

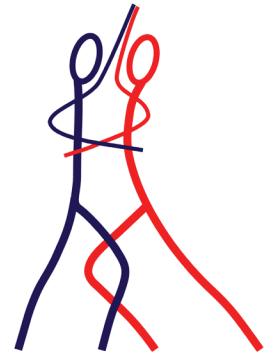
SPINE TANGO Report

International 2012



The International Spine Registry
EuroSpine

C. Röder, M. Neukamp, E. Aghayev, T. Zweig, T. Ambrose, E. Munting, T. Pigott



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This annual report is digitally available in the literature section of the Spine Tango web page under www.eurospine.org

INTRODUCTION

Since the year 2000 EuroSpine – The Spine Society of Europe has been developing and enhancing a documentation system for spinal surgery and also for non-surgical spinal treatments in form of a registry. With Spine Tango we are meeting the growing demand to assess the safety and comparative effectiveness of surgical and non-surgical interventions and therapies of the spine. Only few other fields in medicine are under comparable scrutiny. Reacting to these tendencies, endeavors of pioneer clinicians and the Spine Tango committee, in collaboration with the Institute for Evaluative Research in Orthopedic Surgery of the University of Bern, have led to the implementation of the only international spinal registry to date. The idea for Spine Tango was proposed a decade ago by Dieter Grob and Max Aebi, under the auspices of the SSE. Developments and participation have constantly progressed since those days. Now, having reached a recognized status we would like to encourage national societies and individual partners to join the registry. The German Spine Society DWG, the largest spine society in Europe, is successfully conducting its 2-year pilot of a national spine registry adopting the Spine Tango technology and content, and in fall 2013 a new Polish Spine Tango module will be launched. Health and reimbursement authorities are already limiting the accessibility of some spinal treatment modalities since evidence is lacking in many aspects. Therefore Spine Tango as a registry with routine data resulting from the hospitals' day-to-day work is offered as a common language to make our services visible and transparent. Conclusions from the registry have an admittedly lower internal, i.e. methodological validity compared with higher evidence studies like RCTs, but the external validity and therefore generalizability of our findings is what makes the dataset and its clinical and scientific findings so valuable for health service and outcome research. With a constantly increasing activity in the registry we would like to inform you about its history, its objectives and its current status.

T. Pigott

Chair, on behalf of the Spine Tango committee



^b
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PROFILE

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Spine Tango enables you to document the whole spectrum of spinal pathologies and the possible surgical and non-surgical treatment options. The generic approach of the Spine Tango documentation system is a must to reach the maximum number of participants using a common web based technology. This, in turn, reduces the potential for customizing the Tango in order to meet the individual expectations of specific users. There are, nevertheless, still a number of possibilities to parameterize the data collection processes according to the various hospital workflows in the user community. To give you the opportunity to document not only the surgical treatments, we have developed Spine Tango Conservative, which is now available in its first version. Spine Tango is an international, non-commercial system under the auspices of EuroSpine, the Spine Society of Europe aiming at enabling national societies to organize and control their own part of the registry. For that a technology called “national module concept” has been implemented to enhance participation options and to provide the hardware structure for appropriate security measures for patient and user privacy protection. The new software release 2012 does further improve these aspects. In conclusion, Spine Tango is a unique applied medical and scientific documentation and technology solution. It is to the benefit of patients, physicians and therapists whilst generating evidence based findings to improve spinal care (1,2).

1. Aebi M, Grob D (2004)

SSE Spine Tango: a European Spine Registry promoted by the Spine Society of Europe (SSE)

Eur Spine J. 2004 December; 13(8): 661–662.

2. Kessler J, Melloh M, Zweig T, Aghayev E, Röder C (2011)

Development of a Documentation Instrument for the Conservative Treatment of Spinal Disorders in the International Spine Registry Spine Tango.

Eur Spine J. 2011 March; 20(3): 369–379.



