

AOSpine Knowledge Forums 2018

Generating knowledge for the future



A pioneering concept

The story behind cutting-edge spine tumor research

Award-winning studies and treatment recommendations for spine deformity

Evidence-based guidelines for spinal cord injury

AOSpine Spine Injury Classification System—the new universal language

Putting the patient first with evidence

AOSPINE knowledge FORUM

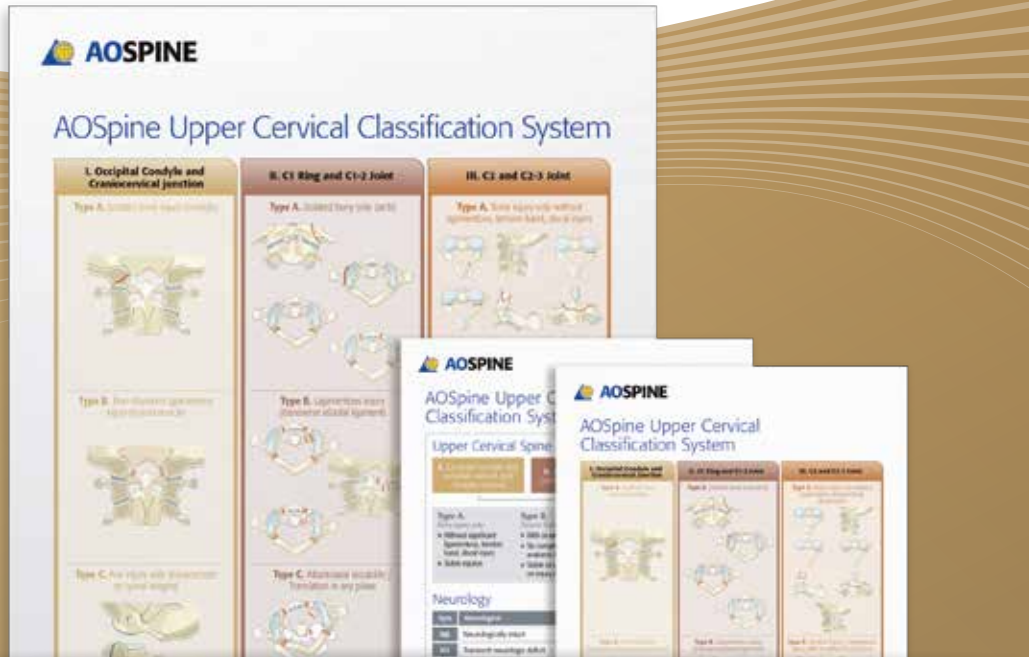


"I had this idea that knowledge is power. In the future, organizations that create knowledge will have the power.

In the beginning, no one understood the relation between AO and our industrial partner. But slowly, they realized we actually had money for research, and we were totally free to decide what kind of research we should invest in; we were not influenced by a sponsor, not even the AO. We had the liberty to fly!"

Luiz Vialle

New AOSpine Upper Cervical Classification launched!



Subaxial



Thoracolumbar



Sacral



Download AOSpine Classification toolkits at www.aospine.org/classification

SOSGOQ2.0: Reliable. Valid. Disease-specific.

A must-have outcome tool for spine oncology patients developed by the AOSpine Knowledge Forum Tumor.



Download your copy of the Patient Reported Outcomes Questionnaire at www.aospine.org/SOSGOQ2



"Psychometric Evaluation and Adaptation of the Spine Oncology Study Group Outcomes Questionnaire to Evaluate Health-Related Quality of Life in Patients with Spinal Metastases" by the AOSpine Knowledge Forum Tumor published in *Cancer*, 6 February 2018.

The open access article is available at <https://doi.org/10.1002/cncr.31240>

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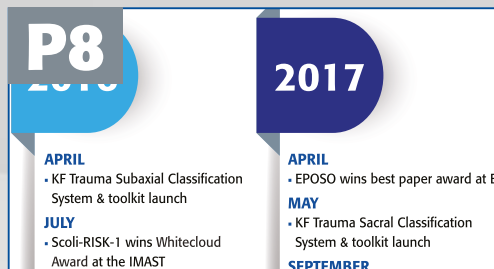
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Stay tuned...

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AOSpine Knowledge Forums—Premier knowledge creators making an impact in spine surgery

AOSpine Knowledge Forums (KF) have been singled out as having had the “biggest impact in the AO in the last decade”, for being responsible for AOSpine’s unique academic status among the spine societies, and for being the most visionary initiative from long-time AO contributor professor Luiz Vialle. The KFs already secured their place in history by becoming a premier knowledge creator in the field of spine surgery. But Vialle didn’t stop here: to complete the research cycle, the results need to be translated into education; to have a benefit for the patients, the outcomes must be transferred into clinical practice.

AOSpine International Board chairperson Dan Riew agrees: “We have the resources and the vision. Today, we are the largest and best funded collaborative research organization in the spine world. With that leadership, we have a responsibility to use our resources wisely and effectively.”

AOSpine is constantly on the lookout for tangible outcomes from its studies to fulfill this task. But to get to this point, you had to first dream big and then work hard; start with fundamentals, put in place a new administrative structure, something Vialle is proud to say, is now modeled by all AO clinical divisions.

AOSpine Knowledge Forums are international working groups in five pathologies: tumor, deformity, spinal cord injury, trauma, and degenerative disease. Each is composed of a maximum of 10 steering committee members, key opinion leaders who meet on a regular basis to discuss research, assess the best evidence for current practices, and formulate clinical studies in their domain. They are charged with conducting clinical research, developing AOSpine classifications, guidelines, and outcome measures.



AOSpine welcomes the KF pioneers to the AO headquarters in Davos, in December 2011.



Kenneth Cheung at the KF launch in the AO headquarters' library.



Luiz Vialle sharing his vision.



KF influencers Marcel Dvorak, Sigurd Berven, Jens Chapman, Lawrence Lenke, Michael Fehlings, Alain Baumann, Kenneth Cheung, and Luiz Vialle taking the first crucial steps.



AOSpine Research Commission chairperson S. Rajasekaran (front row, middle) surrounded by the KF chairpersons at the GSC 2017 in Milan, Italy. Charles Fisher, Jeffrey Wang, and Michael Fehlings (back row), Cumhur Öner and Marinus de Kleuver (front row).

How the Knowledge Forums were created

Twenty years ago, when working as AOSpine faculty and as chairperson of AOSpine Latin America, Luiz Vialle realized AO courses only offered content created by others. People attended AO courses to hear of inventions and discussions produced by other institutions. "I had this idea that knowledge, as much as information, is power; in the future, organizations that create knowledge would have the power," Vialle recalls.

AOSpine was doing a great job distributing knowledge through education; it provided an invaluable platform for exchanging knowledge with its conferences and journals. "We brought a tremendous amount of knowledge together with people from societies like the Scoliosis Research Society, European Spine Society, and North American Spine Society. But it stopped there. In creating new knowledge we did nothing, even if we had the best heads in the entire world of spine in one room!" Vialle realized. This was the rationale behind the KFs. AOSpine could only become a knowledge broker, if it had a strong basis of knowledge creation. "We already had the top surgeons, clinicians who practice medicine, who knew where the gaps in medical science were. They just needed to go to this gap and try to fill it."

The KF Tumor was launched in October 2010, co-chaired by Stefano Boriani and Ziya Gokaslan. Gokaslan vividly remembers the excitement and the enthusiasm, but he also recalls resistance and concerns about the level of available funding.

