swiss social entrepreneur. He operated an NGO assisting women and orphans who are victims of conflict and violence. To fund the operation on a sustainable basis, he opened two Italian restaurants in the capital. They are of high quality, well frequented, profitable, and provide employment to the women supported by the NGO as well a steady source of income.
- A similar situation exists with the Kenya Red Cross Society. During the AO Alliance country needs assessment workshop in the Gambia, the local Red Cross Society representative announced the arrival of nine ambulances as a donation to the Gambian government from the Kenya Red Cross, a social enterprise that, among other things, owns several hotels.

Social enterprise opportunities

These examples make the AO Alliance reflect on social entrepreneurship opportunities to secure sustainable funding sources.

A first distinction is in the activity of the social enterprise: Would it be related to the healthcare mission of the AO Alliance? Or would it be unrelated to it and have the main purpose of securing funding?

A second distinction might be the territory in which the social enterprise operates.

Would it be strictly linked to where AO Alliance operates, thereby generating revenue to support those programs, or would it be more global and contribute to the overall AO Alliance budget?

All options deserve to be explored. Among them, however, the more open unconditional funding option, combined with the AO Alliance healthcare mission, would be the preferred solution.

Creating or investing in a social enterprise requires initial start-up funding. In recent times, impact investment funds have become popular and would be the appropriate source for such a venture. It would, of course, have to be or become profitable to fulfill the AO Alliance's intended purpose.

A local option in Malawi: complementing an existing AO Alliance program

The LION Hospital in Malawi will need continued funding to fulfill its mission. Besides benefiting from private patients' cross-subsidy funding, donor, and government contributions, income from a social enterprise would be more than welcomed. The AO Alliance entertained the idea of supporting local production of low-cost wheelchairs. The approach is valid in any country initiative. In addition to wheelchairs, technologically less sophisticated medical devices, such as personal protective equipment (PPE), skeletal traction weights, surgical trolleys, and crutches could be part of the potential product range.

Independent funding options initiated by the AO Alliance

There are two ideas that can be explored and evaluated in the future and in which the AO Alliance could take a leading role to build the necessary ecosystem:

- The OrthoAccess initiative is exploring how a social enterprise could develop/produce and/or distribute implants and instruments—there is an unsatisfied need for this. A successful social enterprise structure would greatly improve broader access at affordable prices to hospitals and patients, while securing an overall dividend to the AO Alliance funding sources. The objective is worth pursuing even if the contribution to the funding objective is small. It would require a coalition of willing partners—and would be constructed in a nondiscriminatory, open-market fashion, applying strict procurement measures.

To follow the initial road pursued by the AO and by the AO SEC, for the AO Alliance to develop new products itself and generate royalties is no longer viable.

High-quality products at affordable prices are available in today's markets. Transparency, supply chain management, and sustainable financing are the bigger issues.

- A start-up impact investment fund for low-cost high-quality medical services and equipment solutions: To stay abreast of new developments in the digital world of surgery and education in HICs, the AO Alliance, along with partners supporting sustainable finance, could establish or participate in a start-up impact investment fund for the production of low-cost, high-quality medical equipment and implants or services to meet local needs in essential trauma and orthopedic surgery. The precondition would be to find competent partners and seed funding. The returns could be substantial, as could the risks.

Cooperation with the medtech industry _____

The AO Alliance is interested in an arm's-length cooperation with the medical technology (medtech) sector. Indeed, the AO model proves how effective such a cooperation can be in the interest of patient care. By joining forces in providing financing for specific education programs, research, etc, the impact will be greatly enhanced. Preconditions are unrestricted financing and an arm's-length relationship to guarantee professional and commercial independence.

