



International Report 2021

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## Statements about Spine Tango

*“Spine Tango is the ideal format to collect standardised diagnostic & treatment data as well as PROMs on both conservative and surgical treatments on a national level. Physicians’ forms are sufficiently detailed and COMI is concise enough to enhance response rates. The Spine Society of Belgium has been carefully considering all available options and unanimously decided to collaborate with Spine Tango for its joint-ventures with Belgian Health Authorities.”*

Bart Depreitere, Spine Society Belgium (SSBe), Belgium

*“We have used Spine Tango since 2011 with over 12,000 patients on the system. We have published research, measured our own performance and changed our practice due to the information we have gained from the system. It is a vital part of our everyday practice.”*

Tim Pigott, former Consultant Neurosurgeon, Walton Centre for Neurosurgery, United Kingdom

*“As an international registry that captures conservative and surgical treatments, EUROSPINE Spine Tango offers unique research opportunities like multinational data and a large network of global and interprofessional collaborations in Europe and beyond.”*

Professor M. Nordin, Departments of Orthopedic Surgery and Environmental Medicine, New York University, New York, NY, USA

*“Having used Spine Tango and patient outcomes routinely in our secondary care osteopathy service, I believe that the benefits for conservative clinicians are clear. For individual practitioners, the ability to review and analyse your performance in easy steps makes a huge difference to clinical life. Registry participation offers a chance to refine practice based on evidence and performance, and grow as an evidence-based clinician. Once established on the registry, you can publish outcome research and engage with a wider community of spinal clinicians, which makes for a more rewarding career. Yes, there is a commitment in paperwork, but it is less than expected and the benefits are greater.”*

Samuel Morris, Calderdale Royal Hospital, MSK department, United Kingdom

*“Partnering with Spine Tango is an imperative pillar of our strategy to support clinical research, quality assurance of our spinal treatments and their safety and efficacy outcomes. Access to the registry data via the Spine Tango Subscriber Services provides Medtronic with systematic, aggregated Real World Data on our implants and therapies. This data is used for Research & Development, Quality Assurance and Regulatory Compliance, so our users continue to have access to the highest quality spinal implants available.”*

Floris van de Geijn, Director Medical Communication, Medtronic, Tolochenaz, Switzerland

*“To qualify and re-qualify for certification, EUROSPINE Surgical Spine Centres of Excellence (SSCoE) are required to monitor their treatment quality by collecting and evaluating pre- and postoperative data on all spine patients. EUROSPINE’s Spine Tango offers powerful generic and customisable registry tools for the documentation and evaluation of spinal treatments. Besides clinical data on surgical interventions, data on implants, clinical scores, patient-reported outcome measures, follow-ups as well as non-surgical treatments can be registered and analysed.”*

Thomas R. Blattert, Member of the Surgical Spine Centres of Excellence Task Force, Interdisciplinary Spine Center, Ingolstadt, Germany

**Everard Munting**

President of  
EUROSPINE

**Marco Teli**

President-elect of EUROSPINE  
Chair of the ST Registry

## Foreword by the President and the Chair of Spine Tango

In this second year of COVID-19 Pandemic and despite the continuing challenges faced by EUROSPINE and hospitals, the EUROSPINE Spine Tango registry project has continued to grow.

The mandatory Swiss Implant Registry (SIRIS Spine) was successfully launched in January 2021. The SIRIS Spine is implemented on the same registry platform as Spine Tango and has a compatible data structure to Spine Tango. More than 100 departments joined SIRIS Spine in Switzerland and registered over 4,000 lumbar and lumbo-sacral spondyloses (=inclusion criteria) with 15,000 individual implants. The implementation of SIRIS Spine has proved the capability of Spine Tango to tailor the service portfolio to the needs and requirements of individual national societies. We hope this will prompt other national societies to implement their national registries based on the Spine Tango platform, either using it as is or tailoring it to meet their specific needs.

In parallel, the international Spine Tango registry was further developed. The implant catalogue was further enriched and included 180,000 individual implants from 42 manufacturers. To simplify the implant registration, a favourite function was implemented and allows users to save his or her favourite implants for a quick load in the future. Furthermore, users may choose between regular implant registration based on the article number and simpler one based on implant manufacturer and a brand name.

The platform became more multilingual as before and support today English, French, German, Italian, Portuguese, and Spanish languages.

Our goal for 2022 is to implement online statistics and electronic-PROMs to assist users with patient's follow-ups and quality monitoring.

Many thanks to all Spine Tango users and supporters. We are delighted with your interest in Spine Tango and hope you enjoy reading this report.

Kind regards,

Everard Munting and Marco Teli

## About Spine Tango

Spine Tango is an international web-based registry that collects and evaluates data on treatment effectiveness, patient safety and best practice for quality assurance and research on all surgical and non-surgical treatments.

The registry was created and is being continually developed to serve individual users and hospitals, groups of hospitals and national societies.

The idea for an international registry to capture data on spine treatments was proposed almost two decades ago in response to a growing demand for outcome measurement and quality assurance. In 2000, development of Spine Tango began under the auspices of EUROSPINE, the Spine Society of Europe and in collaboration with the Institute for Evaluative Research in Orthopaedic Surgery at the University of Bern, Switzerland. The Spine Tango registry was first launched in 2002, while the first web-based version went online in 2004. Since May 2019, the registry is hosted by NEC Software Solutions (formerly Northgate Public Services) in the UK. By the end of 2021 the registry included over 800,000 forms captured.

### Key benefits

#### Key benefits for individual users

- **Common European approach for registering spinal treatments** (conservative and surgical) as well as **spinal implants** in a structured way to foster a common language (data structure, terms, definitions, outcome measures, implant library, etc.)
- **Personal research database**
- **Access to a variety of valuable functions including** User, hospital and national benchmarking reports comparing data to pooled data from other hospitals as evidence of performance and quality assurance tool
- **Access to the registry data for research purposes** (over 800,000 forms from five continents) and **participation in an international research network**
- **Access to all relevant outcome instruments in various languages** (COMI, EQ5D, SF36, SRS30, etc.)
- **Modern and continually-evolving registry platform including:**
  - Compliance with the European General Data Protection Regulation (GDPR)
  - Highest standards in information security (ISO27001)
  - Registry platform as a web-application (the registry may be accessed from any location via the internet)

- Electronic outcome collection using ePROMs (automatically sends forms to patients via email and/or smartphone on a scheduled basis with no administrative burden for hospitals)

#### Key benefits for national spine societies

- **Access to available data, know-how and infrastructure incl. European Implant Library** (make it your own)
- **Data aggregation to produce statistically robust analyses sooner** (e.g. for national surveillance purposes)
- **'Develop once and share' platform features** (access to the European Spine Registry generic services including all existing and future tools and functions at no additional cost)
- **Flexible modular approach** that allows societies to tailor the registry to their individual needs while ensuring a minimal set of common data
- **Ability to create a personalised spine registry** based on Spine Tango content and infrastructure (optional)
- **Quality assurance and research tool** as well as proof of performance
- **Opportunity to develop national best practice standards** in spine care
- **Continuous collaborative development of the registry approach** in accordance with society needs
- **A full voting position on the Spine Tango Task Force** (Spine Tango steering committee responsible for further development of the registry)
- **Innovative financial model** based on subscription funding from industry reporting that applies certain income to reduce registry costs, registration costs and/or yield shared profits, after fixed costs have been covered

## Governance

The Spine Tango Task Force (STTF) acts as the registry steering committee and as an advisory group for clinical and methodological questions related to improvements in data collection, development of new forms, reports, and all new and ongoing research projects of participating clinics.

The objectives of the internationally-composed STTF are to develop and implement strategies to further develop the registry, increase its value for the users and stakeholders: patients, insurance companies, MedTech companies and health authorities.



STTF members: Marco Teli (chair, surgery, UK), Emin Aghayev (registries, CH), Bart Depreitere (surgery, BE), Sabrina Donzelli (conservative medicine, IT), Jiří Dvořák (sport medicine, CH), Josef G. Grohs (surgery, AT), Beat Leimbacher (delegate of ExCom, CH), Andrea Luca (surgery, IT), Everard Munting (surgery, BE), Samuel Morris (osteopathy, UK), and Pedro dos Santos (surgery, PT).

## Data host

Technical and statistical support for the registry is provided by a dedicated team at NEC Software Solutions. The project team is based in the UK and provides expertise in registry software development, stakeholder management, epidemiology, and statistics.

NEC has been the technology and implementation service provider for the National Joint Registry (NJR) in the UK for over 16 years. The NJR is probably the largest orthopaedics registry in the world with more than 3 million patient records. NEC hosts a number of other medical registries such as the National Vascular Registry (NVR) and the Indian Joint Registry (IJR) – all of which collect data to help clinicians, regulators and industry deliver evidence-based treatments for patients.

For more information, please visit:

- [News: Evidence to improve outcomes for spinal patients with EUROSPINE registry](#)
- [Registries for the best healthcare insight - NEC Software Solutions \(necsws.com\)](#)

## How to join

The Spine Tango registry is a EUROSPINE member benefit. If you are not currently a member and your department or hospital does not have a EUROSPINE member on staff, you may still use Spine Tango provided that you or one staff member of your department or hospital become a EUROSPINE member within one year of your Spine Tango registration.

Individual users and hospitals can join the registry in 3 steps:

### Step 1



Download and complete the [Hospital/User Registration Form](#)

### Step 2



Download, read, complete and sign the [General Terms & Conditions](#) (see [help](#) for assistance).

### Step 3



Send both completed forms to [spinetango@eurospine.org](mailto:spinetango@eurospine.org).

Once EUROSPINE has received your registration request, EUROSPINE will approve it and provide you (and your colleagues in the case of multiple users) with your account details. Then you can start using the registry.

For more information, please visit [EUROSPINE - New Users](#)

## Participation

The underlying principles for participation in the Spine Tango registry are described in the [General Terms & Conditions](#).

## Information security and data protection

The secure and confidential handling of patient and clinical data is a fundamental part of the Spine Tango service provided by NEC. In delivering services to their clients, NEC manages confidential data relating to millions of citizens and patients in the UK and overseas. This not only involves technical solutions to protect the data, but also robust processes and procedures surrounding data access, based upon legislation and industry best practice. Given the nature of the data processed by NPS, security and governance are afforded the highest priority.

Spine Tango is compliant with the *European General Data Protection Regulation* (GDPR) with the highest standards in information security applied (ISO27001).

In certain instances, personal health information may be provided to organisations in some countries where the GDPR does not apply. Where this is the case, EUROSPINE will enter into individual data-sharing agreements based on the requirements of the GDPR. This will ensure that the data are afforded the necessary levels of information governance and security.

Furthermore, it is the responsibility of the individual or organisation (the 'Participant') to ensure that all necessary agreements are obtained from their institution (and can be made available on demand) in respect to any local laws, guidelines, 'best practice', ethical requirements, etc. In particular, the Participant is explicitly responsible for obtaining and documenting each patient's informed consent for the use of the patient's data for the purposes of research and quality assurance in the registry. The participant must also warrant that all necessary consents and approvals required for processing all information relating to an identified or identifiable natural person to be processed under this agreement have been obtained.

Upon registration of a new patient, the registry platform requires a confirmation that informed patient consent has been obtained.

For more detailed information on data security please read the [FAQs on data protection and information security](#).

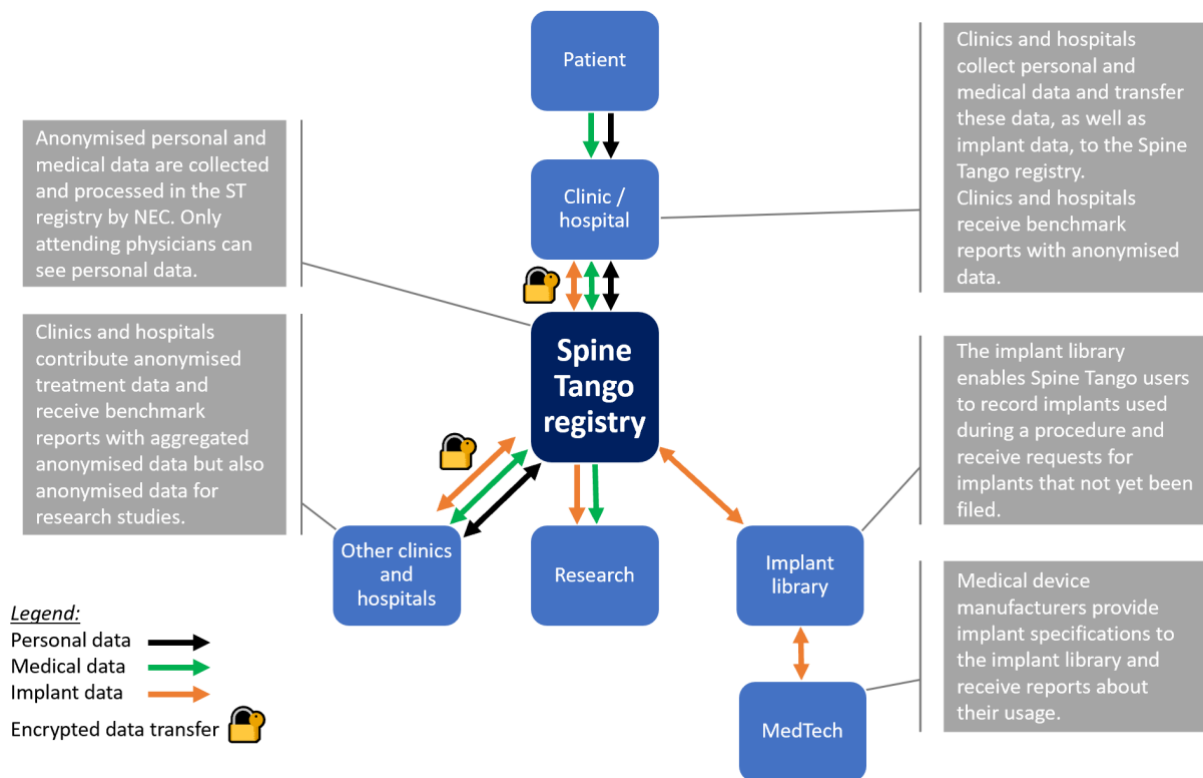


Figure 1. Spine Tango data streams

## Data capture

The goal of generating a comprehensive database is achieved by collecting both patient data and clinical / physicians' data.