"We were sort of a test case to see if this concept would be successful. We were confident that we would be successful academically, so we trusted that through academic success we would get additional funding. Which turned out to be the case," Gokaslan says.

The KF Tumor was followed by expert groups for trauma, spinal cord injury, deformity, and degeneration, led by pioneering professors and surgeons, Lawrence Lenke, Kenneth Cheung, Michael Fehlings, Alex Vaccaro, and Jeffrey Wang. The ever-pragmatic Vialle sees the key to scientific success in the set-up: "I always say friendship would kill the KFs!" Only key opinion leaders were invited: surgeons with at least 100 published peer-reviewed articles, professors, and faculty at universities. The number of members was capped at ten, because anything else would not be financially sustainable. At the time, AOSpine membership was not a prerequisite and AOSpine was able to bring some of the most important surgeons into the organization.

AOSpine Knowledge Forums Highlights



GLOSSARY

AOSIB = AOSpine International Board

AOSNA = AOSpine North America

EMSOS = European Musculo-Skeletal Oncology Society

EPOS = Epidemiology, Process and Outcomes of Spine Oncology

GSC = Global Spine Congress

IMAST = International Meeting on Advanced Spine Techniques

KF = Knowledge Forum

NACTN = North American Clinical Trials Network for the Treatment of Spinal Cord Injury

PRO = Patient Reported Outcome

PT Retro = Predictors of mortality and morbidity in the surgical management of primary tumors of the spine

SCI = Spinal Cord Injury

Scoli-RISK-1 = Evaluation of neurologic complications associated with surgical correction of adult spinal deformity

SRS = Scoliosis Research Society

Research that matters—from creating knowledge to benefiting the patient

The production of research under the KF umbrella started with two studies in 2010, and already at the Global Spine Congress 2011 in Barcelona, the KF Tumor organized its first successful public session. It took another two years for the first journal article to be published. A strong Research Manager, Peter Langer, and the Research Commission chairperson, Keita Ito, were instrumental in putting things on the right track. Today, the KF managers Niccole Germscheid, María Alvarez Sánchez, and Yabin Wu drive more than 40 clinical research projects and dozens of sub-projects. AOSpine is only starting to harvest the outcomes of these efforts: publication and citations numbers are increasing by the year and results are being transferred into education.

“I knew then, as I know now, that for research to be effective, you need to run the project over several years, start publishing, and you will still need 5-10 years before you get strong recognition from the community. Despite all efforts of the first five years, we are still in the beginning, this is how research works. We need time to consolidate our position, to bring knowledge to the practical

awareness of doctors around the world. But once we are recognized as a knowledge provider, people will come of their own accord, they want to join, attend our courses; because we are the creators, we are the innovators,” Vialle believes.

AOSpine Executive Director Jayr Bass confirms this trend is becoming a reality. Translation into education and determining how to do this best continues to be one of his key priorities: “The ultimate goal of our investment into research is to advance spine care and improve patients’ lives.”

The initial focus has shifted from bringing the right people in, and from creating the know-how, to putting the knowledge into practice. In 2016, the KF chairpersons were integrated into the Research Commission, joining the Regional Research officers in the decision-making body. Bass sees this as an important step in taking responsibility for the AOSpine’s mission as a whole: “By getting the KF chairpersons more integrated into AOSpine the vision and the focus of the KFs has broadened beyond research.”

Going global, staying unique

Today, AOSpine is invited to all major orthopedic, spine, and neurosurgical meetings. Vialle is convinced AO is stronger because of the KFs: “The surgeons of course have their own research, but we take them one level higher by bringing them together. We are uniquely multi-centered, multi-cultural, jumping economical hurdles; bringing regions together and finding international solutions to local problems.” The new knowledge has an immediate practical application to patients and perfectly fits with AO’s mission to improve patient care. The AOSpine Research Commission chairperson, Shanmuganathan Rajasekaran, fully agrees. He, too, was brought into the KF Trauma by Vialle, who presented the idea to him at a spine meeting in Malaysia. Rajasekaran remembers thinking it was a brilliant idea. “We have a huge volume of spinal trauma in India and this could profit the other regions. The power of AO is that it’s truly international.” Globalization of AOSpine research

is being implemented. The advantages and successes of each region will benefit all regions. This has been the leading thought throughout Rajasekaran’s chairmanship:

“It’s about bringing together the capacity of AOSpine members across the world. Regions have their strengths and weaknesses. The best research experience may be in North America. While Asia Pacific or Africa may not be as strong in their experience, they have huge amount of clinical material necessary for clinical research.”

The AOSpine Research Commission is also introducing associate member structures into the KFs and training surgeons in becoming surgeon-scientists: “All over the world there are young surgeons, who don’t have the time, the experience to do research. By mentoring these bright surgeons, their practice and orientations is transformed and they integrate clinical research into their daily work.”



The AOSpine Research Commission met in Milan, Italy, in May 2017. Globalization of research was high on the agenda.

Setting the standard—back to the roots

In the future, AOSpine is set to provide a high-impact toolset for each of the KF pathologies, consisting of AOSpine classification, staging of the disease, treatment guidelines, and outcome measures. With this outlook, AOSpine will be the gold standard for whole disease entities and practice in spine care. “We found the right recipe,” Gokaslan believes. “We brought in the experts, we provided a platform for generating new knowledge; we created multi-institutional, global data registries, and a universal network of researchers. You could not be better positioned to be the leader in the field for creating and disseminating new knowledge, for having real impact.”

Gokaslan sees a day, when somebody anywhere in the world has a spine tumor, the treatment principles will have been established by the AO Foundation. Gokaslan and Bass share the notion of going back to our roots. “If ten years from now you look at the situation, you will see something similar to when the AO was first established in the 1960’s. Some decades later, it had become the standard in treating fractures. If we accomplish the same in treating spine diseases and disorders, and we lead the surgical field in this, then I would consider us very successful. I would argue that we are already doing that.”

Vialle believes the KFs are the model for the entire AO Foundation. “Education is our key business, but in the future we may not have the industrial partner. Who knows what happens 20 years from now. What are we going to educate people within CMF, VET, and Trauma? With innovation and knowledge produced by us, our core business of education will be fulfilled.”

Also Dan Riew believes other clinical divisions may find the KFs an excellent model, given the success of the venture. He would like to see the KFs expand to cover topics such as infection. “Despite our successes, not everyone in the spine world is aware of the opportunities and benefits KFs provide for the top-notch researcher. It is my hope that in 10 years, we will be widely recognized as the leader in spine research.”

These thoughts are widely acknowledged in the KFs. “Looking at the impact in the field, number of publications and presentations, and the new knowledge that is created; the KFs really are the shining star for the AO Foundation,” Gokaslan summarizes. But you can always hear a quiet echo in the background: despite their extraordinary success, the KFs still feel uneasy about their future. The need for research is endless, but money is not. Vialle trusts the money invested in research will grow and this will be recognized: “The more money we put in research, the better AO will be recognized as an academic organization. This, I see as the future, this is my vision for 20 years from now.”