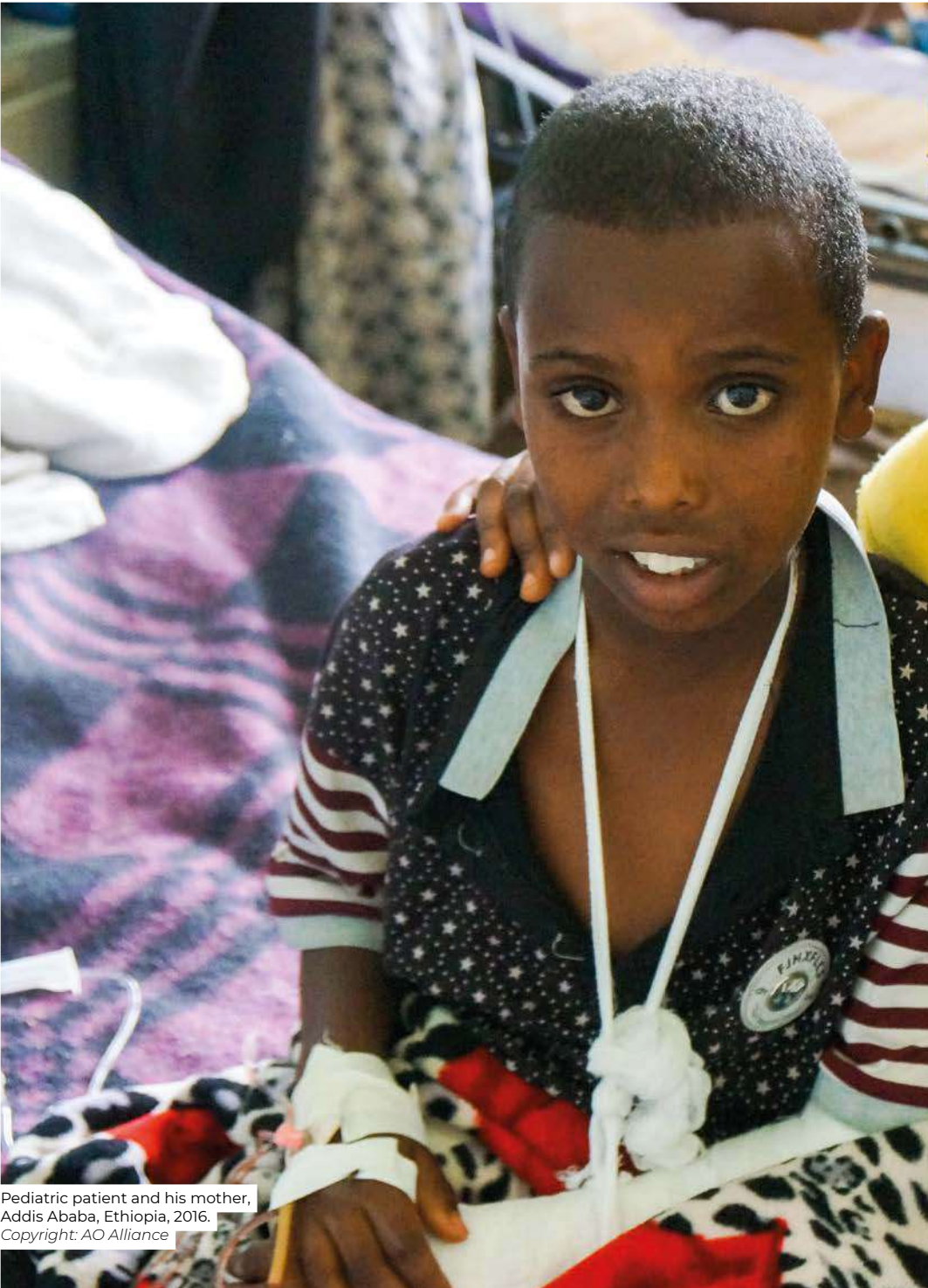
The AO Alliance pursued such relationships in the first five years on a small scale with DePuy Synthes and the Naton Medical Group. Hopefully such partnerships can be deepened and broadened.

The AO Alliance should also not, a priori, exclude entering into an exclusive partnership with an industrial partner willing to adequately serve the needs of LMICs under an arm's-length arrangement, meeting compliance and competition law requirements, with a longer-term and substantial financial arrangement as a precondition.

THE WAY FORWARD

The AO Alliance is exploring its future positioning in the global healthcare value chain, how best to build mission-aligned bridges between operational interventions and strategic initiatives, what balance to strike between local capacity building and initiating healthcare systems change, and the role technology can play in scaling its intellectual capital and the impact of its interventions.

The AO Alliance has come a long way in its first five years. The needs of the injured remain numerous and are escalating. The basic approach of the AO Alliance to build sustainable local capacity for fracture care management in LMICs proved to be the right one and needs to be pursued and further strengthened through awareness building, policy guidance, and a focus on training and education of healthcare workers involved in care of the injured. Jointly with donors and implementing partners, the AO Alliance can continue to make a valuable contribution toward ‘filling the gap.’ Many challenges remain, but the vision of “a world where access to timely and appropriate fracture care is available to everyone” is very much alive and remains achievable.



Pediatric patient and his mother, Addis Ababa, Ethiopia, 2016.
Copyright: AO Alliance

ACRONYMS



ACRONYMS

AO	Arbeitsgemeinschaft für Osteosynthesefragen
AO CID	AO Clinical Investigation and Documentation
AOFB	AO Foundation Board
AO SEC	AO Socio-Economic Committee
ASIF	Association for the Study of Internal Fixation (English translation of AO)
ADFA	Australian Doctors for Africa
AUC	African Union Commission
BLH	Black Lion Hospital
CEO	Chief Executive Officer
CHF	Swiss Franc (currency)
CMF	Craniomaxillofacial
CoDA	Coalition for Dialogue on Africa
CD	Communicable Disease
COSECSA	College of Surgeons of East, Central and Southern Africa
CTM	Clinical Teaching Module
DALY	Disability-Adjusted Life Year
ECSAOA	East, Central and Southern African Orthopaedic Association
ESOT	Ethiopian Society of Orthopaedics and Traumatology
FEP	Faculty Education Program
FIA	Fédération Internationale de l'Automobile
FMRPUSP	Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo
FSP	Fracture Solutions Program
GACI	Global Alliance for the Care of the Injured
GCP	Good Clinical Practice
GCPS	Ghana College of Physicians and Surgeons
GDP	Gross Domestic Product
GNI	Gross National Income

HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
HIC	High-Income Country
HUCSH	Hawassa University Comprehensive Specialized Hospital
HUH	Haukeland University Hospital
IGOT	Institute for Global Orthopaedics and Traumatology
KATH	Komfo AnoKye Teaching Hospital
KCH	Kamuzu Central Hospital
LDC	Least-Developed Country
LION	Lilongwe Institute of Orthopaedics and Neurosurgery
LMIC	Low- and Middle-Income Country
LIC	Low-Income Country
MNCH	Maternal, Newborn, and Child Health
MSK	Musculoskeletal
NCD	Noncommunicable Disease
NGO	Nongovernmental Organization
OCO	Orthopedic Clinical Officer
ORCA	Orthopedic Research Collaborative in Africa
ORP	Operating Room Personnel
PIOA	Pacific Islands Orthopaedic Association
POP	Plaster of Paris
PTCF	Primary Trauma Care Foundation
QECH	Queen Elizabeth Central Hospital
RRC	Regional Referral Center
SDG	Sustainable Development Goals
SICOT	Société Internationale de Chirurgie Orthopédique et de Traumatologie
TB	Tuberculosis
T&O	Trauma and Orthopedic