**The four following data entry methods (or combinations thereof) are currently used for Spine Tango (Figure 2):**

1. Online data entry via web-interface (no software installation required)
2. OMR (Optical Mark Reader) scanner-assisted entry of paper forms on-site
3. Data push using web-service
4. Online implant data capture with handheld barcode scanner

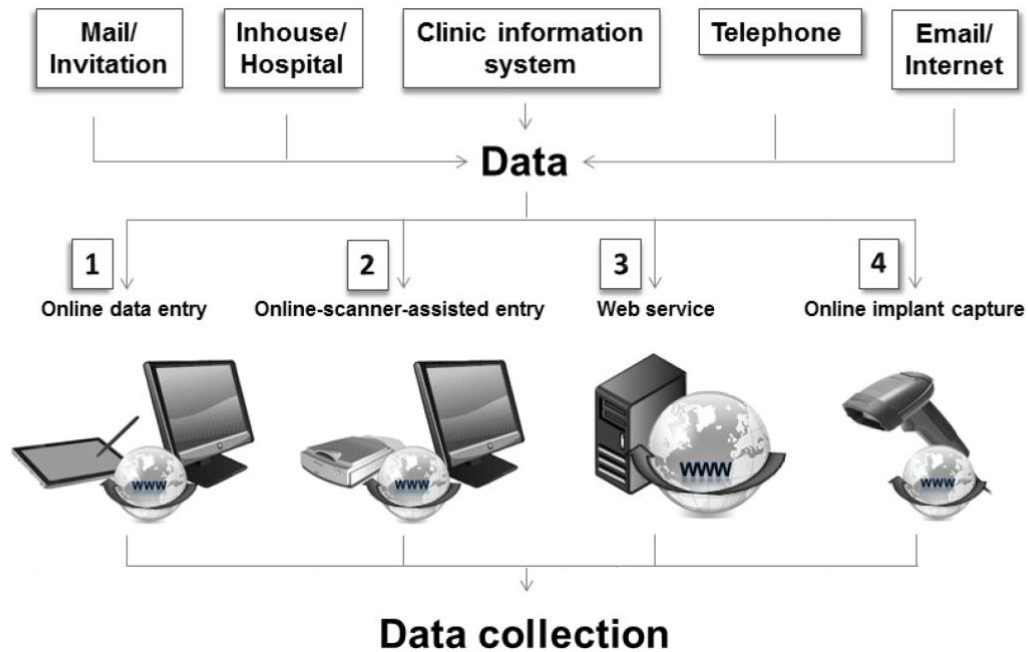


Figure 2. Methods of data entry

## A complete case

The result of a surgical intervention should be recorded when the outcome can be considered definitive. In most spinal surgery cases, assessment three months after surgery predicts outcomes well at later follow-up<sup>1</sup>. Figure 3 and Figure 4 illustrate the steps leading to the capture of a fully-documented treatment<sup>2</sup>.

<sup>1</sup> Mannion AF, Porchet F, Kleinstück FS, Lattig F, Jeszenszky D, Bartanusz V, et al. The quality of spine surgery from the patient's perspective. Part 1: The Core Outcome Measures Index in clinical practice. *Eur Spine J.* 2009;18(Suppl 3):S367–73.

<sup>2</sup> Zweig T, Mannion AF, Grob D, Melloh M, Munting E, Tuschel A, et al. How to Tango: A manual for implementing Spine Tango. *Eur Spine J.* 2009;18(Suppl 3):312–20.

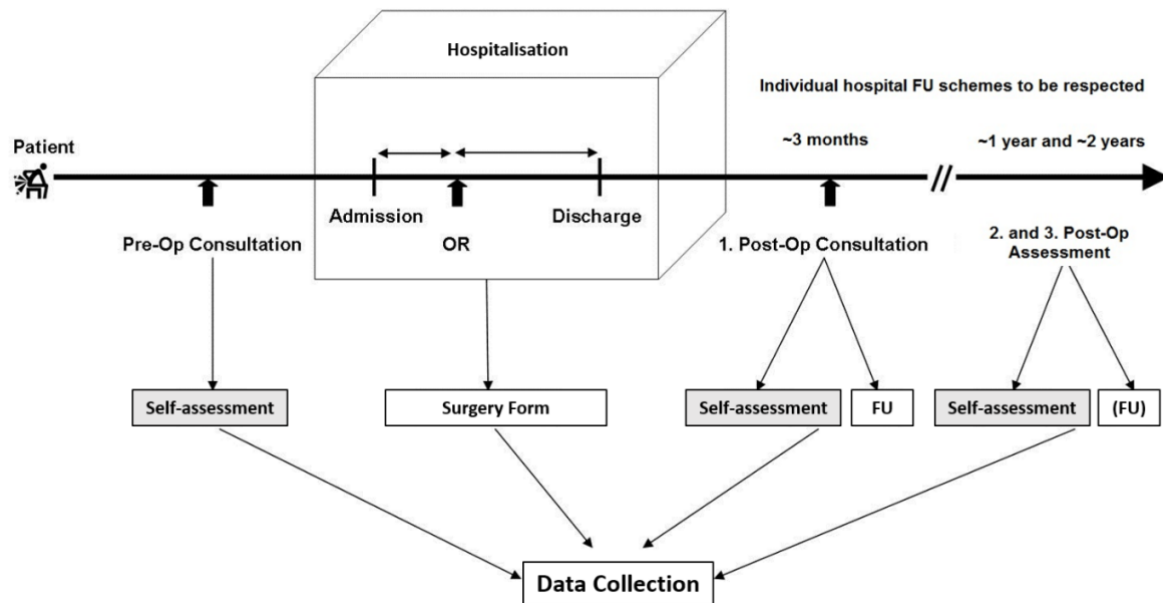


Figure 3. Timing of data collection for a complete Spine Tango case

EUROSPINE encourages one physician- and one patient-reported follow-up in the first year after surgery, ideally more than three months after surgery. Further patient follow-ups at one and two years after surgery are strongly encouraged with documentation of complications possible at any time during the postoperative period.

Patient reported outcomes captured both pre- and post-operatively with the Spine Tango Patient Self-Assessment form, which includes the Core Outcome Measure Index (COMI) for neck and back problems, have become an essential part of the Spine Tango documentation<sup>3</sup>.

<sup>3</sup> Mannon AF, Elfering A, Staerke R, Junge A, Grob D, Semmer NK, et al. Outcome assessment in low back pain: how low can you go? *Eur Spine J.* 2005;14:1014–26.

# NEC

**EURO** SPINE  
**SPINE** TANGO

## How does it work?



Figure 4. Process of data collection from the spinal surgery to the reports

## Data analysis and research

Spine Tango supports meaningful data analysis to further scientific knowledge and improve the quality of patient care. To this end, all users have access to epidemiological and statistical expertise from our data host, NEC. The utility of the data is evident in the high-quality scientific output and increasing interest in using Spine Tango as a model for national spine registries.

Scientific articles using Spine Tango data are increasingly being published and cited in peer-reviewed literature and recognised as outstanding contributions to scientific knowledge<sup>4</sup>. Various statistical methods are utilised in Spine Tango research, including descriptive analyses for data exploration, parametric and non-parametric tests, uni- and multi-variate linear and logistic regression analyses<sup>5,6,7,8,9</sup> and inverse probability of treatment weighting using the propensity score<sup>10</sup>. Comparative effectiveness of research studies across different spine registries have also been published<sup>11,12</sup>. In addition to clinical studies, a multitude of reliability

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<sup>4</sup> Staub LP, Ryser C, Röder C, Mannion AF, Jarvik JG, Aebi M, et al. Total disc arthroplasty versus anterior cervical interbody fusion: use of the Spine Tango registry to supplement the evidence from randomized control trials. *Spine J.* 2016;16(2):136–45.

<sup>5</sup> Aghayev E, Mannion AF, Fekete TF, Janssen S, Goodwin K, Zwahlen M, Berlemann U, Lorenz T; [Risk Factors for Negative Global Treatment Outcomes in Lumbar Spinal Stenosis Surgery: A Mixed Effects Model Analysis of Data from an International Spine Registry](#). *Spine Tango Registry Group. World Neurosurg.* 2020 Apr;136:e270-e283. doi: 10.1016/j.wneu.2019.12.147. Epub 2019 Dec 31. PMID: 31899404

<sup>6</sup> Sobottke R, Aghayev E, Röder C, Peer E, Delank SK, Zweig T. Predictors of surgical, general and follow-up complications in lumbar spinal stenosis relative to patient age as emerged from the Spine Tango Registry. *Eur Spine J.* 2012;21:411–7.

<sup>7</sup> Kleinstueck FS, Fekete T, Jeszenszky D, Mannion AF, Grob D, Lattig F, et al. The outcome of decompression surgery for lumbar herniated disc is influenced by the level of concomitant preoperative low back pain. *Eur Spine J.* 2011;20:1166–73.

<sup>8</sup> Lattig F, Grob D, Kleinstueck FS, Porchet F, Dezsö A, Ae J, et al. Ratings of global outcome at the first post-operative assessment after spinal surgery: how often do the surgeon and patient agree? *Eur Spine J.* 2009;18(Suppl 3):S386–94.

<sup>9</sup> Kleinstück FS, Grob D, Lattig F, Bartanusz V, Porchet F, Jeszenszky D, et al. The Influence of Preoperative Back Pain on the Outcome of Lumbar Decompression Surgery. *Spine (Phila Pa 1976).* 2009;3434(11):1198–203.

<sup>10</sup> Munting E, Röder C, Sobottke R, Dietrich D, Aghayev E. Patient outcomes after laminotomy, hemilaminectomy, laminectomy and laminectomy with instrumented fusion for spinal canal stenosis: a propensity score-based study from the Spine Tango registry. *Eur Spine J.* 2015;24:358–68.

<sup>11</sup> Burkhardt J-K, Mannion AF, Marbacher S, Dolp PA, Fekete TF, Jeszenszky D, et al. A comparative effectiveness study of patient-rated and radiographic outcome after 2 types of decompression with fusion for spondylotic myelopathy: anterior cervical discectomy versus corpectomy. *Neurosurg Focus.* 2013;35(1):E4.

<sup>12</sup> Aghayev E, Henning J, Munting E, Diel P, Moulin P, Röder @bullet C. Comparative effectiveness research across two spine registries On behalf of the SWISSspine and Spine Tango Registry groups. *Eur Spine J.* 2012;21:1640–7.

and validation studies of the patient Core Outcome Measures Index (COMI) in different languages have been performed and published in the last decade<sup>13,14,15,16,17,18,19,20</sup>.

The comprehensive assessment of the performance of an implant or treatment in spine surgery requires the evaluation of several outcomes as well as an adjustment for the case mix. Depending on the scientific question, outcomes of interest could include those related to safety (complications and reoperations), the patient's perspective (pain, satisfaction, quality of life), the physician's follow-up (achievement of treatment goals), or an economic perspective (length of hospital stay, surgery time). Variables used to adjust for case mix can include age, sex, BMI, duration of symptoms, previous treatment, and any co-morbidity. Clearly formulated goals for data analysis defined in a detailed study plan, and a consensus among registry stakeholders are all required.

## Advances and Achievements in 2021

### Cooperation with Swiss Implant Registry (SIRIS) Foundation

In May 2020, EUROSPINE signed an agreement with the SIRIS Foundation in Switzerland to implement and operate the Swiss Implant Registry for Spine (SIRIS Spine) starting from January 2021. The positive feedback we received in 2021 after national roll-out in Switzerland is a success. Over 100 departments joined SIRIS Spine and registered over 4'000 lumbar and lumbo-sacral spondyloses with 15'000 individual implants, which were mandatory for the registration in Switzerland. The Spine Tango team prepared the next enhancement step of Swiss registry to include percutaneous vertebroplasty and kyphoplasty starting from 2022.

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<sup>13</sup> Genevay S, Marty M, Courvoisier DS, Foltz V, Mahieu G, Demoulin C, et al. Validity of the French version of the Core Outcome Measures Index for low back pain patients: a prospective cohort study. *Eur spine J.* 2014;23(10):2097–104.

<sup>14</sup> Storheim K, Brox JI, Løchting I, Werner EL, Grotle M. Cross-cultural adaptation and validation of the Norwegian version of the Core Outcome Measures Index for low back pain. *Eur spine J.* 2012;21(12):2539–49.

<sup>15</sup> Miekisiak G, Banach M, Kiwic G, Kubaszewski L, Kaczmarczyk J, Sulewski A, et al. Reliability and validity of the Polish version of the Core Outcome Measures Index for the neck. *Eur spine J.* 2014;23(4):898–903.

<sup>16</sup> Qiao J, Zhu F, Zhu Z, Xu L, Wang B, Yu Y, et al. Validation of the Simplified Chinese version of the Core Outcome Measures Index (COMI). *Eur spine J.* 2013;22(12):2821–6.

<sup>17</sup> Klemencsics I, Lazary A, Valasek T, Szoverfi Z, Bozsodi A, Eltes P, et al. Cross-cultural adaptation and validation of the Hungarian version of the Core Outcome Measures Index for the back (COMI Back). *Eur spine J.* 2016;25(1):257–64.