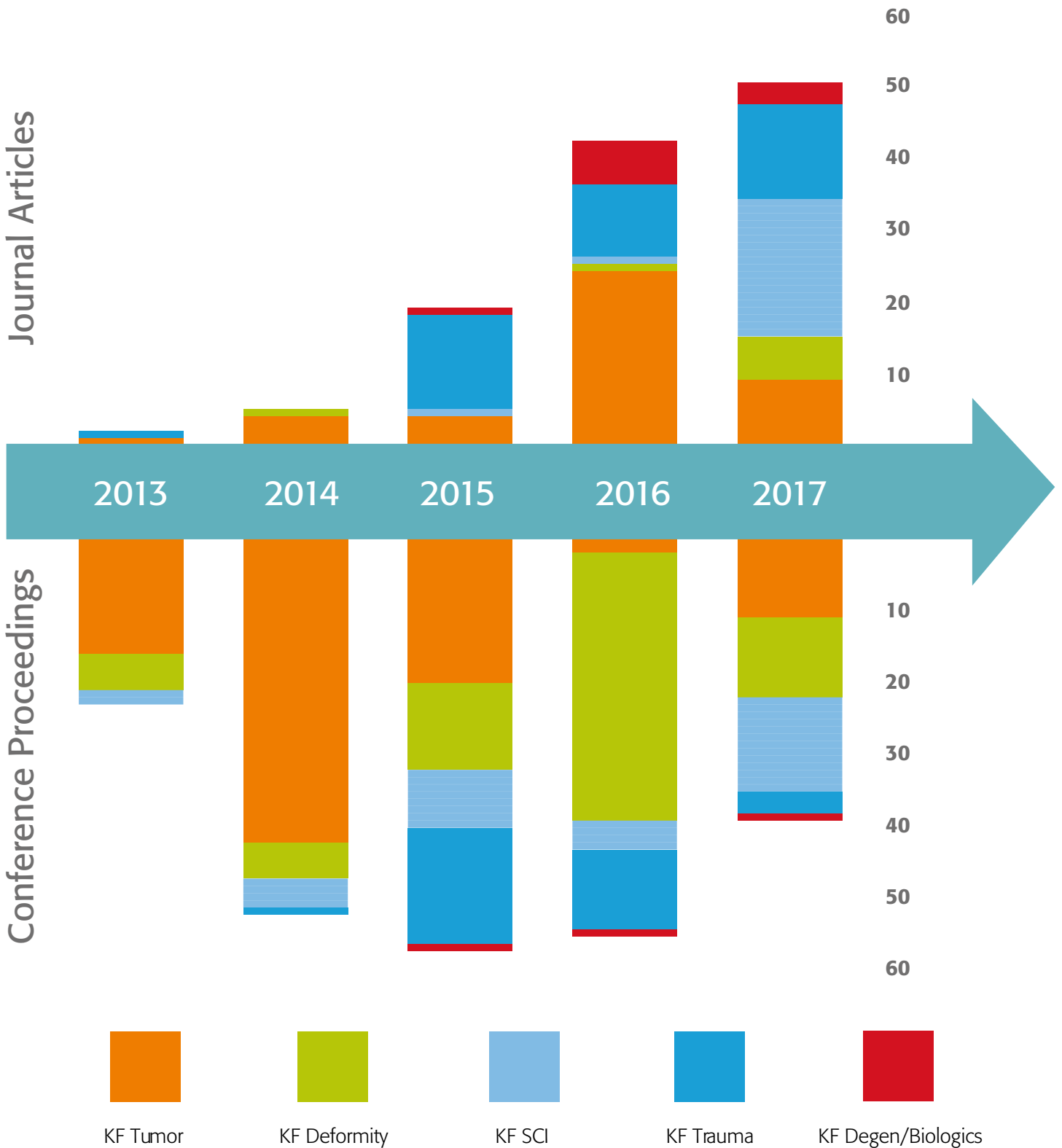
Alain Baumann, Luiz Vialle, and Geoff Richards—thrilled to be launching the pioneering KF concept in 2011.



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AOSpine Knowledge Forums

Peer-reviewed Outcomes



A full list of publications for each KF project is available on the AOSpine website.
 Go to: www.aospine.org/kf > Click on relevant KF > Publication summary



The KF Tumor Steering Committee met in Milan, Italy, during the GSC2017. Chairperson Charles Fisher (back row, left) and Ziya Gokaslan. Front row: Arjun Sahgal (left), AOSpine Research Manager Niccole Germscheid, Laurence Rhines, and Stefano Boriani. Missing: Peter Pal Varga, Chetan Bettegowda, and Norio Kawahara.

AOSpine Knowledge Forum Tumor: Pushing the boundaries—leading the way in spine tumor research

The AOSpine Knowledge Forum (KF) Tumor has been spearheading the KFs since their inception and subsequent mission to achieve the best patient outcome. This key opinion leader group is unique amongst all spine study groups: the cause is not to advance any particular aspect of surgery, but in a holistic way, find the best way to manage the patient, understand the evidence, and take into account all different forms of therapy.

The Chairperson Charles Fisher sees the task threefold: “We implement physician driven landmark clinical studies; advance patient care through multi-center analysis and peer-review publications; and develop and validate treatment algorithms and outcome measures.” The focus is on the more common metastatic and the very rare primary spine tumors. “To truly advance the care of these patients, you must have an international multi-center, multi-physician group like KF Tumor. That’s what makes us unique.”

To meet this objective, the KF meets in person 2-4 times a year and virtually every few months. Through research and discussion, the group advances towards a common recommendation, which as a result is truly multi-disciplinary. The only non-surgeon amongst the KF Steering Committee members, radiation oncologist Arjun Sahgal explains that in other pathologies this can be different: “For spine oncology patients the right decision can only happen in discussion. For a balanced point of view to guide decision making, we must take into account medical oncology, radiation oncology, and surgical oncology. This greatly adds to the quality of our research and knowledge and balances the education. That’s why we are so successful.”

Broadening horizons

KF Tumor was the first of the KFs to introduce an associate structure, expanding across new regions, and welcoming members beyond the steering committee. One of them is Jorrit-Jan Verlaan from the Netherlands, who was invited two years ago. Verlaan is intrigued to see how ideas develop and change, and finds this a great opportunity: “There is a tremendous amount of knowledge in the group, I feel honored! In the work, it does not differ so much if you are a steering committee or an associate member; it’s all about creating a group with ideas to enhance patient care.”

A wider membership base will also allow for succession planning in the Steering Committee, provide opportunities for young leaders, recognizing the importance of new ideas and perspectives. “But we don’t want to grow too quickly and sacrifice quality,” Fisher reminds. “The associate members must have the same level of commitment to high quality multi-center research. The quality of the data is always an issue; you cannot have quality research without quality data and follow-up.”

Landmark studies

The AOSpine Research Manager Niccole Germscheid works closely with KF Tumor and has noted the increasing global impact. The early work with SINS (Spinal Instability Neoplastic Score) has become a mainstream classification system, embraced by most oncologists dealing with metastatic tumor around the world. Verlaan considers it one of the most powerful tools to identify patients in a timely manner, with direct effect to their quality of life.

Major influence comes also from the Primary Tumor Retrospective, an award-winning multi-center study, which according to Fisher accomplished something never done before. “With 1,500 patients entered from all over the world, it is the largest series ever, we solidified and validated things that we previously only suspected.” Another breakthrough was the high impact study led by Chetan Bettegowda on genomics. The molecular sequencing of chordoma was correlated with patient outcome. This had not been done in the primary spine tumor world, and Fisher remembers the task was not simple: “It was challenging to get the pathologist involved, to get IRB approvals to retrieve the pathologic specimens, and to perform the genomics with formalin-fixed and paraffin-embedded (FFPE) samples.”

EPOSO (The Epidemiology, Process, and Outcomes of Spine Oncology) is another valuable project. The KF has gathered data on over 400 patients with metastatic spine disease. “We will be able to better understand which patients are ideal for surgery as opposed to radiation. By having a large dataset which is so heterogeneous, we are getting answers to key questions no one has been able to answer in the past.”