UHC	Universal Health Care
UNECA	United Nations Economic Commission for Africa
USD	United States Dollar (currency)
VAT	Value-Added Tax
WATEP	West Africa Trauma Education Program
WHO	World Health Organization
WHS	World Health Summit
YLD	Years Lived with Disability
YLL	Years of Life Lost
ZHAW	Zürcher Hochschule für Angewandte Wissenschaften (Zurich University of Applied Sciences)



Participants and faculty at a national course for operating room personnel, Kathmadu, Nepal, 2019. Copyright: AO Alliance

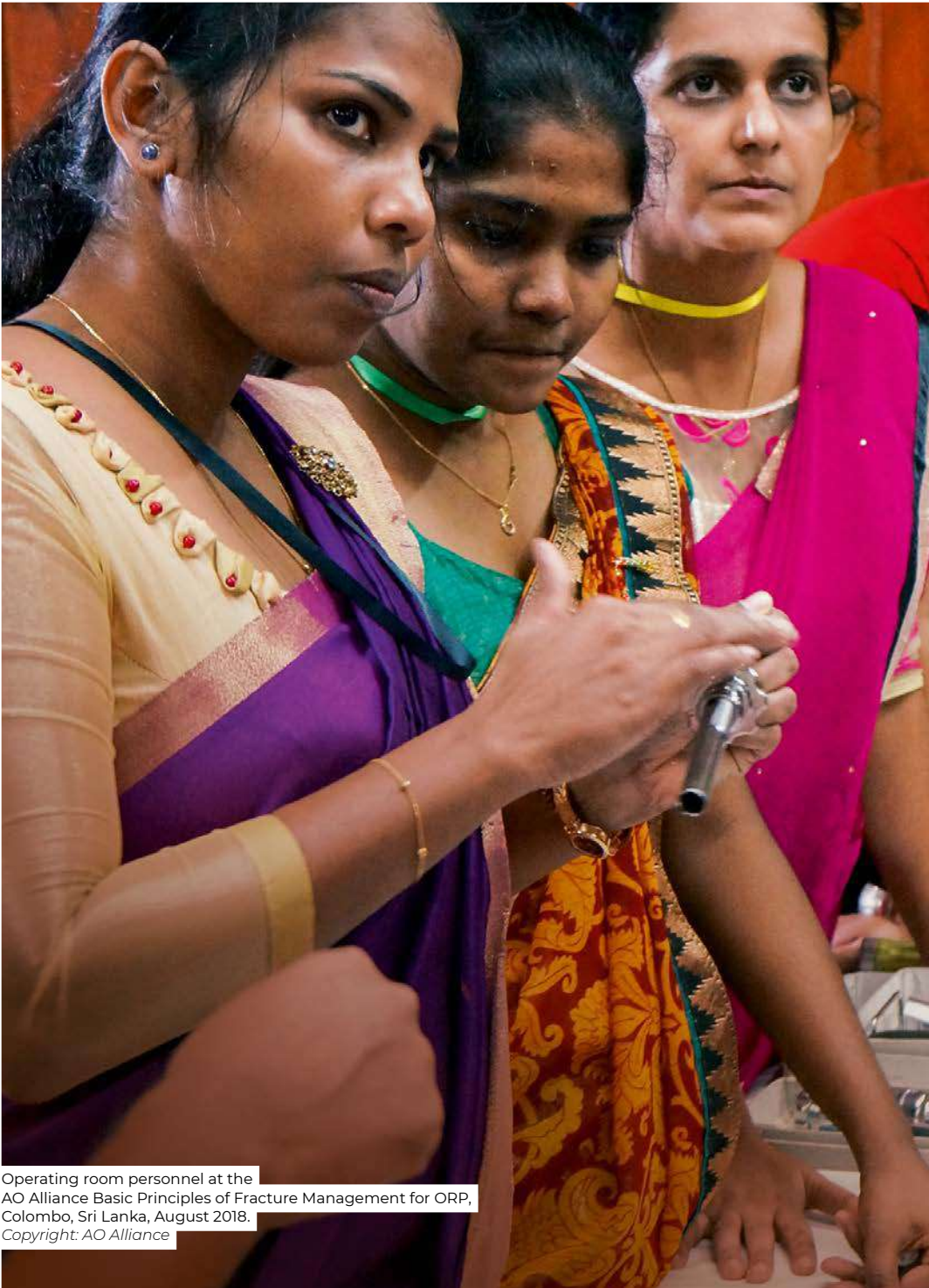
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Operating room personnel at the AO Alliance Basic Principles of Fracture Management for ORP, Colombo, Sri Lanka, August 2018. Copyright: AO Alliance