<sup>18</sup> Nakhostin Ansari N, Naghdi S, Eskandari Z, Salsabili N, Kordi R, Hasson S. Reliability and validity of the Persian adaptation of the Core Outcome Measure Index in patients with chronic low back pain. *J Orthop Sci.* 2016;21(6):723–6.

<sup>19</sup> Van Lerbeirghe J, Van Lerbeirghe J, Van Schaeybroeck P, Robijn H, Rasschaert R, Sys J, Parlevliet T, Hallaert G, Van Wambeke P, Depreitere B. Cross-cultural adaptation and validation of the Dutch version of the core outcome measures index for low back pain. *Eur Spine J.* 2018 Jan;27(1):76-82.

<sup>20</sup> Mohammadi HR, Azimi P, Zali A, Montazeri A. An outcome measure of functionality and pain in patients with low back disorder: A validation study of the Iranian version of Core Outcome Measures Index. *Asian J Neurosurg.* 2015;10(1):46.



## Cooperation with national spine societies in other countries

Collaboration with national spine societies in other countries was pursued. The team developed and submitted a well-thought-out proposal for re-launching the German Spine Registry in close collaboration with best-practice partners. Although the German Spine Society did not accept the proposal, it was an excellent opportunity to prove our capabilities to a wide range of spine specialists. We initiated additional e-workshops with other national spine societies, which clearly indicates the growing interest in our Spine Tango program with the Austrian Spine Society and one with the Slovenian Spine Society, which resulted in an apprehension to brainstorm an opportunity to adopt Spine Tango as a platform for their national registry.

## Cooperation with hospitals

The number of active Spine Tango hospitals remained rather stable, while over 100 new departments joined the platform in Switzerland within the frames of the mandatory registry in Switzerland. The overall number of registered cases increased in comparison to 2020, probably due to the introduction of the mandatory registry in Switzerland (SIRIS).

A new generation of detailed hospital benchmarking reports was developed in collaboration with various stakeholders (view [sample report](#)). These reports include information on hospitals' activity, describe patient profiles and perioperative characteristics of treated patients as well as undertaken treatments, and evaluate treatment outcome including complication types, revisions, and PROMs.

## New medical device regulation and cooperation with the MedTech industry

The Spine Tango implant library was launched in spring 2020. The implant catalogue included in 2021 specification on 180,000 individual implants from 42 manufacturers.

Medical device manufacturers upload and regularly update their implant specifications. Spine Tango implant registration is currently based on structured implant data. Registry users can either scan the barcode or QR-code of the implant, search for the implant in the library or add the implant from their favourites list.

Collecting structured implant data by article number opens new opportunities for accurate evaluation and reporting of implant-based surgery. Furthermore, the accurate registration of implants enables registries to disseminate information to hospitals on potential recalls of medical devices.

Several medical device manufacturers have subscribed for regular implant reporting. Soon anonymised implant data should also be made available to manufacturers via a separate online platform.

For more information for medical device manufacturers can be found on our dedicated site [EUROSPINE - Implant Supplier](#).

## Additional features

In June 2020, a Spine Tango user survey was conducted. Based on received feedback, user requirements and wishes have been prioritised and are now being implemented step-by-step. Namely, online statistics and electronic PROMs will soon be available to hospitals directly on the platform.

## User support and user documents

Multiple video tutorials were created and are available on our webpage to facilitate usage of the registry [EUROSPINE - Video Tutorials](#).

**Information portfolios** for [hospitals](#) and [implant manufacturers](#) have been developed.

[FAQs on data protection and information security](#) have been produced.

An [information leaflet for patients](#), which informs patients about the Spine Tango registry has been published.

Today, Spine Tango has more presence than ever on LinkedIn, YouTube, and Twitter to reach a broader audience.

## Acknowledgment

We wish to thank Spine Tango registry participants for their unwavering support in spite of the pandemic. It is these contributions that make it possible to reflect the daily practice of spinal care through quality assurance and research.

# Selected statistics

## World map

The Spine Tango registry and the majority of participating hospitals are based in Europe. Hospitals from many other countries are also currently participating (or have previously participated) in the registry, as illustrated in the following three maps. This international distribution demonstrates the need for a common language in the registration of spinal treatments and their outcomes, which in turn will lead to the standardisation of spinal care and improved efficiency.

All following maps are based on registry data collected up to 31 December 2021.

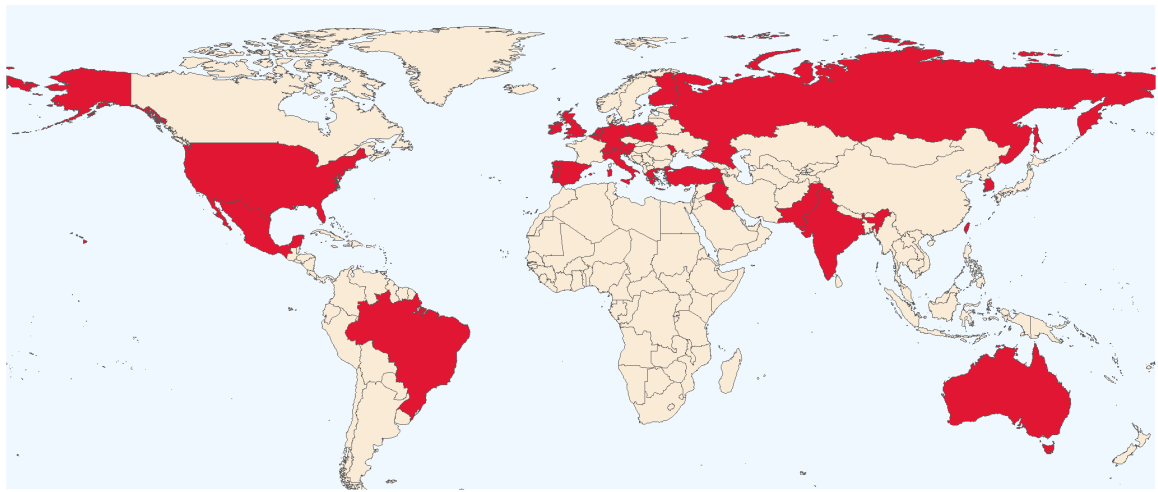


Figure 5. Global overview of origin of participants in the registry

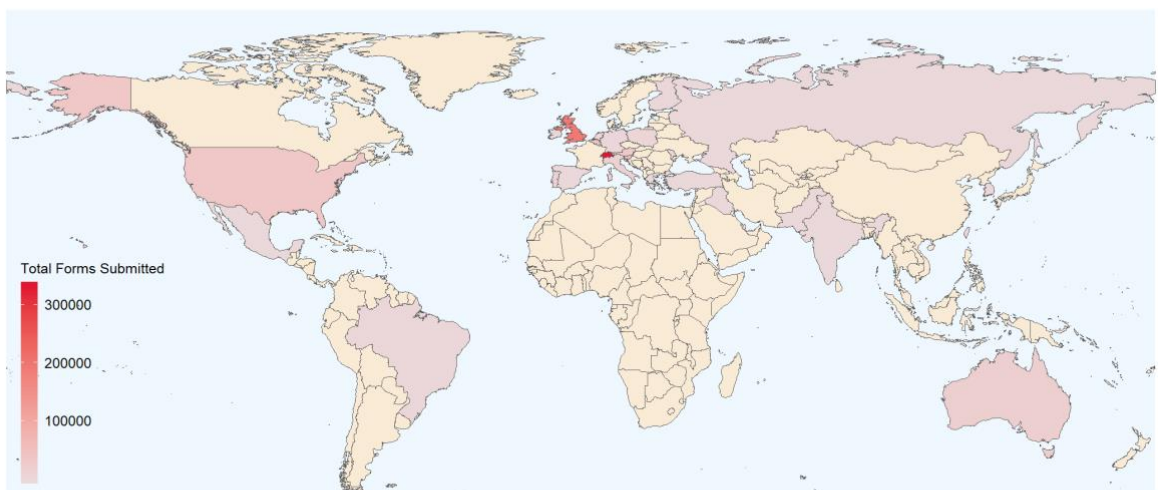


Figure 6. Global overview of submitted forms by country

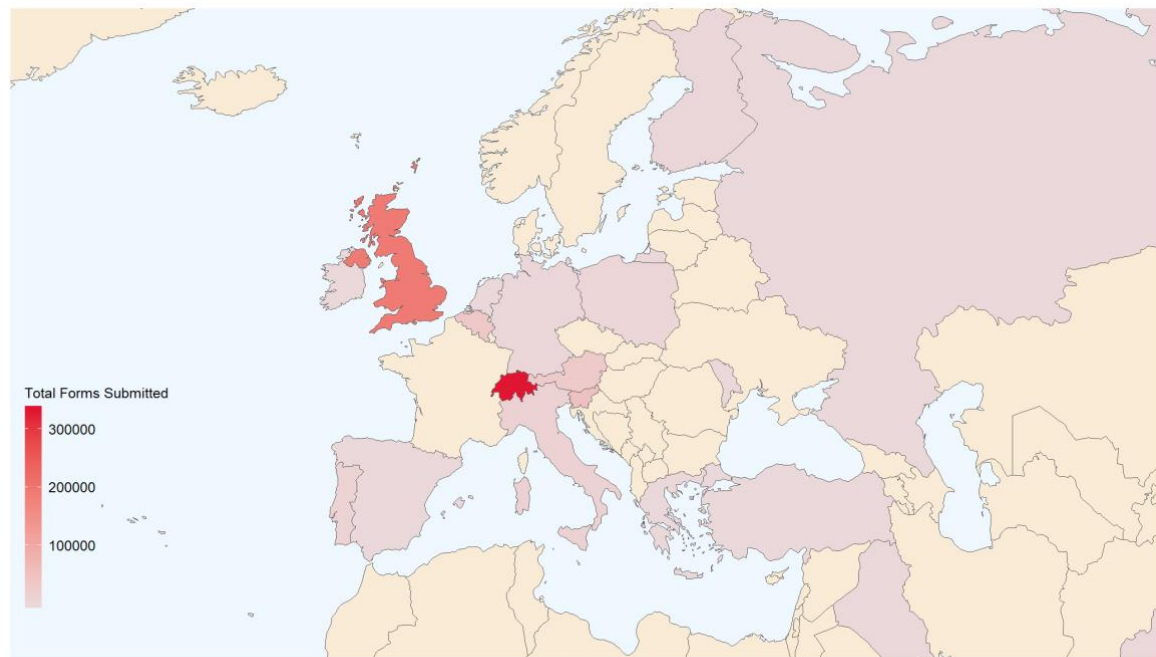


Figure 7. Overview of submitted forms of the participants by country in Europe

## Overall data growth by form type

The number of documented forms in the registry increases each year. After a significant drop in 2020, the number of documented forms in 2021 has picked up again. The drop in 2020 was probably related to the changes of host and transition phase as well as the COVID 19 pandemic.