Chairperson Charles Fisher speaking at the KF Tumor precourse at the Global Spine Congress 2015 in Buenos Aires, Argentina.

Changing practices

To get the most out of KF Tumor research, you are quickly referred to the Spine Focus Issue, published last year (Spine—October 15, 2016—Volume 41—Issue 20S). It provides the spine oncology community with an updated set of treatment recommendations, building from the first focus issue published in 2009 (Spine—October 15, 2009—Volume 34 Issue 22S). Over 40 collaborators from North America, Europe, Asia, and Australia were brought together; an impressive multi-disciplinary collaboration by any standards. Sahgal confirms his own practice and understanding have changed dramatically with it: “I am educating my colleagues as a result of the knowledge I’ve gained and the work we’ve done in the KF, particularly with the Spine Focus Issue.”

Going forward, the KF Tumor will look deeper into the genomics and molecular aspects of tumors and how they relate to outcome. The aim is to establish a core network of international centers to conduct prospective studies. Two networks are underway for this: the PTRON (Primary Tumor Research and Outcomes Network) and the MTRON (Metastatic Tumor Research and Outcomes Network). With such large studies, even faster progress can be expected. A key focus of AOSpine Research strategy is to transfer the outcomes into education.

Fisher is confident that the KF Tumor model will continue to be highly productive, with high quality research done on a sustained basis: “We have the infrastructure, the collaboration, and the good ideas. We know good research takes time. With KFs as part of an AO long-term plan, both from the research and the education side, you are really taking better care of patients.”

QUICK FACTS:

- First of the 5 AOSpine KFs, launched in 2010, co-chaired by Ziya Gokaslan and Stefano Boriani
- Chairperson Charles Fisher leads a Steering Committee of 7 members; serves as a member of the AOSpine Research Commission
- Steering Committee leads a group of over 30 associate members
- Pathology focus includes both primary and metastatic spine tumors
- Published over 40 peer-reviewed journal articles and over 90 presentations since 2014
- Volumes 1-2 of the AOSpine Master Series, editors Charles Fisher, Ziya Gokaslan, and Stefano Boriani

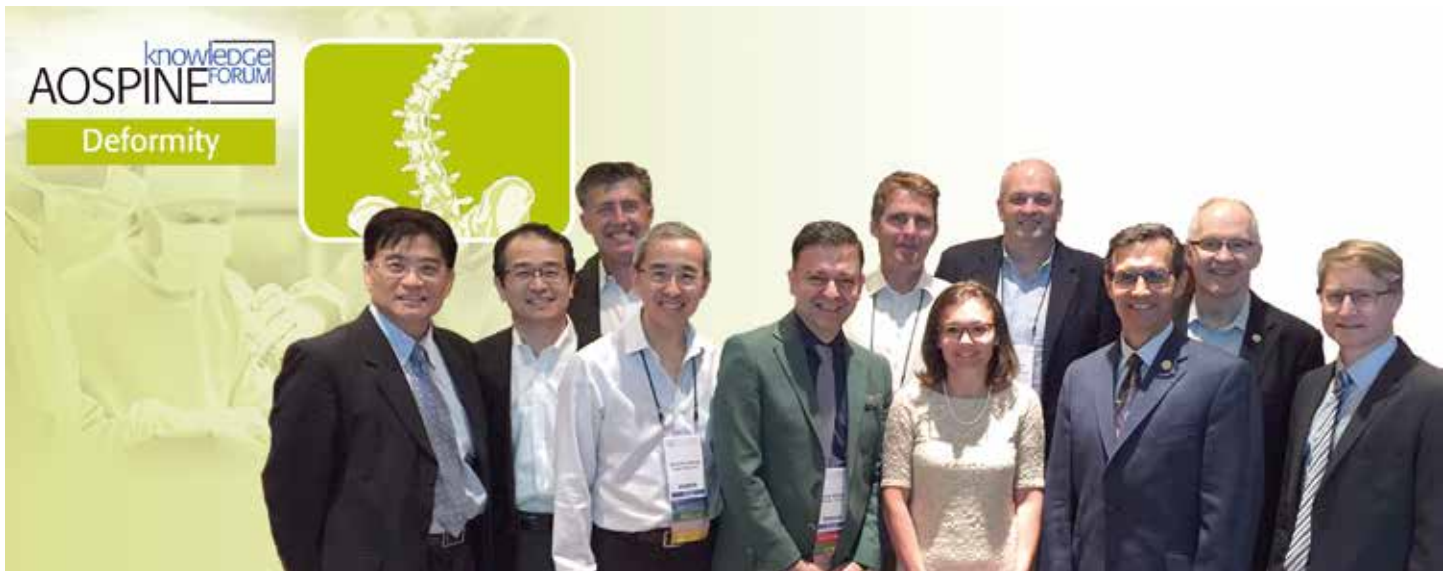
STUDY HIGHLIGHTS:

- Validated the Spinal Instability Neoplastic Score (SINS) in radiologists and radiation oncologists
- Collected retrospective data on 1,500 primary tumor cases (PT Retro study)
- Linked pathologic chordoma specimens to clinical outcomes (FFPE Chordoma study)
- Published a Focus Issue with evidence-based treatment recommendations for spine oncology (Spine Vol 41, Issue 20S, October 15, 2016)
- Established a prospective registry on primary (PTRON) and metastatic tumors (EPOSO/ MTRON)
- Published a spine oncology-specific patient reported outcome tool SOSGOQ2.0

www.aospine.org/kf-tumor



KF Tumor in Milan, Italy, at the Global Spine Congress 2017.



KF Deformity Steering Committee in Kuala Lumpur, Malaysia, 2015, with AOSpine Research Manager Niccole Germscheid. From left to right: Young Qiu, Manabu Ito, Sigurd Berven, Kenneth Cheung, Ahmet Alanay, Marinus de Kleuver, Niccole Germscheid, Christopher Shaffrey, Lawrence Lenke, David Polly, Stephen Lewis.

AOSpine Knowledge Forum Deformity: A truly international spine deformity study group

The AOSpine Knowledge Forum (KF) Deformity is entering exciting times, harvesting the results of its first six years of research. The group expects to generate several landmark papers and set the standard of care for deformity patients.

It was like a huge breath of fresh air," chairperson Marinus de Kleuver describes the creation of KF Deformity. Global thought leaders were brought together from inside and outside AOSpine. Lawrence Lenke had been attracted by the opportunity to set up the first truly international group and became the first co-chair. "I was a bit shocked actually, let's face it!" he says remembering the call from the AO from Luiz Vialle. "Someone calls you with an idea to develop a global study group with guaranteed research funding. It was like a dream come true!" The interaction of diverse opinion leaders from all around the world generated exciting new ideas. "They had to talk the talk, and walk the walk. Besides academic credibility, the members had to be clinically productive," Lenke reminds. The new KFs also helped dispel concerns about AO being guided by the industrial partner, as the first AOSpine Research Commission chair and KF Deformity co-chair Kenneth Cheung adds.

At the time, AO already had a big name in trauma, but was not as well-positioned within the spine deformity community. "And while, for example, the new KF Tumor group was filling a need in oncology, we already had some strong players in the world market in deformity," de Kleuver reminds. The KF helped bridge AOSpine with other renowned academic communities in the field, the most important being the Scoliosis Research Society (SRS). "There are a lot of synergies, some natural overlap, but no real duplication, because the profiles are different. Our collaborations are very important also for getting global acceptance for our outcomes."

Creating a common language

KF Deformity research covers both adult and pediatric deformities. The studies fall under two categories: large multi-center cohort studies, generating new knowledge, and the development of classification systems and outcome sets.