ANNEXES



Executive summary – Annex 1

Economies by per capita gross national income (GNI) in June 2020

High income		Upper middle income	
Andorra	Lithuania	Albania	Jamaica
Antigua and Barbuda	Luxembourg	American Samoa	Jordan
Aruba	Macao SAR, China	Argentina	Kazakhstan
Australia	Malta	Armenia	Kosovo
Austria	Mauritius	Azerbaijan	Lebanon
Bahamas, The	Monaco	Belarus	Libya
Bahrain	Nauru	Belize	Malaysia
Barbados	Netherlands	Bosnia and Herzegovina	Maldives
Belgium	New Caledonia	Botswana	Marshall Islands
Bermuda	New Zealand	Brazil	Mexico
British Virgin Islands	Northern Mariana Islands	Bulgaria	Montenegro
Brunei Darussalam	Norway	China	Namibia
Canada	Oman	Colombia	North Macedonia
Cayman Islands	Panama	Costa Rica	Paraguay
Channel Islands	Poland	Cuba	Peru
Chile	Portugal	Dominica	Russian Federation
Croatia	Puerto Rico	Dominican Republic	Samoa
Curaçao	Qatar	Ecuador	Serbia
Cyprus	Romania	Equatorial Guinea	South Africa
Czech Republic	San Marino	Fiji	St. Lucia
Denmark	Saudi Arabia	Gabon	St. Vincent and the Grenadines
Estonia	Seychelles	Georgia	Suriname
Faroe Islands	Singapore	Grenada	Thailand
Finland	Sint Maarten (Dutch part)	Guatemala	Tonga
France	Slovak Republic	Guyana	Turkey
French Polynesia	Slovenia	Indonesia	Turkmenistan
Germany	Spain	Iran, Islamic Rep.	Tuvalu
Gibraltar	St. Kitts and Nevis	Iraq	Venezuela
Greece	St. Martin (French part)		
Greenland	Sweden		
Guam	Switzerland		
Hong Kong SAR, China	Taiwan, China		
Hungary	Trinidad and Tobago		
Iceland	Turks and Caicos Islands		
Ireland	United Arab Emirates		
Isle of Man	United Kingdom		
Israel	United States		
Italy	Uruguay		
Japan	Virgin Islands (U.S.)		
Korea, Rep.			
Kuwait			
Latvia			
Liechtenstein			

Lower middle income		Low income	
Algeria	Micronesia, Fed. Sts.	Afghanistan	Madagascar
Angola	Moldova	Burkina Faso	Malawi
Bangladesh	Mongolia	Burundi	Mali
Benin	Morocco	Central African Republic	Mozambique
Bhutan	Myanmar	Chad	Niger
Bolivia	Nepal	Congo, Dem. Rep.	Rwanda
Cabo Verde	Nicaragua	Eritrea	Sierra Leone
Cambodia	Nigeria	Ethiopia	Somalia
Cameroon	Pakistan	Gambia, The	South Sudan
Comoros	Papua New Guinea	Guinea	Sudan
Congo, Rep.	Philippines	Guinea-Bissau	Syrian Arab Republic
Côte d'Ivoire	São Tomé and Príncipe	Haiti	Tajikistan
Djibouti	Senegal	Korea, Dem. People's Rep.	Togo
Egypt, Arab Rep.	Solomon Islands	Liberia	Uganda
El Salvador	Sri Lanka		Yemen, Rep.
Eswatini	Tanzania		
Ghana	Timor-Leste		
Honduras	Tunisia		
India	Ukraine		
Kenya	Uzbekistan		
Kiribati	Vanuatu		
Kyrgyz Republic	Vietnam		
Lao PDR	West Bank and Gaza		
Lesotho	Zambia		
Mauritania	Zimbabwe		

Chapter I – Annex 2

Testimonials of former chairs of the AO SEC

James L Hughes (chair, 1990–2000) _____

“At the outset of my time on the Executive Committee of the AO SEC, we initiated the thoughts of providing internal fixation hardware and techniques for the underdeveloped and developing countries. All the members recognized the great need for improved fracture care in these countries. The complex constraints for the delivery of the multiple systems needed, to deliver them into a proper surgical environment merited long and intense discussions. It became readily apparent that the hardware delivery, while problematic, was the least of the difficulties. An environment of complete care was needed with proper training for all personnel along with a sterile operating room environment.

The thought of assisting the third-world countries was an exciting opportunity. Serious discussions emerged concerning how a complete system might be developed to provide answers to all the problems associated with this opportunity. Focus then centered on which of the current implant systems might be used or whether new, simpler products might be developed such as a simple ExFix. Closely aligned with these questions was, who was available and able to teach the techniques of internal fixation. Another major hurdle was how to engage the manufacturers and who would support the financial side of the equation.

Because of the complexity of this international opportunity, it was recognized that a socio-economic committee should be formed and charged with finding solutions to the enormous possibility of sharing the AO expertise throughout the whole world. It was my privilege to serve as the initial chair of this committee.”

Paul Demmer (chair, 2000–2009)

“In 1996 Jim Hughes and Anne Murphy introduced to me to the AO Socio-Economic Committee (AO SEC) and the plans by our industrial partner, the Mathys company, to produce special implants for use in developing countries. My experience of 20 years in orthopedic outreach programs in southern and eastern African countries had shown me that implants were not what they needed. The medical infrastructure was not equipped for open reduction and internal fixation, even in most university hospitals.

The doctors and nurses in these countries needed teaching of orthopedic and trauma management, appropriate for their environment. This would only be successful if one could identify those doctors who were willing not only to accept the type of help we intended to give, but also to account for the financial support they received. We travelled the countries and found willing and enthusiastic colleagues. This, in my opinion, was the right way to spread the true AO spirit of helping patients with skeletal injury and disability.