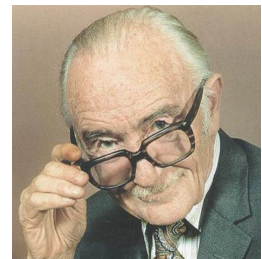
REGISTRIES VERSUS RANDOMIZED CONTROLLED TRIALS (RCT)

	RCT	Registry
Type of evidence	Efficacy	Effectiveness*, safety
Principal question	Can it work? The first step of evidence generation	Does it work? Verification in daily clinical practice
Internal validity (methodological quality)	+++	+ - ++ (expandable with eg. monitoring, audits or comparison with secondary data etc.)
External validity (transferability/generalizability)	-	+++
Levels of evidence	1a, 1b	2b-4, depending on methodology
Hypothesis-based approach,	Yes	Usually no
Duration of observation period	Predefined	Open-ended or predefined
Focus of research/measurement	Sharp, narrow (see hypothesis)	Broad
Quality assessment	Not intended (strictly defined indications, process quality at least derivable, outcome quality depends on effectiveness, a given indication and process)	Indication, process, outcome
Early warning system	Not possible	Feasible
Long-term follow-up	Feasible	Feasible, depending on registry set-up maybe only for a representative sample
Coverage	Only among participants	From individual center/surgeon over representative clinic sample to full national / regional coverage
Benchmarking	Only benchmarking of group	Depending on the final composition of participants regional to nationally representative benchmark
Type of quality assurance	Internal, external vs. benchmark of participants	Internal, external vs. representative regional or national benchmark
Effort	Very high for a few participants	Low for many participants
Cost	High to very high	Low cost basis, costs increase depending on the stage of development and number of participants
Use of generated data	Only in the framework of the scientific goal/hypothesis	Open hypothesis generation possible
Comparator	Given per definition	Ranges between none to numerous comparators, depending on registry set-up

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*unclear terminology, Cochrane called it "efficiency", better always specify what you mean (evidence derived from controlled experiment versus evidence derived from routine clinical practice)

Cochrane AL, British Epidemiologist, 1909-88.
The father of Evidence Based Medicine. Effectiveness and Efficiency.
Random Reflections on Health Services.
London: Nuffield Provincial Hospitals Trust, 1972



NEW DEVELOPMENTS

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The new **follow-up calendar** function allows predefinition of follow-up intervals and related forms within a project. These intervals become part of an overview and planning tool which allows visualizing the performed, pending, and missed as well as “outlier” follow-ups for each case and related forms as well as planning upcoming follow-ups by defining a time interval in the near or far future and viewing all related follow-ups, the dates they should be performed and the respective forms that need to be administered. What type of (different) forms belongs to what follow-up, and what the related “anchor” or “index” form is, can all be specified by the study administrator. Follow-up rules are proposed “downwards” from the module administrator to the participants, but each lower level of organization (hospital – department - physician) can alter the proposed rules and adjust them to local processes and needs. Additional forms can always be created, completed and submitted outside these intervals and will be regarded and listed as “outliers” to the predefined intervals in the various calendar views.

ASIA score: the IEFO team is proud to introduce a “smart” ASIA documentation form for spinal trauma. It automatically calculates the respective scores and has some intelligent functionalities to avoid the very cumbersome completion of sensory and motor functions of all spinal levels. Optionally you can document the Functional Independence Measure (FIM) within this setting.

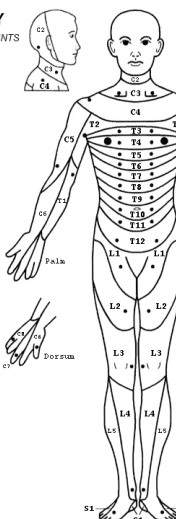
ASIA Score

SENSORY

LT - Light Touch, PP - Pin Prick, R - Right, L - Left

	LT-R	LT-L	PP-R	PP-L
C2	2	2	2	2
C3	2	2	2	2
C4	2	2	2	2
C5	2	2	2	2
C6	2	2	2	2
C7	2	2	2	2
C8	2	2	2	2
T1	2	2	2	2
T2	2	2	2	2
T3	2	2	2	2
T4	2	2	2	2
T5	2	2	2	2
T6	2	2	2	2
T7	2	2	2	2
T8	2	2	2	2
T9	2	2	2	2
T10	2	2	2	2
T11	2	2	2	2
T12	1	1	2	2
L1	1	1	2	2
L2	1	1	2	2
L3	1	1	2	2
L4	1	1	2	2
L5	1	1	2	2
S1	1	1	2	2
S2	1	1	2	2
S3	1	1	2	2
S4-5	1	1	2	2