The biggest study has been Scolio-RISK-1, a highly successful collaboration with SRS, initiated shortly before the KF was set up. "This is, by far, the best existing international multicenter prospective data on the rate of neurologic complications associated with adult spinal deformity operations. The word is getting out and the results are being widely reported," Cheung describes. Another major study is PEEDS, a prospective evaluation of elderly deformity surgery. "We made a real effort to design landmark studies that were knowledge generating. For this reason, some of our publications may take a bit longer, the patient outcomes alone taking years," de Kleuver adds.

The second category of studies has so far looked at defining an international consensus on optimal treatment for spinal deformity patients—both in adolescent idiopathic scoliosis and adult spinal deformity patients. Following this global effort, the group is embarking on an intraoperative spinal cord monitoring study which will look at the role of monitoring in both pediatric and adult deformity surgeries. "Our aim is to come up with a standard of care, to find the state of the art. This study will be revolutionary for surgical teams working with complex cases," Lenke predicts. Another ground-breaking study will categorize complications in all of spine surgery, and the sorely needed results are expected by early 2018. "There is no accepted classification scheme when talking about complications. Concepts like 'major' or 'minor' are all heterogeneous. With no standards, it is difficult to compare studies or complication rates." Lenke expects huge impact from this study. "AOSpine classifications will become a standard to be proud of and a legacy for our group."

"All these initiatives are aimed at creating a common language and framework to communicate across different parties," de Kleuver explains. "There is a myriad of outcome studies and instruments out there, everybody uses different instruments to measure their quality of care. We help bring more rationale to the options that are available."

A will to improve clinical practices

All KF Deformity studies have been led by a Steering Committee member, and the focus is on carrying out research. "One of our strengths has been that we spend so much time in clinical work, in hospitals, and doing the actual research," de Kleuver says. With the recently added eight new associate members, the group is making sure they have the right global representation. Injections of new blood broaden the talent pool and help with succession planning. "But you only invite people, who you know will deliver," de Kleuver says.

"Research is very special, and high-quality research will always be done by a small group of people. The key is to identify this group, and find other ways to involve others," Cheung continues. "All our members have great ideas. So much so, that we may have to look beyond AO funding to carry them out."

The group welcomes expectations for increased transparency and accountability, which they see leading to better quality and wider acceptance. Globalization will help spread the word, involve more surgeons, and reach more stakeholders. Cheung frames the critical measure of success he hopes to witness with KF Deformity: "Publishing in high quality journals is important and easy to measure. But to show that practice or understanding has improved because of our research? I hope that in time we can show we have achieved this."



KF Deformity meeting in full swing (Milan, Italy, 2017).

QUICK FACTS:

- KF Deformity launched in 2011, co-chaired by Lawrence Lenke and Kenneth Cheung
- Chairperson Marinus de Kleuver leads a Steering Committee of 9 members; and serves as a member of the AOSpine Research Commission
- A group of 8 new associate members represent all five AOSpine regions
- Received several awards for the Scolio-RISK-1 study, including the Hibbs Clinical Research Award at the SRS Annual Meeting 2013 (nominated in 2017, 2016, 2014); Whitecloud Award at IMAST (the International Meeting on Advanced Spine Techniques) 2016 and 2015; Best Paper Award at the Global Spine Congress 2015 (nominated 2016)
- Published 9 peer-reviewed journal articles and 70 presentations
- AOSpine Master Series, Volume 4, Adult Spinal Deformities, 2015
- AOSpine Master Series, Volume 9, Pediatric Spinal Deformities, 2018

STUDY HIGHLIGHTS:

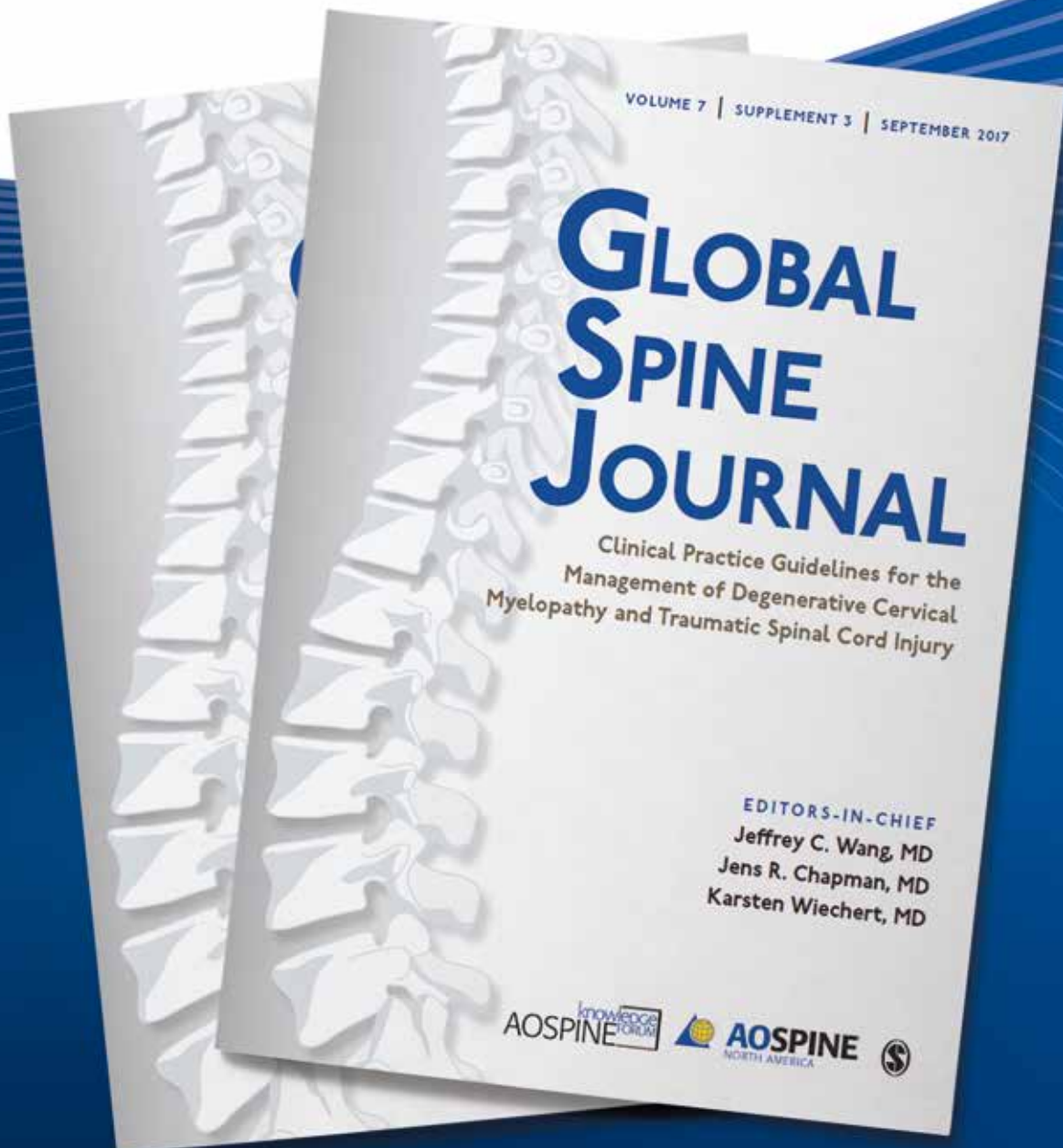
- Scolio-RISK-1
- AIS and ASD Consensus
- PEEDS

www.aospine.org/kf-deformity



The clinical trial collaboration between AOSpine and SRS exceeded all expectations (Istanbul, Turkey, 2012).