In the vast majority the teaching had to be nonoperative fracture management and only once a year in one of the countries an AO basic course in operative management for doctors working in hospitals with appropriate theatre facilities. It took three years to convince the AO management to agree to the plan.

From 2001 on we started the program in Malawi and Kenya and expanded it every year to more countries in East Africa and then to Ghana and further French-speaking countries; 12 countries by 2011. The teachers were initially all non-African AO teachers but soon we could identify local doctors who started to take initiative and subsequently managed the program.

In many countries of the Asian subcontinent the health care conditions are very similar to Africa, we started the program in Nepal, and it soon was introduced in the neighboring countries.

In Brazil, Cleber Paccola continued the existing AO SEC Fellowship Program.”

John Croser (chair, 2010–2012)

“AO SEC was important to the AO because it provided a vehicle for a group of health providers/educators from many countries to engage with medical personnel in developing countries and provide information and support at a level appropriate to their local resources and needs. This varied from introducing plaster-of-paris casts to running modified AO courses. The aim was to identify and recruit motivated local doctors and give them the tools to expand the network utilizing the available resources to manage trauma locally. I was recruited by Paul Demmer and worked with Cleber Paccola and Anne Murphy and later with Joachim Prein, Sylvain Terver, Sergio Franco, Jim Harrison, Ram K Shah, and Susanne Bäuerle with administrative support provided by Giovannina Jost. Our territory ranged from Africa to the Himalayas, the islands of the Pacific to South America. We did not give money or goods but rather tried to stimulate an interest in improving trauma care.

This approach was in contrast to the majority of aid offered to developing countries which largely operated on a fly-in, fly-out basis. Such aid was fraught with problems because there was sophisticated operating being carried out in suboptimal conditions without adequate follow-up and with no long-term benefit to the local community. We were open to affiliations with organizations with shared aims and were in discussions with SIGN Fracture Care International. It was easy to see that the majority of the populations we targeted were not going to be viable markets for first-world implants, but we enjoyed the logistic support and camaraderie of the Synthes staff in the region—a not insignificant gesture on their part. At a personal level, this was work where you could see the benefit and it was a privilege to work with an outstanding group of people who provided expertise, personal time and humor to what we all saw as a worthwhile cause.”

Joachim Prein (chair, 2013–2014)

“Through the many travels I had made during my professional life I have seen very different levels of education and skills in the various parts of the world. It was obvious that often, especially in less developed countries, the patients suffered a lot from insufficient fracture care. It was a heavy burden for the people and caused a lot of misery. So, I got interested in the activities of the AO SEC Group in 2006. At that time, I was vice-chair of AO Education together with Piet de Boer as chair of AO Education.

In 2006 I acted as an advisor and extraordinary member of the AO SEC. In 2009 I became a member and in February 2013 I took over as chair, because the chair at that time, John Croser, had suddenly to step down because of personal reasons.

From the beginning I was impressed by the enormous efforts made by the members of the AO SEC Group. Traveling to the various countries in Africa and teaching there needed great efforts of those who went. Teaching concerned mainly nonoperative fracture treatment in Africa and Asia. The course material for the courses in Africa was stationed at Synthes SA. Often it was very difficult to get the course material transported to the various course locations.

Only through great personal effort from Paul Demmer and various other colleagues was it possible to have everything prepared in time.

Teaching in Africa was organized in sub-Saharan countries in English, and in West African countries in French.

Courses in Asia were organized by Ram K Shah. They were performed mainly in Bangladesh, Cambodia, Myanmar, Nepal, Laos, Sri Lanka, and Vietnam.

Videos for the practicals existed at first in the English language and were translated into French through the help of Sylvain Terver who organized courses in French speaking countries.

Observing the situation in the AO, I got the impression that not many members really took notice of the activities of the AO SEC.

Also, the industry was not really eager to sustain the efforts of the SEC Group. With a small budget (CHF 1.2 million) it was not really possible to offer effective help for less developed countries in Africa and Asia.

Important was an excellent presentation by Chris van der Werken at the occasion of a Trustee meeting (I believe it was in Lisbon). He showed in a very impressive way how dreadful the situation was for people who sustained accidents in the less developed part in the world.

Fortunately, Rolf M Jeker as CEO of the AO and vice-chair of the AO Foundation Board, saw how difficult it was for the AO SEC to be of real help for low- and middle-income countries. Together with former AO President Jaime Quintero, they organized a breakout session at the occasion of the AO Trustees Meeting in Lima, Peru, in 2013. This discussion fortunately was an eye-opener for several members within the AO. At least there was a little more openness for the idea to build a successor organization, outside of the AO, like the AO Alliance, which finally was realized at the end of 2014.”

Chapter I – Annex 3

List of the AO Socio-Economic Committee (AO SEC) members and contributors 1990–2014

James L Hughes (chair, 1990–2000)

Siegfried Weller	Rene Garo	Wolfram Einars
Rudolf Maag	PVA Mohandas	Anne Murphy
Robert Mathys Jr	Uma Grob	Hermann Oberli
Urs G Jann	Emmanuel Trojan	Robert Frigg
Reinhold Mathys	Nandkishore Laud	José Soares Hungria
Martin Allgöwer	Dankward Höntzsch	Neto
Max Landolt	Stephan Perren	Erwin Locher
Marvin Tile	Slobodan Tepic	Cleber AJ Paccola
Stephan Wintsch	Jaime Quintero	Lars Kühn
Cristopher L Colton	Suthorn Bavonratanavech	Joe Schatzker