KEY SENSORY POINTS



0 = absent
1 = impaired
2 = normal
NT = not testable

MOTOR
Key muscles

Upper limb

	R	L
C5 - Elbow flexors	5	5
C6 - Wrist extensors	5	5
C7 - Elbow extensors	5	5
C8 - Finger flexors	5	5
T1 - Finger abductors	5	5

13. UPPER LIMB TOTAL (max:50)
50.0

Lower limb

	R	L
L2 - Hip flexors	5	5
L3 - Knee extensors	5	5
L4 - Ankle dorsiflexors	5	5
L5 - Long toe extensors	5	5
S1 - Ankle plantar flexors	5	5

14. LOWER LIMB TOTAL (max:50)
50.0

SCORE
Asia score

Neurological level CALCULATED
The most caudal segment with normal function

R: T11 L: T11

SENSORY: T11 MOTOR: T11

MOTOR Functional independence measure (FIM)
Each of the 18 items is evaluated in terms of independence and function using a seven point scale. Leave no blanks; enter 1 if patient is not testable due to risk.

16. NLI: T11 FIM Score: **+ optional FIM**

18. ASI:

Self care

27. Eating	28. Grooming
29. Bathing	30. Dressing upper body

The **case ID** is a seemingly harmless but truly powerful new function to help users establish a clearly defined relation between all their forms and make later online and offline statistical analyses less error prone. This is especially helpful in cases with several interventions on various levels and a multitude of related follow-ups at different dates and hence different intervals. Given a certain number of cases with such complexity in the registry, and no clearly defined case history, many statistical analyses become probabilistic. Therefore, the new case ID function allows users to clearly link forms with each other that belong to one case, e.g. cervical disc protrusion and related follow-ups and outcomes, but a lumbar stenosis surgery with a new and different set of follow-ups and outcome forms at a later point in time. Such a patient consequently has two “cases” in his chart and all related forms are clearly and intentionally linked with each other by the user. If the time and location relationship of an intervention form and a follow-up or outcome form does not match while the user is adding it to a case, the system displays warnings or suggests creating a new “case”. Hence overall across-form data quality and analyzability become significantly improved with the registry. In addition, form selection becomes more comfortable, since a new “Plus” icon next to an intervention form allows the user to directly link a follow-up/outcome form to an intervention form. The user is only offered those forms that can theoretically be linked based on location (e.g. no ODI displayed to a cervical intervention form) or diagnosis (e.g. no SRS-30 offered for a degenerative intervention form). With the Plus sign, follow-up intervals are controlled by the system, based on surgery and follow-up dates. If the user chooses a grossly incorrect interval, warnings are displayed and a better matching interval is proposed.

Spine Tango adolescent scoliosis add-on: long awaited and a project that was initiated by our Spine Tango fellow Dr. T. Zweig, the first generation of adolescent scoliosis add-on forms is available. Thanks to an international effort of experts from Eurospine, DWG and the Hospital for Joint Diseases at New York University, a carefully developed and comprehensive “add-on” form in conjunction with the surgery form allows specialists to document these types of interventions in a more detailed mode. In addition to the already available SRS-30 outcome form, the SAQ Spinal Appearance Questionnaire will also be uploaded in those language versions that are validated.

Spine Tango adult deformity add-on: following along the lines of the adolescent scoliosis form, a similar yet distinct add-on form for adult degenerative deformity surgery was also developed

Adolescent scoliosis add on form Front side

SPINE TANGO



SCOLIOSIS adolescent add-on

Directions

- Use a #2 soft pencil for marking.
 - Text answers must be entered with the web interface.
 - All questions must be answered unless otherwise indicated.
- Completely fill in boxes to record answers.

Question types

- only 1 answer allowed mandatory question
 multiple answers allowed

periop postop / followup

Internal Use Only
Not read by scanner

Last name		First name		Gender
Street			M.R.N.	
Country code	Zip code	City		
Social security number			Birthdate (DD.MM.YYYY)	

Form to be completed with SSE surgery or followup.

