Prologue: Orchestrating A Cast of Thousands

Davos, Early on a December Morning

A curious sight can be observed early on a December morning in the mountain resort town of Davos, Switzerland. There, on a typical workday before the sun rises above the peak of Pischahorn, and with the street noise muffled by fresh snow, one can see a stream of people walking the streets, all in the same direction. The crowd is much larger than one would expect at this hour, especially in a resort town. These people are not dressed to go skiing or hiking; instead they are wearing comfortable sports clothes, dressed warmly enough for the typical cool mountain air of the season. This stream of humanity, coming out of the various hotels, appear wholly unconnected to all the snow that covers the ground. Instead of skis, they are equipped with computer shoulder bags, books, and folders. These men and women give the impression of young professionals and are, apparently, from all over the world. What are all of these hundreds of people doing in the middle of the Swiss Alps, in winter, if not to go skiing? (Exhibit 1.1)

Following the crowd, along where the stream swells, the people start to head toward the Davos Congress Center, flags draped all over its entrance and giving way to the purpose of this early congregation. This is an annual meeting of the AO Foundation’s Davos Courses (AO stands for Association pour l’Ostéosynthèse in French; Arbeitsgemeinschaft für Osteosynthesefragen in German; Association of Osteosynthesis in English), which is held each December to expose yet another generation of early and mid-career surgeons to the principles of bone trauma care and related injuries, known the world over as Osteosynthesis. Before the sun rises (which happens in the winter sometime after 08:00), the nearly 1000 participants and instructors split into groups, review bone fractures, discuss surgical approaches, learn from experienced colleagues, and become experts at treating bone trauma for patients anywhere in the world applying Osteosynthesis techniques. Bending over artificial models of limbs, skilled and experienced surgeons will teach their younger colleagues how to place sophisticated implants to join broken bones, how to apply...
screws to keep them in place, and how to use specially-designed surgical instruments to achieve the best results for patients. The participants will stay inside the conference center, huddled over their simulated operations and bone injuries, until late in the afternoon. By the time they leave the Conference Center, the sun has disappeared and the Davos sky begins to sparkle, the stars becoming clearly visible. This routine will be repeated for the next four days (Exhibit 1.2).

This sight has repeated itself every year since 1960, and over these almost 60 years about 65,000 surgeons and several thousand operating personnel have graduated from the Davos program, becoming skilled at applying the medical technology of Osteosynthesis to bone trauma (not including the approximately 600,000 surgeons outside of Switzerland who have participated in similar courses) (Exhibit 1.3).

Davos Hospital, on a December Morning

Shortly after 07:00, a team of about a dozen surgical staff assembles in the Davos Hospital to man the three operating theaters, each equipped with state-of-the-art instrumentation. They ready the various stations for patient intake, take inventory of medical supplies, and check sterilization stations, as well as the X-ray and anesthesia equipment needed for the operations. Promptly, at the pre-scheduled time, patients are wheeled into the operating area: they are received, transferred to an operating bed, checked, infused, provided with the necessary anesthesia, and moved over into the operating theater where a team of five professionals are ready to perform a demanding procedure—requiring either the application of a fracture fixation, or
Exhibit 1.2 Davos Conference Center with AO Banner. Copyright by AO Foundation, Switzerland

Exhibit 1.3 A Davos course. Copyright by AO Foundation, Switzerland
sometimes the removal of a metal implant that had been put in about a year earlier—following a complicated fracture, such as of a lower leg or tibia.

The surgeon in charge, helped by an assistant, an operating nurse, and the support staff for anesthesia, X-ray, and supplies, goes over the procedure using medical terminology not always easily understood by laymen. Dr. med. Nikolaus Renner explains:

The patient, having suffered a trauma to the proximal lateral tibia (fracture to the lower leg), had been originally treated with small cortical screws for inter-fractional compression, bridged using a LISS PLT Less Invasive Stabilization Plate with Self Tapping Locking Screws (5.0), and appeared ready for the removal of these implants as the fracture has sufficiently healed.\(^1\)

The procedure for removing the plate and screws takes a good hour. The approach of applying these implants at the time of fracture, and their subsequent removal, are the same as those exercised each year by the surgeons in the Davos Conference Center. Today’s procedure called for a removal of an implant. At another time, the operation might be implantations needed as a result of a fresh bone trauma (Exhibit 1.4).

Elsewhere, on this same December day, hundreds, if not thousands of patients with bone fractures or trauma will be wheeled into operating arenas all over the world. On any given day, thousands of interventions are carried out in line with the procedures taught and practiced in the courses offered in Davos. They may include bone trauma, or trauma to the spine, skull, or face. In a typical year at New York–Presbyterian Hospital, some 37,000 Orthopedic and trauma operations are conducted, with about 8000 being in the area of trauma alone—more than 20 per day.\(^2\)

Some of these procedures may be optional, or elective, and yet still contribute significantly to the improvement of patients’ lives. Other procedures may be the result of accidents and are actually life-saving. In all cases, however, patients are treated by highly-skilled teams, specializing in different areas of medicine, ranging from surgery and anesthesia to X-ray technology; each of these professionals is focused on contributing to an optimal outcome for their patients.