Paul Demmer (chair, 2001–2010)

Mirjam Pally	Giovannina Jost	Peter Matter
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John Croser (chair, 2010–2012)

Susanne Bäuerle	Markus Rauh	Thomas Rüedi
Rene Marti	Chris van der Werken	Prabodh M Desai

Joachim Prein (chair, 2013–2014)

James E Kellam	Paul Manson	Jim Harrison
Gregor Strasser	Ram K Shah	Norbert Haas
Urs Rüetschi	Sérgio Franco	Rolf Jeker
Lukas Kreienbühl	Sylvain Terver	Polly Bühler

Chapter III – Annex 4

AO Alliance founders

Chris Colton

John Croser

Paul Demmer

Norbert Haas

James L Hughes

James Kellam

René Marti

Peter Matter

Joe Schatzker

Chris van der Werken

Hansjörg Wyss

Chapter IV – Annex 5

AO Alliance consensus group

Jim Harrison, T&O consultant and associate professor,
Countess of Chester NHS Foundation Trust

Claude Martin Jr, managing director of the AO Alliance

Alexander Schade, T&O academic clinical fellow, University of Warwick

Olaf Bach, T&O consultant, Zomba Central Hospital

Nicholas Lubega, T&O consultant, CURE International Malawi

Jana Schweder, visiting medical intern, Austria

Forcina Mdala, theater matron, CURE International Malawi

George Manjolo, senior orthopedic clinical officer (OCO),
Kamuzu Central Hospital

Leonard Banza, T&O consultant, Kamuzu Central Hospital

Mabuuto Chawinga, senior OCO, Kamuzu Central Hospital

Master Yesaya, senior OCO, Queen Elizabeth Central Hospital

Jes Bates, T&O consultant, Queen Elizabeth Central Hospital

Sam Maina, T&O consultant, CURE International Malawi

Boston Munthali, T&O consultant, Mzuzu Central Hospital

Linda Chokotho, T&O consultant, Queen Elizabeth Central Hospital

Chiku Mpanga, T&O consultant, Queen Elizabeth Central Hospital

Precious Kamange, AO Alliance project officer, Malawi

Chris Ngulube, senior OCO, Queen Elizabeth Central Hospital

Chapter IV – Annex 6

Ghana country initiative: Needs assessment participant list

The late Jacob Plange-Rhule, rector of Ghana College of Physicians and Surgeons, Ghana

Samuel Debrah, president, division of surgeons, GCPS, Ghana

Alex Gabby Horttordze, Human Resources Directorate, ministry of health, Ghana

Prudence Nutsuklo, consultant T&O surgeon, Korle-Bu Teaching Hospital, Accra, Ghana

Francis Odei-Ansong, senior T&O resident, Korle-Bu Teaching Hospital, Accra, Ghana

Samuel Kaba Akoriyee, director, Institutional Care Division, Ghana Health Service, Ghana

Vincent Ativor, chief of T&O division, Komfo Anokye Teaching Hospital (KATH), Ghana

Francis Offei, dean, Cape Coast School of Medical Sciences, Ghana

Daniel Asare, CEO, Cape Coast Teaching Hospital, Ghana

Alexis Baunaaim, lead T&O surgeon, Tamale Teaching Hospital, Ghana

Peter Trafton, director, Health Volunteers Overseas, United States

Adam Gyadu, Representative Research Group

Wilfred Addo, consultant T&O surgeon, AO Alliance chair for English-speaking Africa steering committee

Claude Martin Jr, managing director, AO Alliance, Switzerland

Jim Harrison, regional director, Africa, AO Alliance, United Kingdom

Polly Bühler, project coordinator, AO Alliance, Switzerland

Abdoulie Janneh, member, AO Alliance Board of Directors, Senegal

Sylvain Terver, coordinator, French-speaking Africa, AO Alliance, France

Michel Orsinger, special consultant, AO Alliance, Switzerland

Stella Minta, lead operating room personnel (ORP), KATH

Abel Tunni, T&O surgeon, Presbyterian Hospital, Bawku, Ghana

Seth Makafui, resident, Cape Coast Teaching Hospital (CCTH), Cape Coast, Ghana

Kingsley Doku, consultant T&O surgeon, CCTH, Cape Coast, Ghana

Jefferson Owusu, T&O resident, CCTH, Cape Coast, Ghana

Dina Odum, ICD, Ghana Health Services, Accra, Ghana

Akwasi Agyen Mensah, consultant T&O surgeon, CCTH, Cape Coast, Ghana

Richard Baidoo, consultant T&O surgeon, CCTH, Cape Coast, Ghana

Chapter VII – Annex 7

List of participants at the Coalition for Dialogue on Africa, September 2018 meeting

Olusegun Obasanjo, Coalition for Dialogue on Africa Board, Paris, Former President of Nigeria & Chair of CoDA Board

John Mahama, Ghana, Accra, Former President of Ghana

Thomas Kwesi, African Union Commission (AUC), Addis Ababa, Deputy Chairperson, AUC & Co-Chair of the Consortium

Abdalla Hamdok, United Nations Economic Commission for Africa (ECA), Addis Ababa, Deputy Executive Secretary & Co-Chair of the Consortium