Examination date

Day 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
 Month 1 2 3 4 5 6 7 8 9 10 11 12 Year 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Diagnosis — periop only

Type of scoliosis

<input type="checkbox"/> idiopathic	specify: <input type="checkbox"/> infantile	<input type="checkbox"/> juvenile	<input type="checkbox"/> adolescent
<input type="checkbox"/> congenital	specify: <input type="checkbox"/> failure of formation	<input type="checkbox"/> failure of segmentation	<input type="checkbox"/> combination of both
<input type="checkbox"/> neuromuscular	specify: <input type="checkbox"/> myopathic conditions	<input type="checkbox"/> neuropathic conditions	
<input type="checkbox"/> posttraumatic			
<input type="checkbox"/> postsurgical			
<input type="checkbox"/> other.....			

Please specify

if myopathic conditions **if neuropathic conditions**

<input type="checkbox"/> muscular dystrophy	<input type="checkbox"/> upper motor neuron	<input type="checkbox"/> spinocerebellar dysfunction
<input type="checkbox"/> arthrogyposis	<input type="checkbox"/> lower motor neuron	<input type="checkbox"/> hereditary motor sensory neuropathy
<input type="checkbox"/> congenital myopathy	<input type="checkbox"/> mixed upper and lower motor neuron	

Curve type - Lenke Classification

<input type="checkbox"/> Type 1, main thoracic (MT)	<input type="checkbox"/> Type 4, triple major (TM)		
<input type="checkbox"/> Type 2, double thoracic (DT)	<input type="checkbox"/> Type 5, thoracolumbar/lumbar (TL/L)	Lumbar modifier	Imbalance
<input type="checkbox"/> Type 3, double major (DM)	<input type="checkbox"/> Type 6, thoracolumbar/lumbar-main thoracic (TL/L -MT)	<input type="checkbox"/> A	<input type="checkbox"/> none
		<input type="checkbox"/> B	<input type="checkbox"/> sagittal
		<input type="checkbox"/> C	<input type="checkbox"/> coronal

Thoracic sagittal modifier (Th 5-Th12) - (Hypo) N (Normal) + (Hyper)

Pulmonary function tests

Pulmonary function not applicable

VC (Vital Capacity) TLC (Total Lung Capacity)

liter

FEV1 (Forced Expiratory Volume in one second) FVC (Forced Vital Capacity)

% of pred. value

Radiological skeletal maturation

Risser sign / score **Triradiate cartilage (TRC)** **Bone age determination**

not evaluated open Greulich & Pyle other method.....

US grading system closed Tanner & White-house Please specify

French/European grading system

Grade **Bone age**

0 1 2 3 4 5 **years** 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

months 0 1 2 3 4 5 6 7 8 9 10 11 12

Truncal appearance

Photographs yes Please upload photographs!

no

Scoliometer (*in degrees) *Example: 37° = mark 3 in the 1st row and 7 in the 2nd row.

Prox. thoracic (PT) <input type="checkbox"/> not applicable	Main thoracic (MT) <input type="checkbox"/> not applicable	Thoracolumbar/lumbar (TL/L) <input type="checkbox"/> not applicable
<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9
<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9

Operation/ additional surgical measures — periop only

Osteotomy Classification (Schwab) none Details of Classification are provided in the Dictionary of terms.

Grade I: partial facet joint resection Th1 Th2 Th3 Th4 Th5 Th6 Th7 Th8 Th9 Th10 Th11 Th12 L1 L2 L3 L4 L5

-> Specify levels / VBs

Grade II: complete facet joint resection (Smith-Petersen) Th1 Th2 Th3 Th4 Th5 Th6 Th7 Th8 Th9 Th10 Th11 Th12 L1 L2 L3 L4 L5

-> Specify levels / VBs

Grade III: pedicle and vertebral wedge resection (PSO) Th1 Th2 Th3 Th4 Th5 Th6 Th7 Th8 Th9 Th10 Th11 Th12 L1 L2 L3 L4 L5