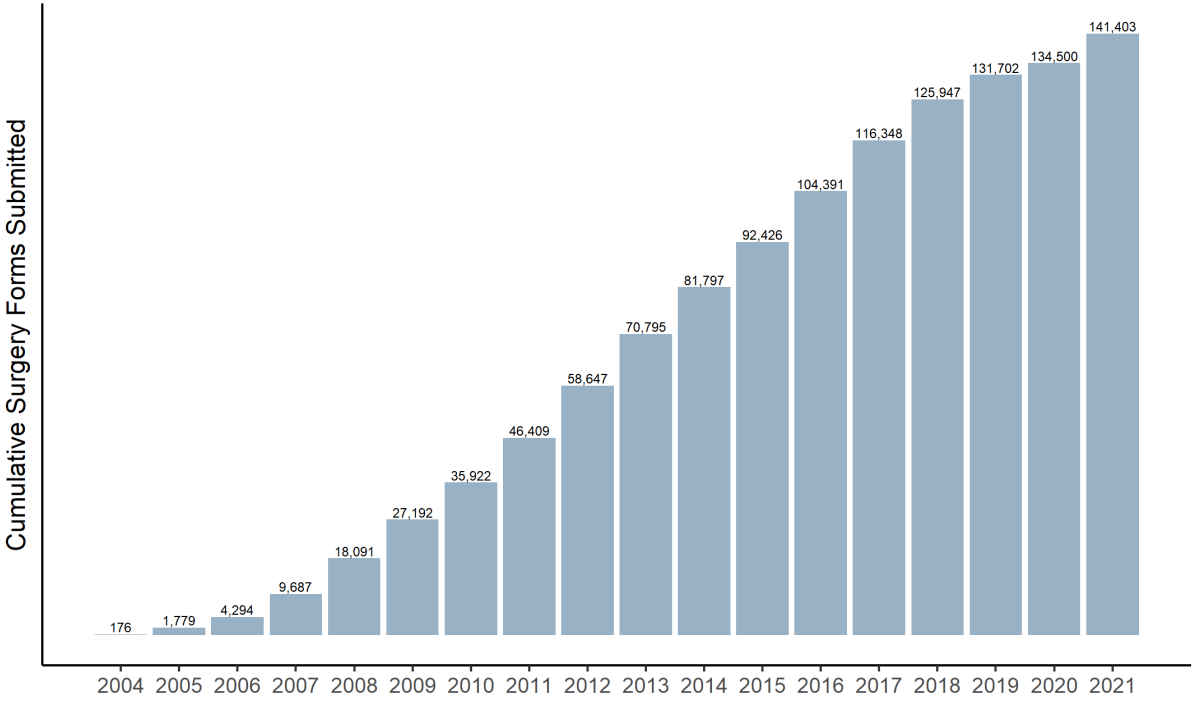


Figure 8. Cumulative Surgery forms

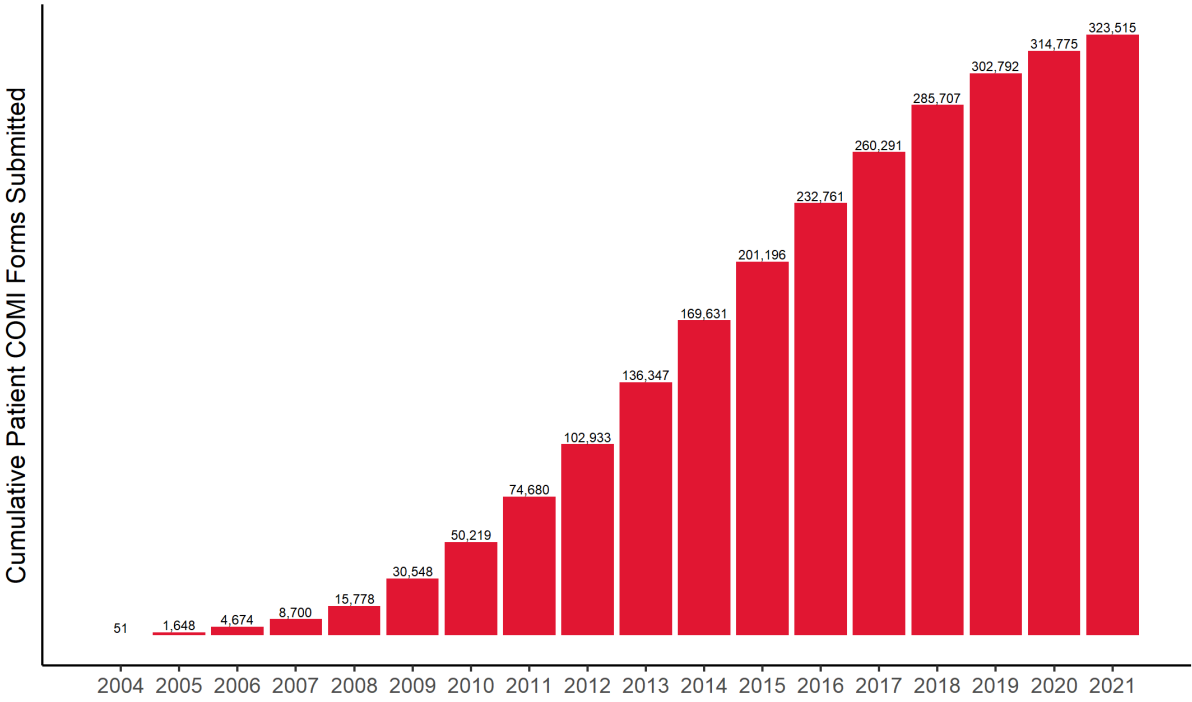


Figure 9. Cumulative COMI forms (both surgery and conservative COMI)

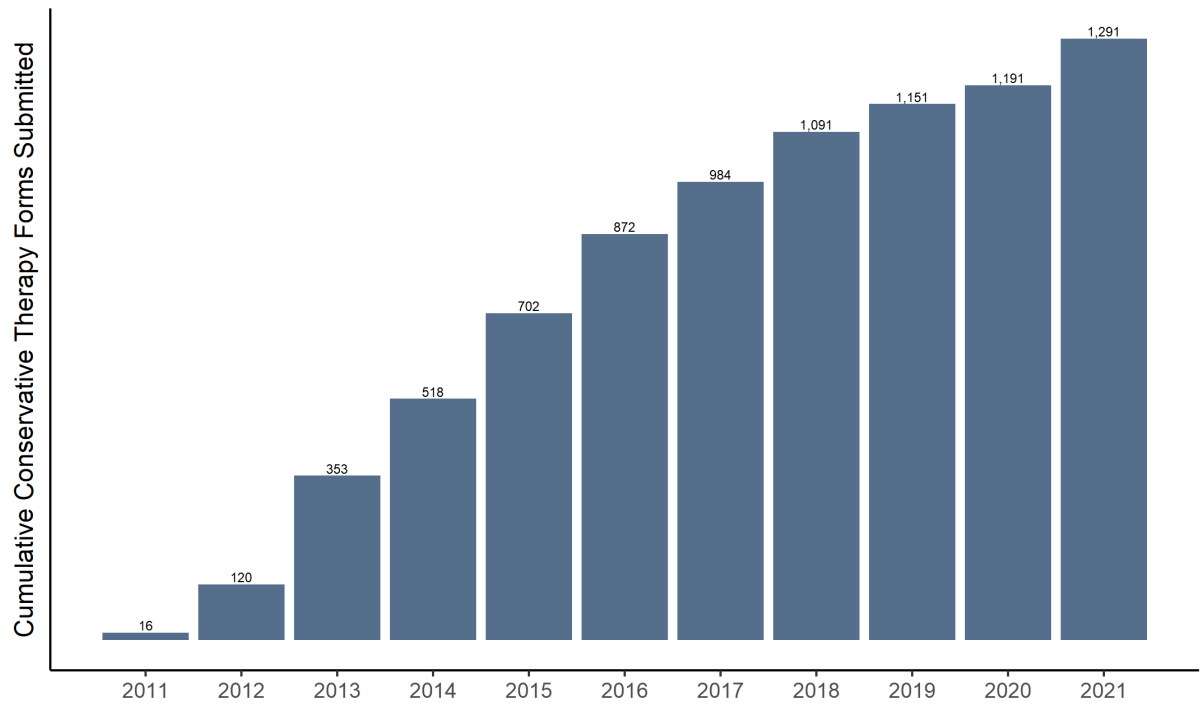


Figure 10. Cumulative Conservative treatment forms

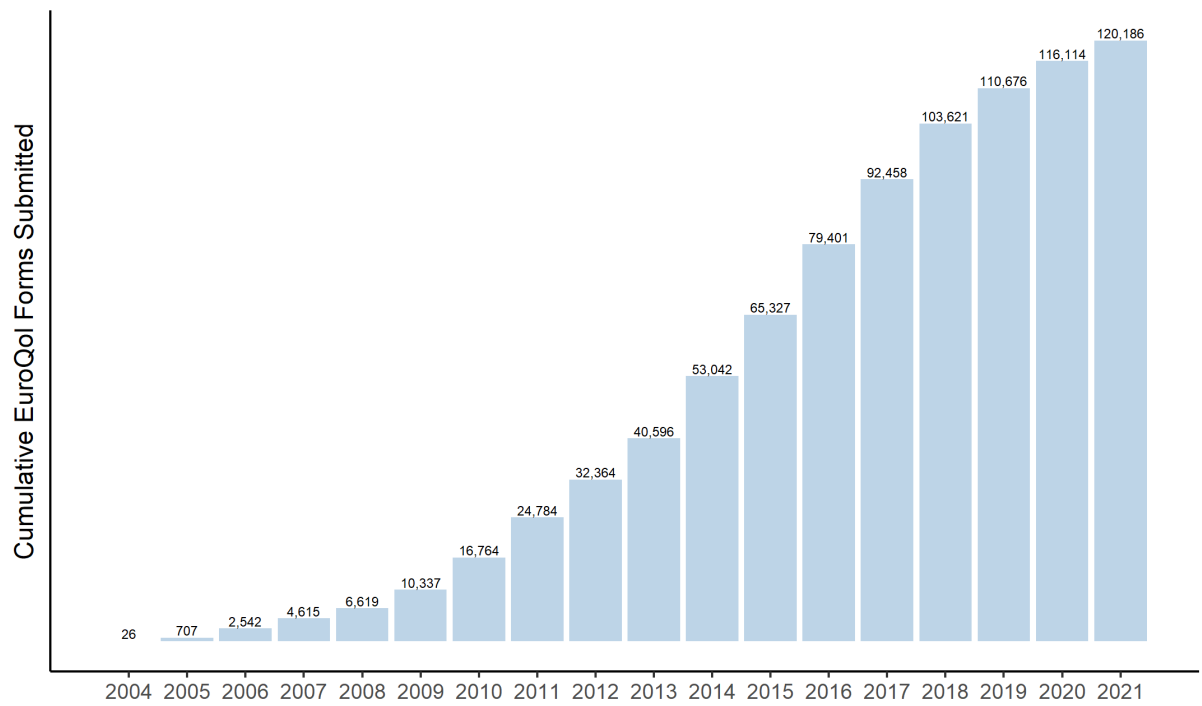


Figure 11. Cumulative EuroQol forms

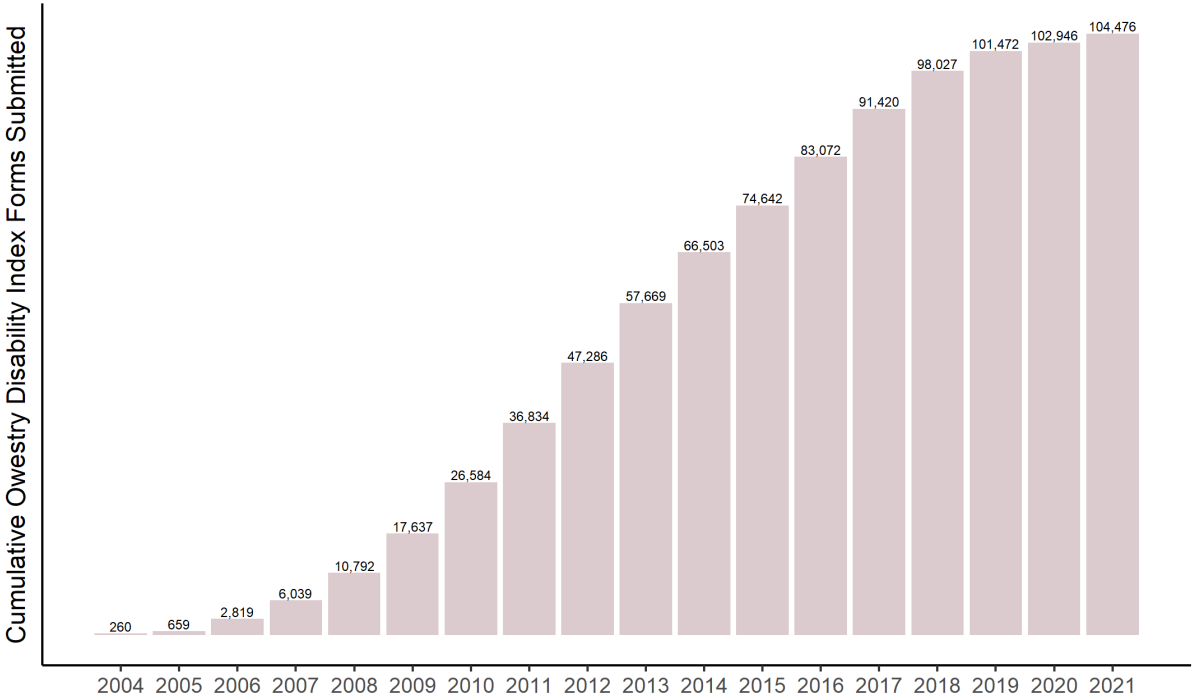


Figure 12. Cumulative Owestry Disability Index (ODI) forms

## Patient characteristics

The figures presented in the following tables are based on 141,403 surgeries documented up to 31 December 2021.

Characteristic	Subgroup	Percent
Age	< 40	15.4%
	40-50	17.0%
	50-60	20.5%
	60-80	40.0%
	> 80	7.0%
Gender	Male	48.3%
	Female	51.4%
Smoker*	No	50.1%
	Yes	14.3%
	Unknown	35.6%
BMI*	< 20	4.7%
	20-25	30.0%
	26-30	34.1%
	31-35	15.3%
	> 35	7.0%
	Unknown	8.9%
Number of Segments Affected	1	34.6%
	2-3	26.7%
	< = 4	38.7%
Number of Previous Surgeries (any level)	0	70.8%
	1	19.2%
	> 1	10.0%

Table 1. Patient characteristics overview (\*these characteristics were documented in the 2011 and 2017 form versions only and their proportions are calculated based on the number of those 91,226 forms.)



## Main pathologies

The most frequent pathology seen in the registry is degenerative disease with around four fifth of the surgeries, followed by repeat surgery with 4.5% and other less frequent pathologies.