Rolf Jeker, AO Alliance Foundation, President, AO Alliance Board

Claude Martin jr., AO Alliance Foundation, Managing director, AO Alliance

Manjul Joshipuna, India, Board Member AO Alliance Foundation

Jim Harrison, UK, London, Regional Director Africa, AO Alliance Foundation

Betelehem Shiferaw, Ethiopia, Addis Ababa, Federal Ministry of Health

Kweku Ofori Asiamah, Ghana, Accra, Minister of Transportation

Emmanuel Owusu-Ansah, Ghana, Accra, TECHNICAL ADVISOR TO THE HON. MINISTER

Isatou Touray, Gambia, Banjul, Minister of Health & Social Welfare

Ahmadou Lamin Samateh, Gambia, Banjul, Chief Medical Director, EFSTH

Kwaku Agyeman Manu, Ghana, Accra, Minister of Health

Fareed Kwesi Arthur, African Union Commission (AUC), Addis Ababa, Deputy Chief of Staff

Sajo Jallow, African Union Commission (AUC), Addis Ababa, Advisor, Stakeholder Management (BDCP)

Mathieu Blaise Banoum, African Union Commission (AUC), Addis Ababa, Advisor, Administration (BDCP)

Mekonnen Haddis, African Union Commission (AUC), Addis Ababa, Advisor, Capacity Building and Reforms (BDCP)

Lovishka Babajee, African Union Commission (AUC), Addis Ababa, Health and Nutrition Officer

Hilina Wassihun, African Union Commission (AUC), Addis Ababa, Health, Nutrition and Population Division

Omar Diop, African Union Commission (AUC), Addis Ababa,
Senior Policy Officer, Labor Division

Abdalla kamara, African Development Bank, Addis Ababa,
country manager of the Ethiopia country office

Netsanet Hussen, African Development Bank, Addis Ababa,
Executive Assistant

Aida Opoku-Mensah, United Nations Economic Commission for Africa (ECA),
Addis Ababa

Jean-Marie Dangou, World Health Organization (WHO), Brazzaville,
Regional Adviser

Teri Reynolds, World Health Organization (WHO), Head of the Emergency and
Trauma Care Programmes

Pamela Mitula, World Health Organization (WHO), MCHN and EPI Program
Manager

Justin Maeda, Africa Centers for Disease Control and Prevention (CDC), Addis
Ababa, Director CDC

Biruk Lambisso, Tikur Ambessa Hospital, Addis Ababa, Orthopedic Surgeon

Dan Kekane, Disabled People South Africa, Gauteng,
Gauteng Province Chairperson

Thandiwe Bridgette Ginya, Disabled People South Africa, Gauteng

Jane Marie Ong'olo, African Union Commission (AUC), Addis Ababa, Head
of Division, Social Welfare, Vulnerable Groups and Drug Control and Crime
Prevention

Johan Strijdom, South Africa, Johannesburg, Former Head of Social Welfare
Division, AUC

Albert Yankey, Republic of Ghana, Accra, Chief Director of the Ministry of
Foreign Affairs

Biruk L. WAMISHO, Associate Professor of Orthopaedics, Addis Ababa,
Consultant Orthopaedic Surgeon at Black Lion Hospital (BLH)

Fatuma Ebrahim, MOH, Emergency and critical care Assistant directorate,
Addis Ababa, Assistant Director

Tigist Gelagle, AO Alliance Ethiopia Project Officer, Addis Ababa

Samuel Hailu, Black Lion Hospital, Addis Ababa University, Addis Ababa,
Orthopaedic Trauma & Joint Replacement Surgeon / Orthopaedic Trauma
Fellowship Director

Karin Poulsen, Danish International Development Agency, Addis Ababa, Ambassador of Denmark

Fatih Ulusoy, Turkish Embassy, Addis Ababa, Ambassador of Republic Turkey

Mariann Murvoll, Norwegian Embassy, Addis Ababa, Minister Councillor

Audun Fostvedt-Mills, Norwegian Embassy, Addis Ababa, Second Secretary, Regional Section

Anab Ovidie Grand, Norwegian Embassy, Addis Ababa, Political Officer, Regional Section

Charlotte Thyra Lunde, Norwegian Embassy, Addis Ababa, Trainee, Regional Section

Barbara King, Australian Embassy, Addis Ababa, Second Secretary

African Ambassadors accredited to AU & Ethiopia

Catherine Muigi Mwangi, Kenyan Embassy, Addis Ababa, Ambassador of Kenya to Ethiopia

Susan Sikaneta, Zambian Embassy, Addis Ababa, Ambassador of Zambia to Ethiopia & AU

Albert R. Chimbindi, Embassy of Zimbabwe, Addis Ababa, Ambassador of the Republic of Zimbabwe to Ethiopia & AU

Chapter VII – Annex 8

The AO Alliance trauma system planners' course

The AO Alliance has already developed suitable educational programs for surgeons, paramedics and other healthcare workers. With its public health initiatives through the Coalition for Dialogue on Africa (CoDA), the World Health Organization (WHO), and other efforts, the AO Alliance has started sensitizing political leaders to generate political will in favor of care of the injured. However, senior policy makers (bureaucrats, directors, hospital chiefs in the health system, etc) generally do not get formally exposed to the importance of trauma as a public health problem. This group still remains a critical weak link in the AO Alliance's wider objective of strengthening care of the injured across sub-Saharan Africa and low- and middle-income countries (LMICs). This stakeholder group controls health budgets, set priorities, and allocates hospital resources and manpower across the health system of a country.

Training in trauma system planning and management is mandatory for trauma directors and system managers in developed countries. Such courses are run by surgical colleges. In LMICs, in the absence of support and sensitive health systems, surgeons find it difficult to deliver care due to the lack of resources and manpower.