Whatever the procedure, surgeons and their skilled operating room staffs will rely on implants, plates, screws, and surgical instruments produced specifically for a given purpose and situation. Supporting these surgical teams, and invisible to patients, is a large support staff ensuring that the correct implant is delivered at the right time, to the right place, and for the right patient. Every day, thousands of specialists travel to hospitals in order to engage with surgical teams and assure optimal patient outcomes.

\(^1\)Dr. med. Nikolaus Renner, President of the AO Foundation Board, 2016–2018, and Head of Trauma Surgery at Aarau Cantonal Hospital, Switzerland, reviewing the X-rays.

\(^2\)Source: Dr. David Helfet, Chief Emeritus, Orthopedic Trauma Service, New York–Presbyterian Hospital, 4 December 2017.
At the same time that the scores of surgeons congregate in Davos to learn how to apply sophisticated medical implants on trauma patients to perform Osteosynthesis, a related and not dissimilar movement is taking place in Western Switzerland.

Exhibit 1.4  X-ray of patient for implant removal, Davos Hospital. By Permission Davos Regional Hospital, Switzerland

Solothurn, Switzerland, on the Same December Morning
Looking down from the hills above Solothurn—the capital city of the Swiss Canton bearing the same name—one can see the busy movements of cars, trains, and other transport vehicles going toward a number of factories dotted along the Jura mountain range. Again, it is early morning and the lights of the moving cars and buses are clearly visible, creating, a long line, hemmed in between the Jura mountain chain to the West and the River Aare to the East. In this line of vehicles sit thousands of highly-skilled workers, machinists, engineers, and medical technology experts going to the many factories that, in this region, have created a competence center for the production of medical implants needed for Osteosynthesis—an industry, which supports the surgeries that the teams are performing in Davos, and that the young surgeons are learning about.

In the factories located around the city of Solothurn, as well as in smaller towns beyond the MedTech community, with little-known names such as Zuchwil, Bellach, Bettlach, Grenchen, and Lengnau, a workforce of several thousand are machining metal and titanium parts to exacting specifications, using highly-sophisticated machinery. These enterprises reach up and down along the Jura mountain range, even reaching into the neighboring Canton of Basel-Landschaft, or Basel-Land. The factories have names such as DPS Synthes, Mathys, and Stryker, among others. They manufacture surgical implants and instruments that are so demanding to produce only the most skilled workers will succeed. Their workforces produce these items with sophisticated machinery, titanium steel, LISS PLT plates and the required screws, such as the one implanted in the patient at the Davos Hospital. While the majority of these efforts is concentrated in the Solothurn region, these same companies maintain operations in other parts of the world where, again, thousands of employees machine implants to the most precise of specifications.

The workers, factories, and companies in charge of this industrial effort have been involved in this effort since the early 1960s. When arriving at their workplace for the first morning shift on this early December day, it is still dark outside. When the second shift returns home at the end of their workday, it’s dark again. Without the daily contributions of this dedicated workforce, none of the operational procedures supporting Osteosynthesis, the method being taught in Davos, would be possible.

Who Orchestrates This Cast of Thousands?

The thousands of surgeons training in Davos, the thousands of workers streaming towards the factories in the Solothurn area, and the thousands of patients seeking treatment for their bone trauma in hospitals around the world are not random or unrelated. The genius behind these activities is not a governmental, or any other, official body. Instead, this cast of thousands is being orchestrated through the effort of a private, non-governmental organization, known today by the abbreviation of AO (which has since taken the legal form of a foundation). It was originally inspired by a small team of surgeons who came together in Switzerland as colleagues in 1958 and took on the mission to revolutionize the treatment of bone fractures and improve the life of patients around the world. Through the creation of a fraternity of
like-minded surgeons, they built an organization largely without government subsidies and created a social entrepreneurial start-up of unprecedented proportion. This was all bootstrapped by their own resources and self-funded through an ingenious business model involving a group of implant producers.

This book tells the story behind this enormous effort, largely performed on a volunteer basis, speaks about the personalities and talents of the founders, as well as the others who joined them, and shows how this small group grew into an ever-larger association, creating a global network of surgeons that would eventually bring their superior surgical methods to every corner of the globe.

The intention is to shed some light on the early challenges that the founders faced, the hurdles they had to overcome, the internal debates they carried out, the structures they built, and the efforts they undertook to enlist the participation of far-sighted industrialists and entrepreneurs needed to supply them with the tools required for their sophisticated surgical procedures—not to mention to help fund the effort. Featured will be how this founding team, and the organization they created, overcame stiff resistance to their innovative surgical techniques from established medical practitioners, how they engaged in research in support of their ideas, and how they built a global organization that has sustained itself to this day, resulting in, among other things, the training courses that still bring thousands of surgeons together every year, and the research program that supports new surgical concepts and practices.