Pathology	Percent	Count
Degenerative Disease	77.3%	109309
Repeat Surgery	4.5%	6392
Fracture / Trauma	3.8%	5408
Spondylolisthesis (Non-Degenerative)	3.1%	4446
Non-Degenerative Deformity	2.6%	3619
Pathological Fracture	2.4%	3460
Tumour	2.4%	3434
Failed Surgery	1.5%	2060
Other	1.2%	1638
Infection	1.0%	1391
Inflammation	0.2%	246

Table 2. Main pathologies tabular overview

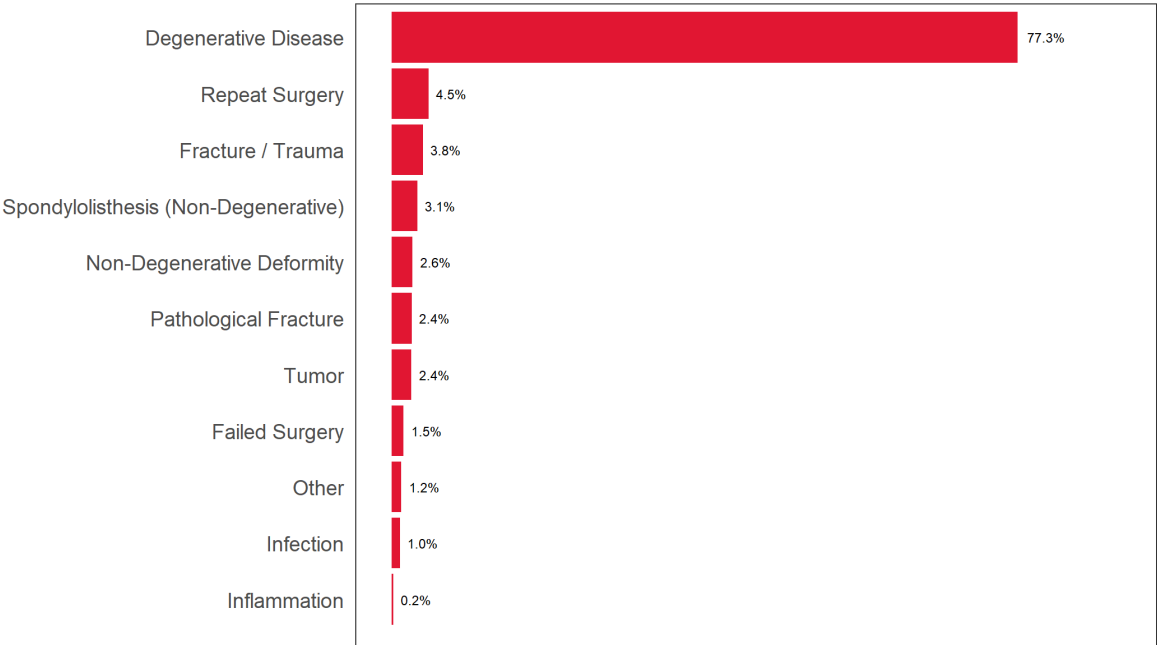


Figure 13. Main pathologies bar chart overview

Regarding the levels of intervention, the majority of the cervical surgeries take place at C5 (11.1%), followed by C6 (9.0%). Thoracic levels are rather rare with Th12 as the most frequent thoracic level at 3.2%. The three most treated levels are L4 (43.6%) followed by L5 (34.3%) and L3 (18.5%).

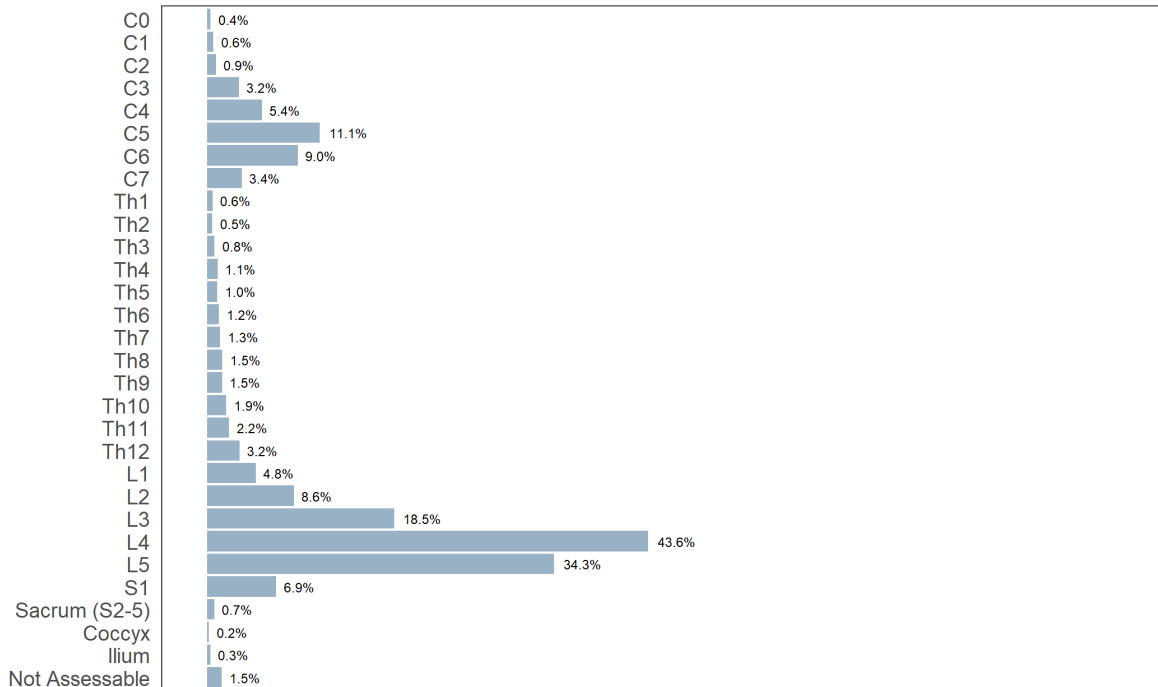


Figure 14. Levels of intervention

## Descriptive analysis of selected pathologies

The authors of this annual report elected to describe some key characteristics of patient groups undergoing surgical treatment for one of the two most frequent pathologies: disc herniation and spinal stenosis.

### Disc herniation

32.3% of all documented surgeries in Spine Tango (N=55,610) were related to the treatment of disc herniation. The following Table 3 describes characteristics of this patient population.

## Patient characteristics

Characteristic	Subgroup	Percent
Age	< 40	22.5%
	40-50	25.7%
	50-60	22.8%
	60-80	26.0%
	> 80	3.0%
Gender	Male	52.3%
	Female	47.7%
Smoker	No	43.7%
	Yes	15.2%
	Unknown	41.1%
BMI	< 20	3.9%
	20-25	29.6%
	26-30	34.3%
	31-35	14.6%
	> 35	7.0%
	Unknown	10.5%
Number of Segments Affected	1	45.8%
	2-3	21.8%
	> = 4	32.4%
Number of Previous Surgeries (any level)	0	77.9%
	1	16.3%
	> 1	5.8%

Table 3. Patient characteristics disc herniation

## Surgical measures

The following Figure 15 demonstrates proportions of key surgical measures over a time period of 16 years between 2005 and 2021. The distribution of the individual surgical measures remained rather stable over this time period with a slight but visible reduction of motion preserving stabilisation in the last seven years.

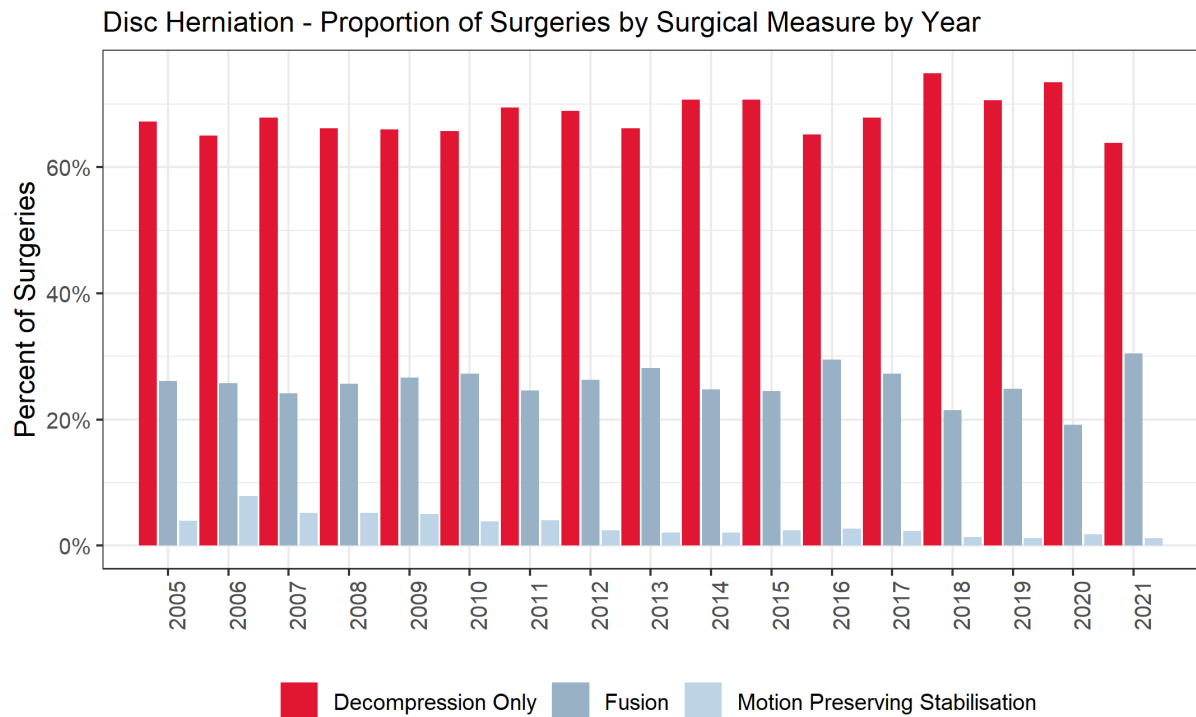


Figure 15. Proportion of surgeries by surgical measure by year

### Complications

General complications were rather rare with the leading complication of kidney and urinary tract in 0.25% of the surgeries (Figure 16).

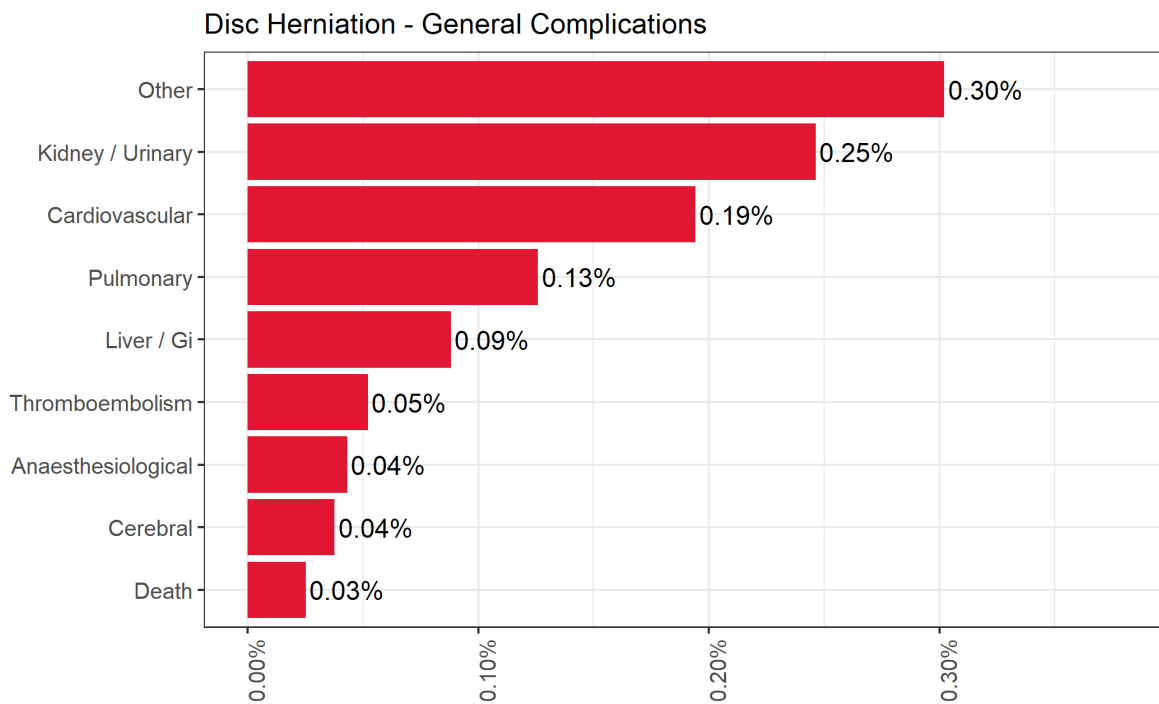


Figure 16. General complications for herniated disc cases

Surgical complications were more frequent with dural lesions documented in 2.83% of the surgeries (Figure 17). The next most frequent complications were neurological with motor dysfunction, radiculopathy and sensory dysfunction in 0.37%, 0.32% and 0.30%, respectively.

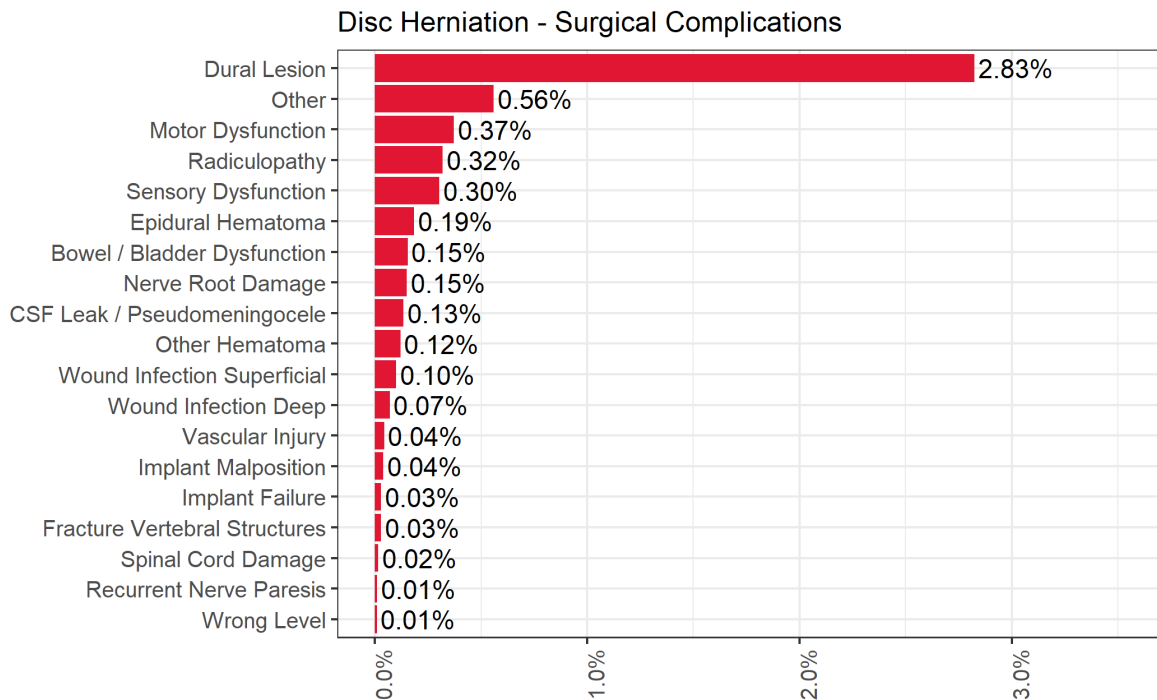


Figure 17. Surgical complications for herniated disc cases

### Outcomes - COMI

In 24.4% of all patients with disc herniation a baseline COMI form and a 3-month postoperative or a later COMI form were documented. This rate varies considerably between hospitals, depending on whether they collect COMI or not. The following Figure 18 to Figure 20 demonstrates the average preoperative and postoperative axial and peripheral pain levels as well as COMI score with 95% confidence intervals over the last 16 years. The curves were not adjusted by patient characteristics, surgical measures and follow-up interval, which are assumed to be relatively stable. Nevertheless, the figures have a descriptive character only and a conclusive interpretation requires more granular investigations.