Introduction

This course provides an overview of injury as a public health problem, the different elements of a trauma system, as well as strategies for improving trauma care services and systems. It seeks to promote better understanding of the field of trauma system planning and management in LMIC setting. Finally, it encourages the participants to draw their national plans for trauma care systems.

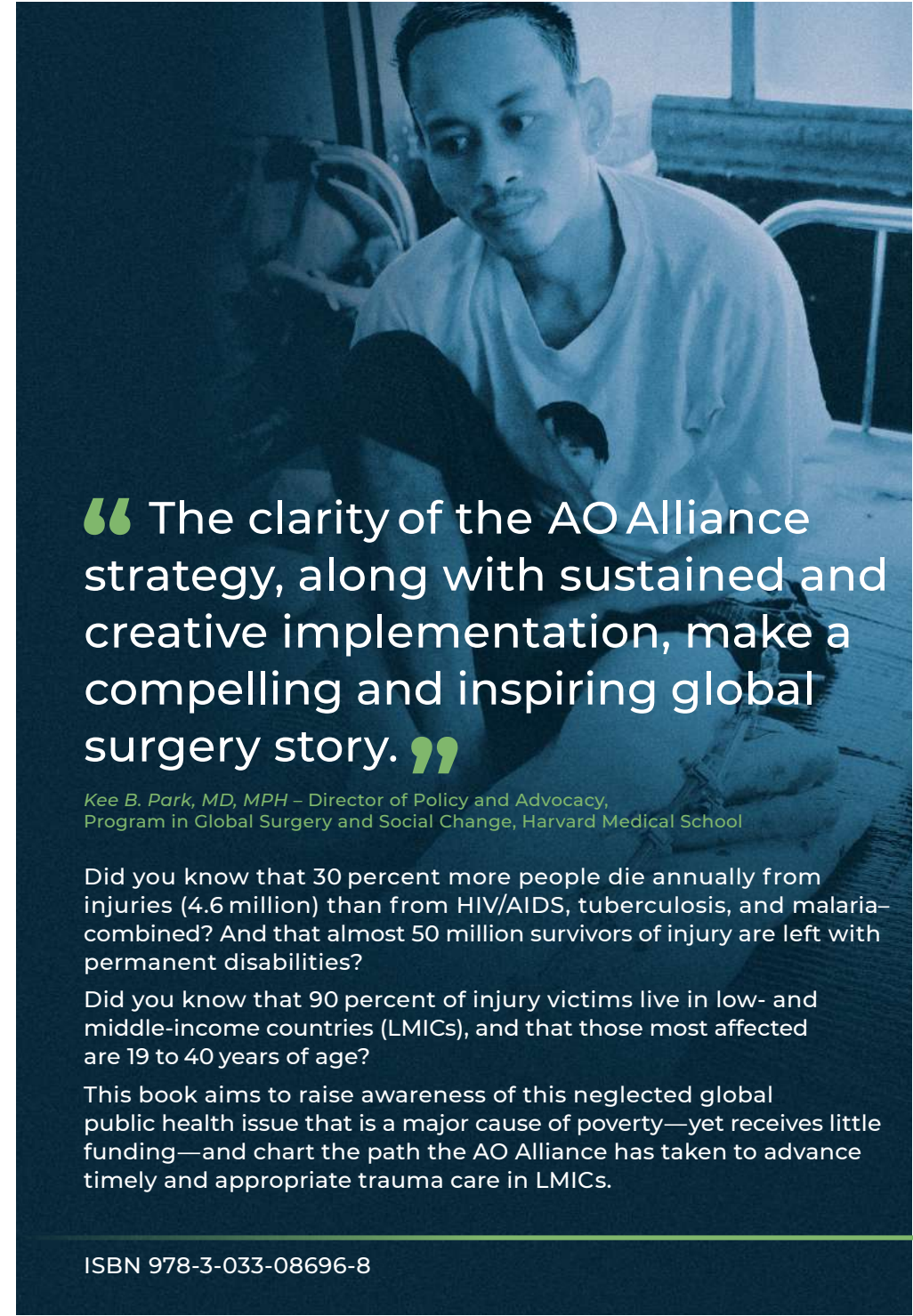
Purpose

Participants will acquire an understanding of the elements that go into trauma system planning, including surveillance, quality, prehospital and hospital-based care—with focus on musculoskeletal trauma. The AO Alliance can customize the course structure to suit local requirements.

Target audiences

The course is designed for individuals with a planning or administration role in relation to trauma services, such as:

- Senior government staff involved in health systems planning;
- Hospital administrators;
- Mass casualty management/disaster planning staff; and
- Trauma care clinicians with administrative roles or responsibilities.



“ The clarity of the AO Alliance strategy, along with sustained and creative implementation, make a compelling and inspiring global surgery story. ”

*Kee B. Park, MD, MPH – Director of Policy and Advocacy,
Program in Global Surgery and Social Change, Harvard Medical School*

Did you know that 30 percent more people die annually from injuries (4.6 million) than from HIV/AIDS, tuberculosis, and malaria—combined? And that almost 50 million survivors of injury are left with permanent disabilities?

Did you know that 90 percent of injury victims live in low- and middle-income countries (LMICs), and that those most affected are 19 to 40 years of age?

This book aims to raise awareness of this neglected global public health issue that is a major cause of poverty—yet receives little funding—and chart the path the AO Alliance has taken to advance timely and appropriate trauma care in LMICs.

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