Global Spine Journal Special Focus Issue



**Clinical Practice Guidelines for the Management of Degenerative
Cervical Myelopathy and Traumatic Spinal Cord Injury**

Volume 7, Issue 3

Download them at <http://bit.ly/SCIDCMguidelines>



KF SCI Steering Committee, Milan, Italy, May 2017, top row, left to right: Mark Kotter, Shekar Kurpad, James Harrop, Brian Kwon. Front row: Bizhan Aarabi, Chairperson Michael Fehlings and Knowledge Forum Manager María Alvarez Sánchez. Robert Grossman missing from picture.

AOSpine Knowledge Forum SCI: Building on world-wide partnerships for global impact

The AOSpine Knowledge Forum Spinal Cord Injury (KF SCI) can pride itself upon a significant number of firsts, both in its studies and in their outcomes. KF SCI is also the only spinal cord injury group in the AO. Soon its accomplishments may extend to yet a new level, moving from knowledge creation to knowledge transfer, from dissemination to implementation.

The KF SCI story can be traced to the very beginning of the Knowledge Forums, but the history of their studies started long before. Thinking back, Chairperson Michael Fehlings remembers the creation of the AO Clinical Divisions, how the AOSpine Regions were set up; he vividly recalls the excitement of interdisciplinary broadening when he came onboard as a young neurosurgeon—all building up to the AOSpine Research structure, and the birth of the KF SCI.

“By then we had established a significant research infrastructure in North America, and we had a vision of doing multi-centered clinical research studies.” This is exactly what the KF SCI went on to do. Initially, the Knowledge Forum Trauma and SCI was launched as one study group.

The groups are still working closely together, as Steering Committee member Bizhan Aarabi testifies, but a separation allowed to sharpen the focus. KF Trauma went on to develop Classifications, for KF SCI it meant building on an earlier study showing early surgical intervention had a positive impact on improving neurological outcomes and reducing complications for people with spinal cord injury.

Brave new undertakings

What followed meant stepping into an area completely novel to the AO: an international multi-center randomized controlled trial on a drug, complementing early surgical intervention, to improve outcomes in spinal cord injury. “Through systematic reviews, we decided to focus on Riluzole, a repurposing of an inexpensive drug, approved for reducing neurological deterioration in Amyotrophic Lateral Sclerosis, ALS,” Fehlings explains.

At the time, AOSpine started encouraging partnering with other organizations. KF SCI quickly established strategic partnerships* while making use of the strengths of AOSpine North America. The clinical trial for Riluzole showed promising results, and in collaboration with

other groups, the KF SCI launched the RISCIS trial. “This would have been a major undertaking by any measure. For the AO, it was the first ever large multi-center randomized controlled trial,” Fehlings is proud to say. Currently, the study involves 20 sites, a hundred enrolled patients, and the plan is to reach the enrollment target in three years.

Aarabi is excited the outcomes will have direct implications on patient care, if with the effect from the medication you do not have to wait months to see clinical evidence for recovery of functions. “Ours is a rigorous but a very specialized group. Spinal cord injury is rare, but the chances of recovery really should encourage centers to participate in studies.”

Another big area for KF SCI is the development of clinical practice guidelines and knowledge translation. “We felt that there were big knowledge gaps around the management of traumatic and non-traumatic SCIs, a condition called degenerative cervical myelopathy,” Fehlings explains.

A several-year undertaking of the KF SCI Guidelines Group with a broad range of partnerships** recently published results in an open access Focus Issue in the Global Spine Journal. The guideline indicates that patients with acute spinal cord injury should undergo early surgical intervention when medically feasible, and that surgery is the treatment of choice for patients with a more severe myelopathy.

“But there is still some uncertainty how best to manage patients with mild myelopathy. So, we also defined critical knowledge gaps that will represent areas of research in the future.”



Michael Fehlings and Luiz Vialle moderate. The first ever KF sessions at the Global Spine Conference 2011 in Barcelona were attended by 300 people.

Science in motion

If Bizhan Aarabi is right, the guidelines findings will make life essentially easier for spine surgeons. The KF SCI is keen to move forward in knowledge translation and disseminate the new information to everyone involved in the care of people with cervical myelopathy and spinal cord injury. To alter care, the KF SCI wants to “test drive” the guidelines, and Fehlings would like to see enhanced interaction between education, community development and the area of new technology development in the AO. “It all fits wonderfully to the AO principles as part of the knowledge to action cycle: the community defines the key questions, the researchers come up with solutions, you distill and synthesize the knowledge, disseminate it to the community, and so on.”

Overall, Fehlings sees globalization of research as an extremely positive opportunity. It can widen perspectives on certain conditions and set the stage for impact on a world-wide level. “It is really exciting to think that the work we are doing could have a global impact! We could tailor the guidelines to work in countries with advanced infrastructure, but also in emerging economies where the infrastructure is more challenged.”

Jefferson Wilson also commends the international presence and perspective in the AO, which allows for a more global picture of the actual disease, injury, or clinical epidemiology. “There is an enthusiasm in the AO to get the job done, to make good studies happen, and put personal glory aside,” Wilson continues. He is one of the selected young surgeons to have been invited as associate members into the Knowledge Forums. So far, he is the only associate in KFCSCI, but he hopes to see continued collaborations from participants in all stages of their career.

New generations stepping in

The past two years Wilson has participated in regular discussions with great knowledge experts in the KF SCI, fulfilling his goal of becoming a surgeon scientist in spinal trauma. “It’s really exciting, this is such a rich collaborative environment! I am trying to gain as much wisdom from this group as I possibly can.” Wilson points out that the spinal cord injury patient population is getting bigger and more heterogeneous: the biggest groups affected are no longer young people from motor vehicle accidents or sports injuries, but elderly people with incomplete spinal cord injuries from falls. “Besides looking at changing epidemiology we should derive preventative strategies and specific treatment strategies for the new populations,” Wilson thinks. “I’ve already reached some of my goals. I suppose I’ll spend the rest of my career trying to answer these questions.”

Discoveries and break-throughs are hard to come across in complex spinal cord injury. But with time, the KF SCI trusts they can point to a body of research that has made a difference for human beings with various spinal conditions, including spine trauma and spinal cord injury. “I’d like to see changes in clinical practice with improved clinical outcomes, potentially changes in society with better access to care,” Fehlings envisions, always thinking of the generations to come. “I’d also like to look at the number of people we’ve trained or mentored as fellows, as young faculty, and associates, and to see succession that occurs where young leaders are being developed.”