Over this time period the preoperative axial pain has steadily increased from about 5 points to 6.4 points in 2019, to drop in 2021 to about 6 points, while the postoperative axial pain has steadily increased from 3.5 to 4 points. This finding of increasing preoperative axial pain points to a stable but steadily improving treatment indication. This is positive. The increasing postoperative axial pain over the years demonstrates, however, that a better treatment indication does not necessarily result in a better postoperative axial pain level. At the same time, a trend for slightly lower pain relief is seen in the last years two years.

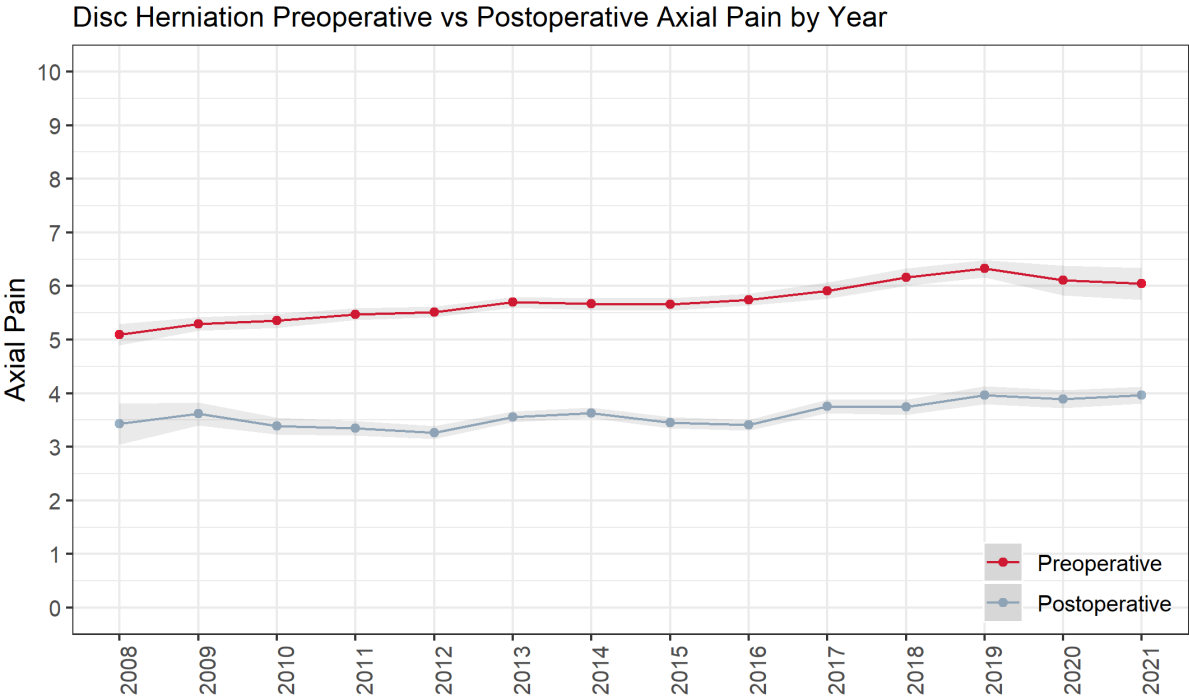


Figure 18. Preoperative and postoperative axial pain in disc herniation cases by year

Over this time period the preoperative peripheral pain has steadily increased from about 6.7 points to 7.6 points in 2019, then a slight drop to 7.4 and 7.5 points in 2020 and 2021, while the postoperative peripheral pain has increased from 3 to 3.7 points. This finding of increasing preoperative peripheral pain points also to a stable but steadily improving treatment indication, which is positive. The increasing postoperative peripheral pain over the years demonstrates again that a better treatment indication does not necessarily result in a better postoperative peripheral pain level.

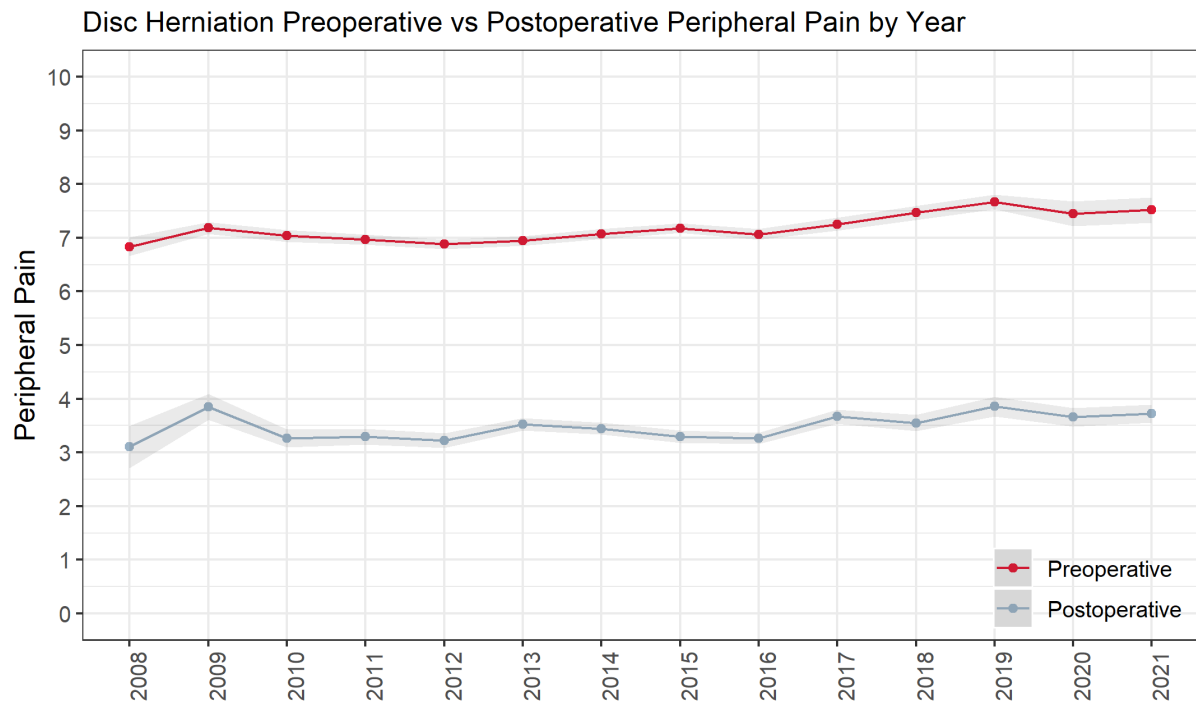


Figure 19. Preoperative and postoperative peripheral pain in disc herniation cases by year

Over this time period the preoperative pain remained very stable at 8 points, while the postoperative COMI score has oscillated around 4.5 points. No relevant trend both for preoperative and postoperative scores were observed over the whole time period.

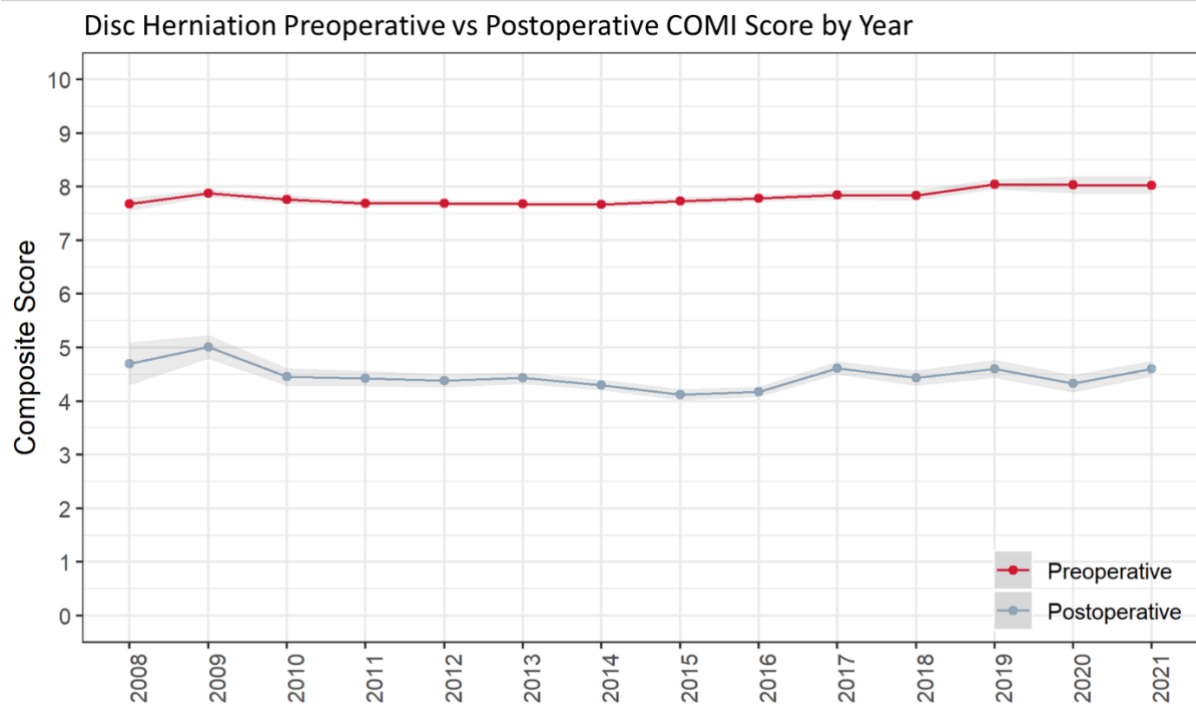


Figure 20. Preoperative and postoperative COMI score in disc herniation cases by year

## Spinal stenosis

37.7% of all surgeries documented in Spine Tango (N=53,309) were related to the treatment of spinal stenosis. The following Table 4 describes characteristics of this patient population.

### Patient characteristics

Characteristic	Subgroup	Percent
Age	< 40	4.6%
	40-50	10.6%
	50-60	19.9%
	60-80	54.9%
	> 80	10.0%
Gender	Male	49.5%
	Female	50.5%
Smoker	No	50.9%
	Yes	12.4%
	Unknown	36.7%
BMI	< 20	3.2%
	20-25	24.9%
	26-30	36.2%
	31-35	18.0%
	> 35	7.7%
Number of Segments Affected	Unknown	10.0%
	1	33.1%
	2-3	33.8%
Number of Previous Surgeries (any level)	> = 4	33.1%
	0	74.7%
	1	17.7%
	> 1	7.6%

Table 4. Patient characteristics spinal stenosis

### Surgical measures

The following Figure 21 demonstrates proportions of key surgical measures over a time period of 16 years between 2005 and 2021. The distribution of individual surgical measures changed over this time period. The proportion of decompression alone has grown from 31% initially to over 70% of all surgeries in 2020, and decreased again to about 45% last year. The proportion of instrumented fusion has steadily decreased from 31% in 2005 to 20-25% in 2018-2020, with an increase to over 40% in 2021. This shift from mainly decompression to almost 50%-50% decompression vs fusion is driven by the cases from the SIRIS Spine registry, which were all spondylodesis in 2021. The proportion of motion preserving stabilisation has further decreased in the last four years and practically disappeared in 2021.



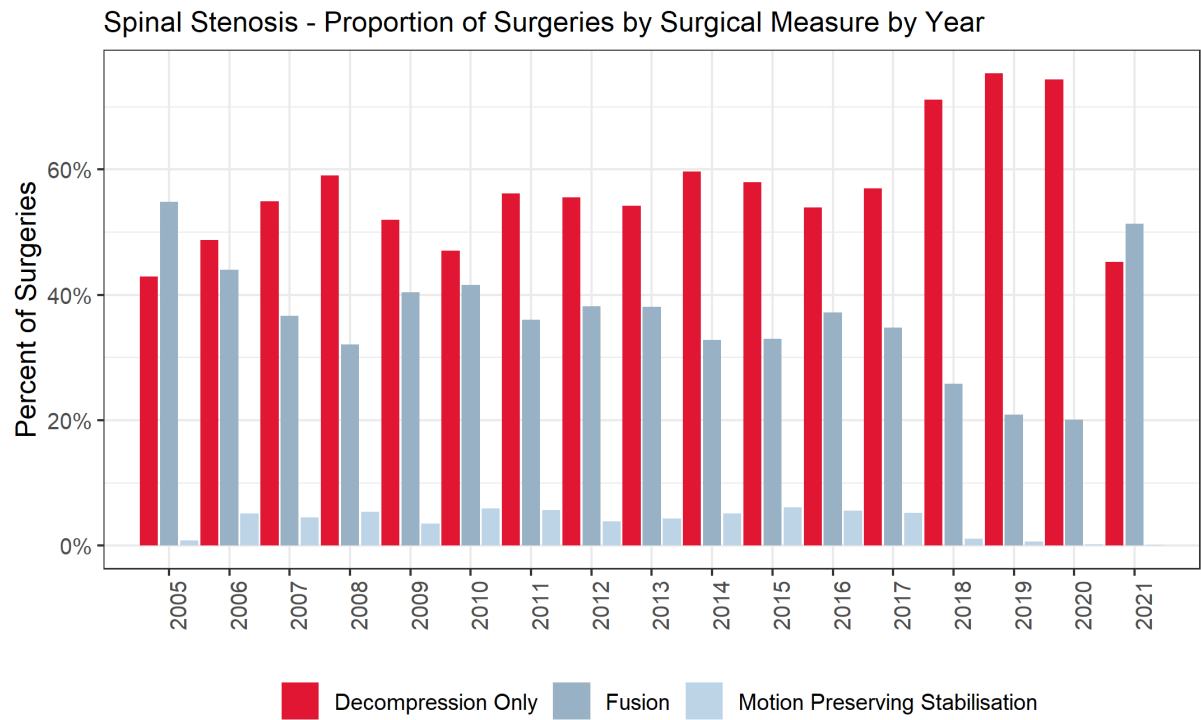


Figure 21. Proportion of surgeries by surgical measures by year

## Complications

General complications were rather rare with the leading complication of kidney and urinary tract in 0.54% of the surgeries (Figure 22).

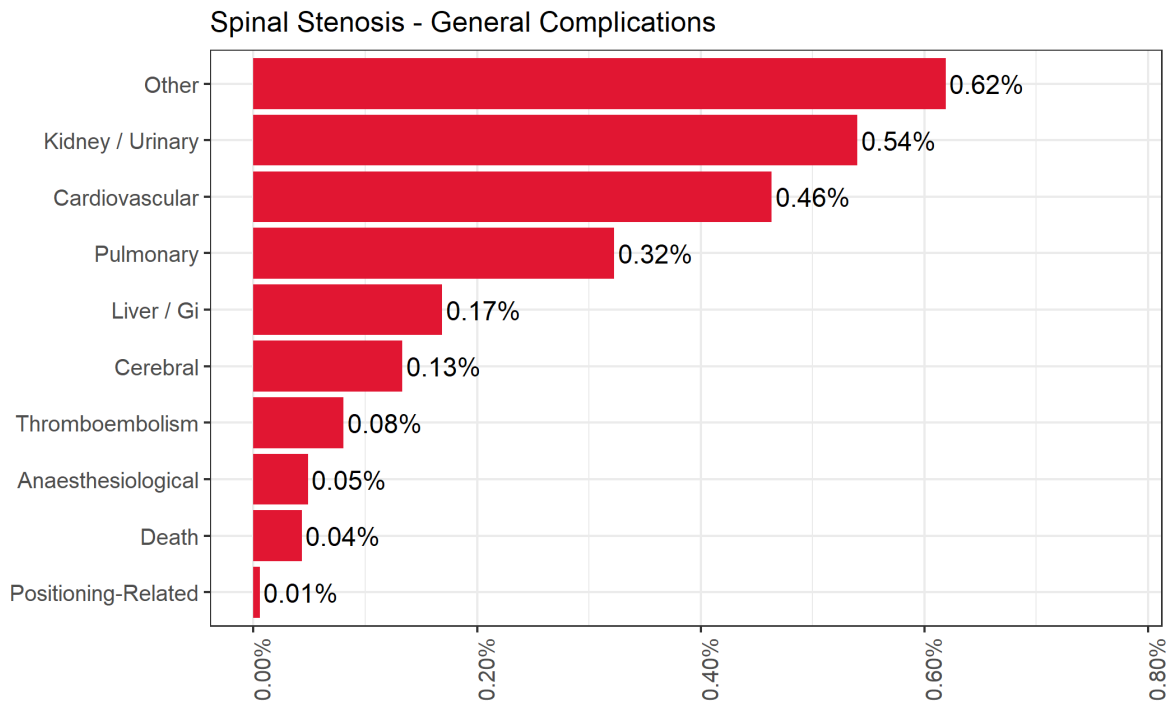


Figure 22. General complications for spinal stenosis cases

Surgical complications were more frequent with dural lesions documented in 4.34% of the surgeries (Figure 23). The next most frequent complications were neurological with motor dysfunction, epidural hematoma, sensory dysfunction and radiculopathy in 0.54%, 0.48%, 0.37% and 0.35%, respectively.

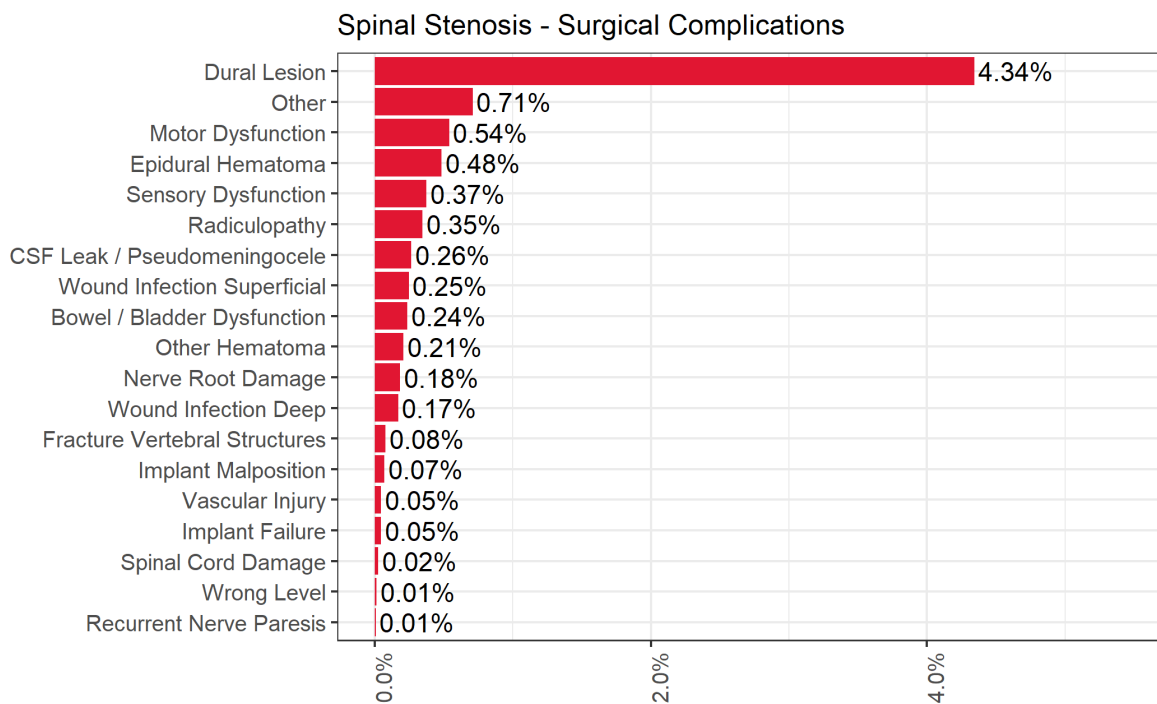


Figure 23. Surgical complications for spinal stenosis cases

## Outcomes – COMI

In 31.2% of all patients, a baseline COMI form and a 3-month postoperative or a later COMI form were documented. This rate varies considerably between hospitals, depending on whether they collect COMI or not. The following Figure 24 to Figure 26 demonstrates the average preoperative and postoperative axial and peripheral pain levels as well as COMI score with 95% confidence intervals over the last 16 years. The curves were not adjusted by patient characteristics, surgical measures and follow-up intervals, which are assumed to be relatively stable. Nevertheless, the figures have a descriptive character only and a conclusive interpretation requires more granular investigations.

Over this time period the preoperative axial pain has steadily increased from about 5.5 points to 6.5 points in 2019, with a decrease to 6 points in 2021, while the postoperative axial pain has slightly fluctuated around 4 points mark. This finding of increasing preoperative axial pain points to a stable but marginally improving treatment indication. The stable postoperative axial pain is rather a neutral finding pointing out that changes in the treatment strategy did not result in relevant worsening or improving postoperative axial pain.

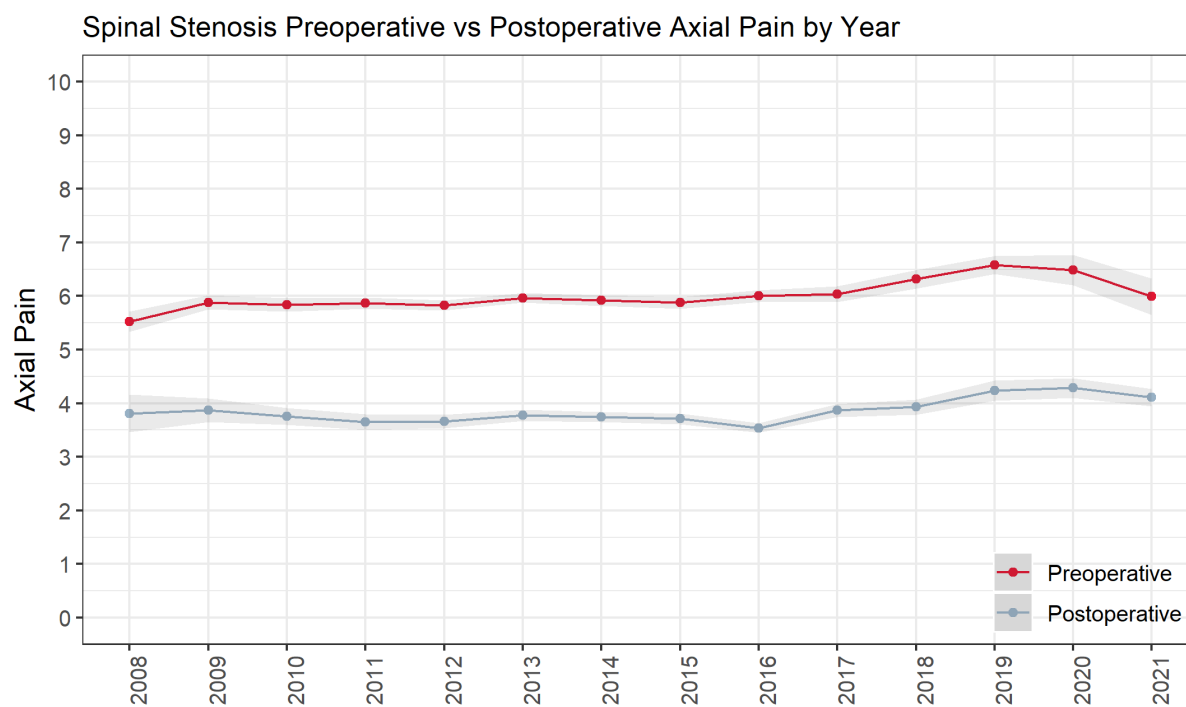


Figure 24. Preoperative and postoperative axial pain in spinal stenosis cases by year

Over this time period the preoperative peripheral pain has steadily increased from about 6.6 points to 7.5 points in 2019, with a decrease to 7 points in 2020-2021, while the postoperative peripheral pain has steadily increased from 3.5 to 4.0 points. The postoperative pain relief remains rather stable over the years with approximately 3 points.

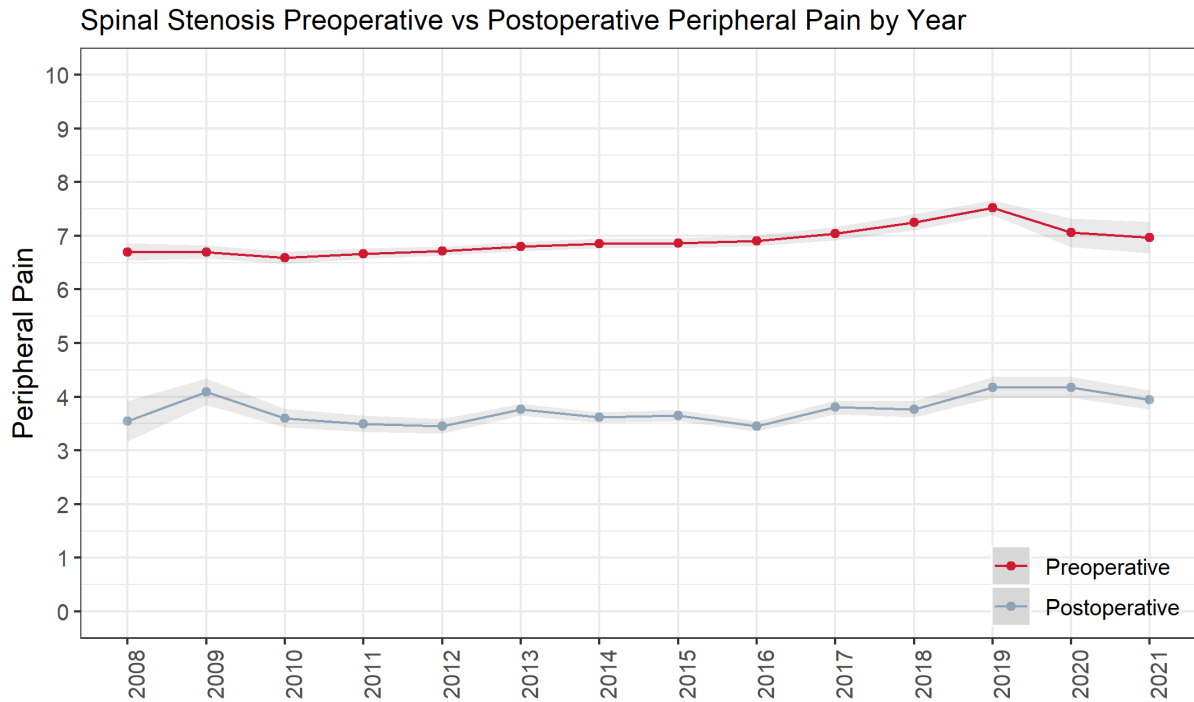


Figure 25. Preoperative and postoperative peripheral pain in spinal stenosis cases by year

Over this time period the preoperative remained very stable at 7.5 points and the postoperative COMI score remained rather stable between 4.5 and 5 points.