QUICK FACTS:

- “Burning issues in the treatment of spinal cord injuries—how can AOSpine contribute to improve patients’ lives?” A workshop attended by 300 people at the Global Spine Congress 2011, Barcelona, confirmed interest in topic
- KF Trauma and SCI launched in 2011, co-chaired by Michael Fehlings and Alexander Vaccaro
- KF SCI operates as an independent study group from 2015
- Chairperson Michael Fehlings leads a Steering Committee of 6 members; serves as a member of the AOSpine International Research Commission
- Associate member structure in development, will provide wider regional representation
- Published 22 peer-reviewed journal articles and 30 presentations
- AOSpine Master Series, Volume 7, 2015
- AOSpine Master Series, Volume 8, 2017

STUDY HIGHLIGHTS:

- *RISCIS—ongoing AOSpine International study in partnership with AOSpine North America, the North American Clinical Trials Network (NACTN), Christopher and Dana Reeves Foundation, US Department of Defense, AOSpine International and North America, Ontario Neurotrauma Foundation, Rick Hansen Institute
- SCI Database Merge—merging two existing databases NACTN and STASCIS
- **SCI Guidelines—developed by KF SCI in partnership with AOSpine North America, the Cervical Spine Research Society (CSRS), the Joint Section Neuro-Trauma and Critical Care from the American Association of Neurological Surgeons (AANS) and the Congress of Neurological Surgeons, AOSpine International and North America, NACTN, Christopher and Dana Reeve Foundation; the Guidelines Group brought together representatives from around the world, nurses, orthopedic surgeons, ICU and Emergency Room doctors, rehabilitation specialists, physiotherapists, people with spinal cord injury and NGOs representing them, pre-clinical and clinical epidemiology scientists. Access the Guidelines here: <http://bit.ly/SCIDCMguidelines>

www.aospine.org/kf-sci



AOSpine Knowledge Forum Trauma meeting in Amsterdam, the Netherlands, 2015. From left to right: Jens Chapman, Mechteld Lehr, Said Sadiqi, Frank Kandziora, Cumhur Öner (Chairperson), Klaus Schnake, María Alvarez Sánchez, Alex Vaccaro, Gregory Schroeder, and Shanmuganathan Rajasekaran. Marcel Dvorak, Lorin Benneker, and Emiliano Vialle are missing from the picture.

AOSpine Knowledge Forum Trauma: Systematically bringing the world on the same page

The AOSpine Knowledge Forum (KF) Trauma has been developing basic AO principles, classifications, severity scoring systems, treatment algorithms and outcome measures from the moment it was founded. The simple algorithmic approach allows clinicians to understand the basic trauma mechanisms. And because the systems are repeatable and coherent, AOSpine is putting people from all countries on the same page.

I never thought back then we could accomplish as much as we already have," says Alex Vaccaro. "Before the KFs, we were never really exposed to opinion leaders from different countries, with different perspectives. It stimulated us to ask important topical questions and opened up opportunities we never thought existed."

Vaccaro co-chaired the KF Trauma and Spinal Cord Injury (SCI) in its early days, which was originally launched as one. A growing number of studies led to setting up two groups, allowing both to excel in their key focus areas. To Vaccaro, the KFs are the purest kind of study groups, where physicians decide what is best for research without involvement from companies. "We are looking at topics such as the management of trauma in osteoporosis, and the use of artificial intelligence to understand the classification of fractures; topics that industry might not have an interest in and would not support."



An intense KF Trauma meeting in the early days (Zürich, Switzerland, 2012).

Towards a universal language

The most impactful project of KF Trauma has been the development of the AOSpine Spine Trauma Classification System and the Injury Severity Score. The final part of the system, the occipital cervical injuries, will be launched at the Global Spine Congress in Singapore, in May 2018. "We are systematically using the same approach to cover the entire spinal column and to understand these injuries," Chairperson Cumhur Öner explains. A reiterative methodology involves several work intensive and lengthy assessment cycles. Once the expert group agrees on a final version, a verification is done in the AOSpine community. "We included hundreds of people from all over the world, and sent them cases to classify," Öner explains. "The community was invaluable, it confirmed our system is reliable and useful."

The AOSpine Spine Trauma Classification System is becoming the universal language for trauma, replacing nonspecific descriptors from before. "Earlier, you would call a fracture whatever you liked," Vaccaro says. "With the AO system you immediately know what you are talking about."

KF Trauma's position is strong beyond classifications and the audience of spine surgeons. Recently the group published a Focus Issue, reaching out to the entire trauma community with the latest up to date knowledge, and laying out remaining knowledge gaps. "We have the advantage of being the only global spine trauma study group, there are no rival groups," Öner points out, adding another advantage to their work, the intensive cooperation on overlapping topics with its AO sister groups, KF SCI and KF Tumor.

Painstakingly exploring grey areas

The biggest challenge ahead is the wide treatment variations. There is still a big grey area where guidelines are lacking. "Same injuries are treated with a kind of a benign neglect in some areas, and very aggressively in others, and everyone is equally convinced their philosophy is the right one," Öner says. "We don't yet have the means to understand what is the best way." An on-going parallel cohort study on AOSpine A3/A4 fractures will bring clarity to this in a couple of years. Steering Committee member Lorin Benneker reminds these guidelines are not only important for the patients, but have a wider economic implication. "To get funds back, we must provide the insurers with good clinical data."

Most existing outcome instruments are not suitable for spine trauma patients; they are either too generic or were created for a different patient population. "We wanted a system that was condition-specific for spine trauma, and to measure outcomes separately from patient and surgeon perspectives. In the end, this will be the society's perspective," Öner says, explaining the background for developing the Patient and Clinician Reported Outcome Spinal Trauma (AOSpine PROST and CROST).

AOSpine PROST was realized globally with 10 centers, and it is currently being validated in English and Dutch. A German version will be produced next. The study revealed that patients' expectations are essentially different from what specialists had thought. Conventionally, spine surgeons had used systems developed for lower back pain patients, where the most important item is pain. "Most surgeons thought pain was the most important measure. But for our patients, it is not at all so!" Öner says. "If you break something, you understand that it hurts, which makes the pain more acceptable. These are not chronic patients; getting back to their normal life, recovering physical functions, returning to work, that is the most important thing for them."



"Many discoveries in orthopedic or spine surgery have originally been developed within trauma. Keep an eye on us, and let us know if you have ideas or feedback!" Chairperson Cumhur Öner encourages

Going the extra mile

The KF Trauma Steering Committee is progressing from a group of well-published opinion leaders initiating research, to increasingly involving others in studies. Öner believes the way forward is a balanced geographic distribution and onboarding young surgeons, the global opinion leaders of tomorrow. Recently Emiliano Vialle from Curitiba, Brazil, and Lorin Benneker, from Bern, Switzerland, were invited to the Steering Committee. "It was easy to accept. The KFs are the crown of the AO," Benneker laughs with open admiration for 'the old guys'. He sees them very settled, wanting to bring research to a higher level. "It's not about personal gain. Every member wants to accomplish something in their limited time. That's the fuel that keeps AO on the top, what makes AO so successful. And the strong support from the organization allows people to focus on the research and go the extra mile."



The study group added Best Paper award from the Global Spine Journal to its merits (Global Spine Congress, Milan, Italy, 2017).

Öner encourages the wider AOSpine community to get involved in studies. "It is stimulating and makes you think of these issues." He reminds that trauma was always a good school for understanding and developing basic concepts, often directly applicable in other pathologies.

In Vaccaro's vision, every surgeon throughout the world, regardless of financial status, could use work products of AOSpine to improve patient care. "If we really get artificial intelligence working, you could for example download a free app. A patient comes in, you put the app up, see the radiographs, and immediately you get the recommended treatment, country-specifically, understanding the available resources. That would move the needle in terms of improving the quality of life for people from around the world." Such systematic approaches to trauma and their impact on patient care are the essence of AO also for Öner. "Artificial intelligence will be the next big focus area. If we manage to transfer the understanding to the 21st century, that is going to be a success!"