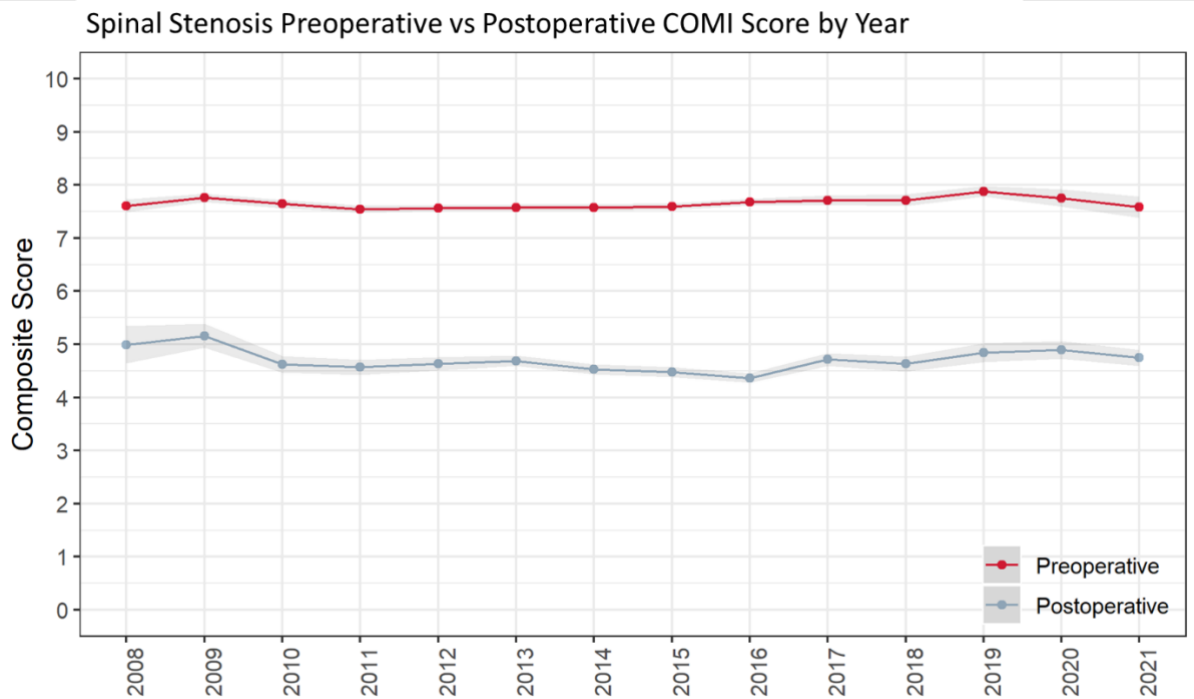


Figure 26. Preoperative and postoperative COMI score in spinal stenosis cases by year

# Research

## How to publish with Spine Tango data

As a participant of the Spine Tango registry, you have access to Spine Tango data for research purposes. The access to data is bound to specific studies and is granted following approval of the study protocol. A template for the study protocol can be found [here](#). The protocols should be sent to [spinetango@eurospine.org](mailto:spinetango@eurospine.org).

Once we have received the completed study protocol, the following steps will be required to access the requested data:

1. The STTF will review the protocol in terms of scientific accuracy, good clinical and epidemiological practice, methods, and appropriateness of the analysis based on the Spine Tango data.
2. You will receive feedback from the STTF either approving your protocol, advising that you make some adjustments to the study, or requesting clarification on some points.
3. Once the protocol has been approved by the STTF, an analysis will be conducted by EUROSPINE or you will be provided with data, depending on the study protocol and some other factors.

## Publications (2021)

The following list includes publications released between 1 January 2021 and 31 December 2021 along with the conclusion of the authors.

1. Patient-rated outcome after atlantoaxial (C1-C2) fusion: more than a decade of evaluation of 2-year outcomes in 126 patients.  
Kleinstück FS, Fekete TF, Loibl M, Jeszenszky D, Haschtmann D, Porchet F, Mannion AF.  
Eur Spine J. 2021 Dec;30(12):3620-3630. Doi: 10.1007/s00586-021-06959-1. PMID: 34477947.

Conclusion: In this large series with almost complete follow-up, C1-C2 fusion showed extremely good results. Despite the complexity of the intervention, outcomes surpassed those typically reported for simple procedures such as ACDF and lumbar discectomy, suggesting reservations about the procedure should perhaps be reviewed.

2. Development of a model to predict the probability of incurring a complication during spine surgery.  
Zehnder P, Held U, Pigott T, Luca A, Loibl M, Reitmeir R, Fekete T, Haschtmann D, Mannion AF.  
Eur Spine J. 2021 May;30(5):1337-1354. Doi: 10.1007/s00586-021-06777-5. PMID: 33686535.

Conclusion: We developed two models to predict complications associated with spinal surgery. Surgical complications were predicted with less discriminative ability than general complications. Reoperation at the same level was strongly predictive of surgical complications and a higher ASA score, of general complications. A web-based prediction tool was developed at <https://sst.webauthor.com/go/fx/run.cfm?fx=SSTCalculator>.

3. Validation of a surgical invasiveness index in patients with lumbar spinal disorders registered in the Spine Tango registry.  
Holzer EM, Aghayev E, O’Riordan D, Fekete TF, Jeszenszky DJ, Haschtmann D, Porchet F, Kleinstueck FS, Pigott T, Munting E, Luca A, Mannion AF.  
Eur Spine J. 2021 Jan;30(1):1-12. Doi: 10.1007/s00586-020-06651-w. PMID: 33231779.

Conclusion: The mMII [modified version of the Mirza invasiveness index] appeared to be a valid measure of surgical invasiveness in our study population. It can be used in predictor models and to adjust for surgical case-mix when comparing outcomes in different studies or different hospitals/surgeons in a registry.

4. Primary lumbar decompression using ultrasonic bone curette compared to conventional technique.  
Moon RDC, Srikandarajah N, Clark S, Wilby MJ, Pigott TD.  
Br J Neurosurg. 2021 Dec;35(6):775-779. Doi: 10.1080/02688697.2020.1817321. PMID: 32930607.

Conclusions: The use of ultrasonic bone curette for primary lumbar decompression is associated with reduced intra-operative blood loss compared to conventional techniques, alongside a comparable safety profile and equivalent patient reported outcomes.

5. Patient-Reported Outcomes Following Lumbar Decompression Surgery: A Review of 2699 Cases.  
Sunderland G, Foster M, Dheerendra S, Pillay R.  
Global Spine J. 2021 Mar;11(2):172-179. doi: 10.1177/2192568219896541. PMID: 32875849.

Conclusions: Lumbar decompression is effective in improving quality of life in appropriately selected patients. Patient-reported outcome measures collected routinely and collated within a registry are a powerful tool for assessing the efficacy of lumbar spine interventions and allow accurate counseling of patients perioperatively.

6. Quality of life and mortality after surgical treatment for vertebral osteomyelitis (VO): a prospective study.  
Yagdiran A, Otto-Lambertz C, Lingscheid KM, Sircar K, Samel C, Scheyerer MJ, Zarghooni K, Eysel P, Sobottke R, Jung N, Siewe J.  
Eur Spine J. 2021 Jun;30(6):1721-1731. doi: 10.1007/s00586-020-06519-z. PMID: 32613398.

Conclusion: Surgical treatment of VO patients leads to significantly improved QoL. Nevertheless, QoL levels were below those of the general population. Our results

underscore that spine disability questionnaires measuring QoL are mandatory to demonstrate comprehensively the severity of this entity. Our study confirms a high mortality and points out the role of VO as a potentially life-threatening condition.

## Participants

The following is a list of hospital departments that submitted forms to the Spine Tango registry based on surgeries dated between 1 January 2021 and 31 December 2021.

### Belgium

- Orthopedic Surgery in CHU Ambroise Paré
- Neurosurgical department in CHR Citadelle Liège
- Spine Unit in Cliniques Universitaires UCL / St.Luc

### Czech Republic

- Department of Orthopaedics and Traumatology in Fakultní nemocnice Brno

### Egypt

- Neurological & Spinal Surgery in Waeel Ossama Hamouda Center

### Italy

- Neuro-orthopaedic Spinal Department in Casa di Cura Rizzola SPA

### Netherland

- Neurosurgery department in Medische Kliniek Velsen

### Philippines

- Department of Orthopedics, Division of Spine in Philippine General Hospital,

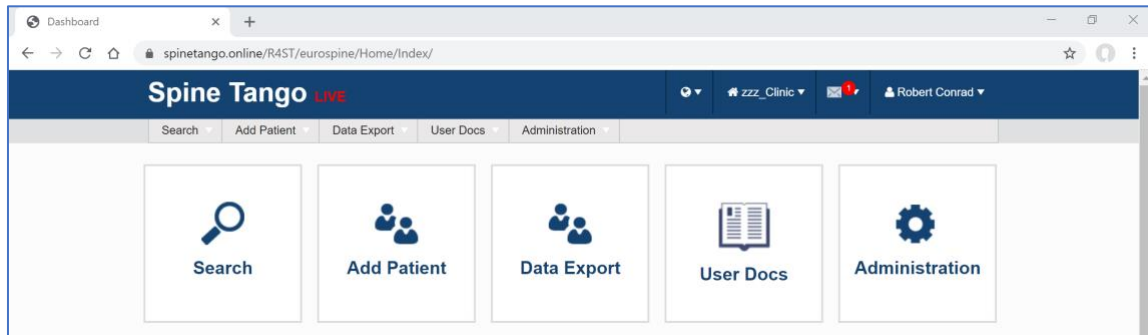
### Spain

- Neurosurgery Department in Hospital de la Santa Creu i Sant Pau
- Orthopedic Surgery, Neurosurgery department in Hospital General Universitari de Castelló

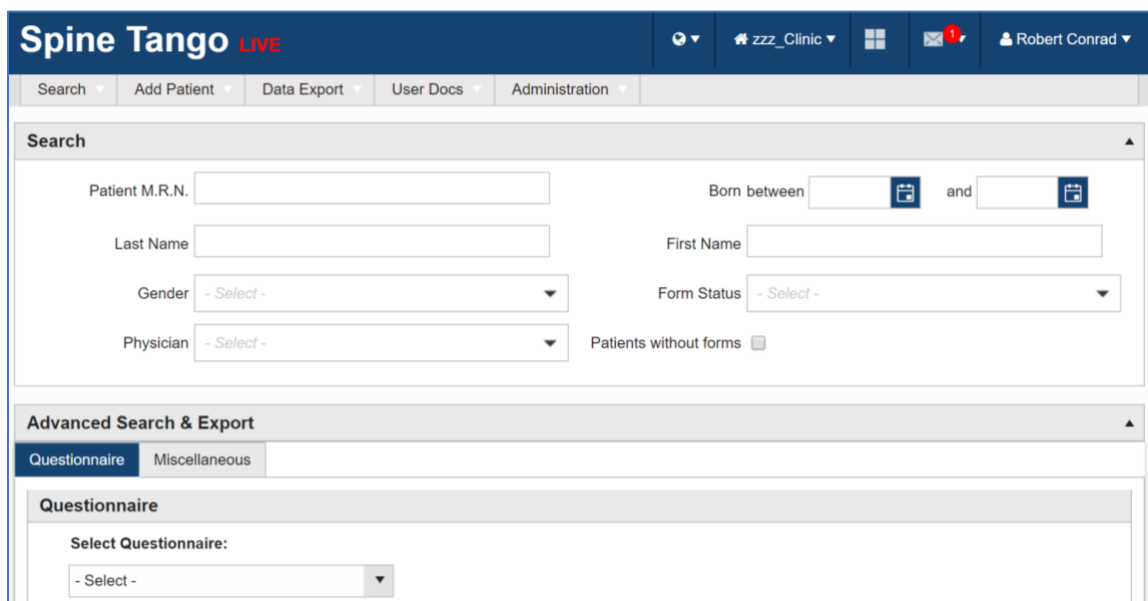
# Images of the Spine Tango registry

The following screen shots are from the web interface of the ST registry.

User-friendly dashboard:



Powerful search function to find patients, questionnaires, and implants:

A screenshot of the Spine Tango LIVE search interface. The browser address bar shows 'spinetango.online/RAST/eurospine/Home/Index/'. The page features a dark blue header with the 'Spine Tango LIVE' logo and user information for 'zzz\_Clinic' and 'Robert Conrad'. Below the header is a navigation bar with tabs for 'Search', 'Add Patient', 'Data Export', 'User Docs', and 'Administration'. The main content area is titled 'Search' and contains several search fields: 'Patient M.R.N.', 'Last Name', 'Physician', 'Born between' (with calendar icons), 'First Name', 'Form Status', 'Gender' (dropdown), and 'Patients without forms' (checkbox). Below the search fields is an 'Advanced Search & Export' section with tabs for 'Questionnaire' and 'Miscellaneous'. The 'Questionnaire' tab is selected, and it contains a 'Select Questionnaire:' dropdown menu with '- Select -' as the current selection.



Guided documentation procedures with indications of missing or inappropriate data:

The surgery and conservative forms, as well as key patient-reported outcome measure forms, can be found [here](#).

## Erratum

The number of surgeries on spinal stenosis documented in Spine Tango by 2020 shown on the page 30 of the annual report 2022 as 66,427 as well as its proportion were incorrect. The correct number by 2020 was 51,693 and its proportion 38.4%.

## Contact



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 Switzerland  
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