QUICK FACTS:

- Knowledge Forum Trauma and SCI launched in 2011, co-chaired by Alex Vaccaro and Michael Fehlings
- Operates as an independent study group from 2015
- Chairperson Cumhur Öner leads a Steering Committee of 8 members; serves as a member of the AOSpine International Research Commission
- Associate member structure in development, will provide wider regional representation
- Published 36 peer-reviewed journal articles and 31 presentations
- AOSpine Master Series, Volume 5, 2015, Cervical Spine Trauma
- AOSpine Master Series, Volume 6, 2016, Thoracolumbar Spine Trauma

STUDY HIGHLIGHTS:

- AOSpine Classification Systems: thoracolumbar, subaxial, sacral, and upper cervical (www.aospine.org/classification)
- Outcome Measurement: a universal outcome instrument for spinal trauma
- Published a Focus Issue addressing controversies in spine trauma (JOT September 2017—Volume 31—Supplement 4)

www.aospine.org/kf-trauma



Chairperson S. Tim Yoon, Darrel Brodke, María Alvarez Sánchez (KF Manager), Jeffrey Wang, Zorica Buser, Jong-Beom Park, and Patrick Hsieh attending KF Degenerative/Biologics Steering Committee and Associates meeting (Buenos Aires, Argentina, 2015).

AOSpine Knowledge Forum Degenerative/Biologics: In search of evidence

The current evidence in biologics is severely lacking and there are no reliable comparative studies to guide surgeons' decisions. To increase accountability on a global level, the Knowledge Forum (KF) Degenerative/Biologics has been focusing on biologics for its first four years of existence. Now it is moving into developing the first ever biologics Classification.

Realizing there is a lack of evidence surrounding decision making about biologics, the first Chairperson of KF Degenerative/Biologics, Jeffrey Wang, inspired the study group to cover the full spectrum: past, present, and future. The past meant looking at existing large databases collected by other groups and analyzing the currently available data. The present, includes publishing the evidence generated from these databases and from conducting health technology assessment reviews. For the future, the group is looking to establish an international multicenter prospective biologics database through the DegenPRO study, to be able to understand which biologics work and which don't, with a strong focus on patient reported outcomes.

"We are really trying to raise the bar, to understand the effect of biologics on spine surgery outcomes and to increase awareness of evidence; or rather the lack of it," explains the newly elected Chairperson Tim Yoon. "There is such a big discrepancy in the amount of evidence supporting the use of one biologic versus the other. It is frustrating, how many of our colleagues are unaware of the differences."



Chairperson S. Tim Yoon gathering momentum.

Making the best choice

According to Yoon, AOSpine has no competition in this area. The foundation has been laid to take research to the next level and to ramp up the data collection from all over the world. "Something like this requires a global group like AOSpine," Wang confirms. Companies are creating new biologic products that sound good and may be more effective, but cost much more, raising health care costs without sufficient evidence to support that these new products are any better. "What makes it worse is that surgeons are using these products without understanding the therapeutic benefit and the evidence or lack of it."

Increased accountability is the wider social impact the KF is seeking. "It's not that you should pick based on cost, you should always think what is best for the patient," Wang explains. "But how can you choose what is best when you don't have the evidence? We may be wasting healthcare dollars, but we don't know." The ethical question of using human allograft tissue adds to the need of acquiring more evidence. "Someone has donated their body, and you are creating a commercial product out of their bone. We owe it to them to create the best possible products, so that surgeons can pick the most effective one."

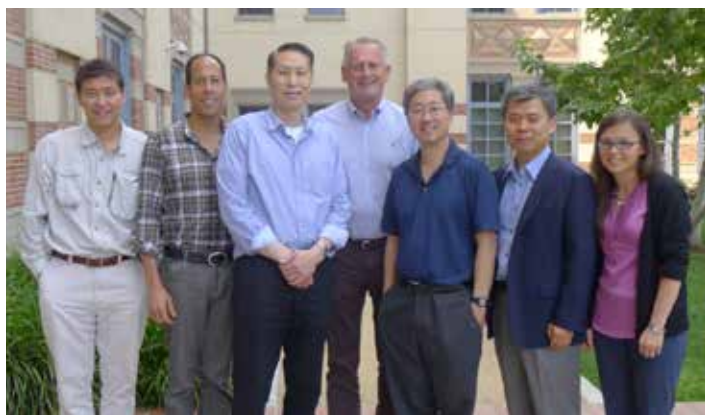
There are several new biologics coming out, and Wang hopes the public, the patients, and especially the surgeons who make the decisions will demand to see the evidence, to prove the products are effective and safe. "We are basing other treatment decisions on evidence, whether to do surgery, what surgery to do, so why not biologics? This will be the measure of our success, to see people demanding evidence."

Branching out

The next immediate goal for the KF is to rapidly expand both in scope and numbers. Gathering momentum for his three-year term, Yoon envisions developing the KF Degen/Biologics into a research group where several sub-studies could be performed in subsets of degenerative patients focusing on cervical, minimally invasive surgery, and so on. The area is broad, and the expertise needed is wide.

With the results from the DegenPRO study, the group hopes to contribute meaningful evidence to the research community. In parallel, in the footsteps of the AO pioneers, the KF is also developing the first ever Osteobiologics Classification, hoping it will become the standard like the other AO Classifications. Developing treatment guidelines through the DegenPRO study and the Osteobiologics Classification would enable more tailored treatment procedures to the patients and reduce the need for revision surgeries.

Zorica Buser, Associate Member of the KF, reminds that lower back pain is a leading cause of disability worldwide both in developed and developing countries. "We are constantly advancing our knowledge in spine care. However, we still see an increase in the number of spine fusion procedures, for example, with the growing aging population. Biologics really play an instrumental role in the surgical success."



Launching the KF Degenerative/Biologics with Dan Riew, Jim Youssef, Jeffrey Wang, Hans Jörg Meisel, S. Tim Yoon, Jong-Beom Park, and Niccole Germscheid (Los Angeles, CA, USA, 2013).

QUICK FACTS:

- KF Degenerative/Biologics launched in 2013, the youngest of the AOSpine Knowledge Forums, first chaired by Jeffrey Wang
- Chairperson S. Tim Yoon leads a Steering Committee of 5 members; serves as a member of the AOSpine International Research Commission
- Wang continues in the AO Foundation Board and as a KF Steering Committee member
- Associate member structure in development, will provide wider regional representation
- Published 11 peer-reviewed journal articles and 3 presentations

STUDY HIGHLIGHTS:

- DegenPRO database—prospective study on Osteobiologics, now opening to members
- Osteobiologics Classification—evaluates the level of evidence supporting use of bone grafts

www.aospine.org/kf-degen

Creating the best mix

The Knowledge Forum is a mix of surgeons and non-surgeons, research driven clinicians and clinically driven researchers. The associate members play a key role and Buser brings crucial basic science and translational knowledge to the table. "In a translational field like spine you really need both, basic science fundamentals and clinical evidence." She is impressed by the huge potential of the group and the way it works. "Everyone brings in ideas and contributes to all steps. It's a collection of great minds."

AOSpine members benefit widely from the KF studies, from the evidence, the ideas, the classifications. Any AOSpine member can also get directly involved in the KF Degenerative/Biologics. "You don't have to be a leader of AOSpine in your country, you don't have to be an officer, it's all based on merit and accountability," Wang assures. "We have the cream of the crop, but we are moving into new topics and must include more members of AOSpine from around the world," Wang says.

Together with Yoon, Wang welcomes dedicated new people to participate. People who can demonstrate they share the vision, are able to contribute, and provide patient data to their degenerative studies. "AO is an organization with no limits. You can do great things through this organization," Wang concludes.



Jong-Beom Park and Hans Jörg Meisel discussing publication strategy and Knowledge transfer (Los Angeles, CA, US, 2014).



First discussions on the DegenPRO study with Jeffrey Wang, Darrel Brodke, and Hans Jörg Meisel (Los Angeles, CA, US, 2014).



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