-> Specify levels / VBs

Grade IV: Grade III plus resection endplate and disc Th1 Th2 Th3 Th4 Th5 Th6 Th7 Th8 Th9 Th10 Th11 Th12 L1 L2 L3 L4 L5

-> Specify levels / VBs

Grade V: monosegmental vertebratomy (including adj. discs) Th1 Th2 Th3 Th4 Th5 Th6 Th7 Th8 Th9 Th10 Th11 Th12 L1 L2 L3 L4 L5

-> Specify levels / VBs

Grade VI: multisegmental vertebratomy Th1 Th2 Th3 Th4 Th5 Th6 Th7 Th8 Th9 Th10 Th11 Th12 L1 L2 L3 L4 L5

-> Specify levels / VBs

Neuromonitoring

none

by surgeon

by neurophysiologist

Technique/ screw insertion

each level/VB bilaterally

each level/VB unilaterally

alternating

Material/ Rod specification

CoCr convex

CoCr concave

Titanium convex

Titanium concave

other convex.....

other concave.....

Please specify

Sacro-iliac fixation

none

S2-ala-screw right left

S2-ala-ileum-screw right left

ileum-screw right left

ev. both right left

Perioperative management of bleeding

none fibrin glue

FFP thrombin

fibrinogen other.....

tranexamic acid Please specify

If ileum screws - no of

Right 1 2 3

Left 1 2 3

Abbreviations: VB = vertebral body CoCr = cobalt-chrome FFP = fresh frozen plasma

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15.07.2013

The back side with the radiographic measurements is not displayed.

Adult deformity add on form Front side

SPINE TANGO

ADULT DEFORMITY add-on

Directions

- Use a #2 soft pencil for marking.
- Text answers must be entered with the web interface.
- All questions must be answered unless otherwise indicated.
- Completely fill in boxes to record answers.

Question types

only 1 answer allowed mandatory question
 multiple answers allowed multiple answers allowed

period **postop / followup**

Examination date

Day 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
 Month 1 2 3 4 5 6 7 8 9 10 11 12 Year 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Diagnosis — *period only*

<p>Deformity type</p> <p><input type="checkbox"/> AIS in adults</p> <p><input type="checkbox"/> degenerative</p> <p><input type="checkbox"/> post-surgical</p> <p><input type="checkbox"/> posttraumatic</p> <p><input type="checkbox"/> neuromuscular/ neuro degenerative</p> <p><input type="checkbox"/> other..... Please specify</p>	<p>Primary deformity pattern</p> <p><input type="checkbox"/> scoliosis/coronal plane</p> <p><input type="checkbox"/> kyphosis/flatback/sagittal plane</p> <p><input type="checkbox"/> combined</p> <p style="font-size: small;">AIS = adolescent idiopathic scoliosis</p>	<p>SRS-Schwab Classification <i>Further details are provided in the dictionary of terms.</i></p> <p>Curve pattern</p> <p><input type="checkbox"/> thoracic only</p> <p><input type="checkbox"/> thoracic and lumbar</p> <p><input type="checkbox"/> lumbar only</p> <p><input type="checkbox"/> primary sagittal</p> <p>Global balance modifier</p> <p><input type="checkbox"/> N (SVA <40mm) <input type="checkbox"/> P (SVA 40 - 95mm) <input type="checkbox"/> VP (SVA >95 mm)</p>
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<p>Primary surgical indication</p> <p><input type="checkbox"/> low back pain</p> <p><input type="checkbox"/> leg pain/neuro findings</p> <p><input type="checkbox"/> loss of ambulatory endurance</p> <p><input type="checkbox"/> general disability/functional loss</p> <p><input type="checkbox"/> concerns over deformity progression</p> <p><input type="checkbox"/> other..... Please specify</p>	<p style="text-align: center;">Lenke Classification</p> <p>Curve type</p> <p><input type="checkbox"/> Type 1, main thoracic (MT)</p> <p><input type="checkbox"/> Type 2, double thoracic (DT)</p> <p><input type="checkbox"/> Type 3, double major (DM)</p>	<p>Pelvic tilt modifier</p> <p><input type="checkbox"/> low (PT < 20°)</p> <p><input type="checkbox"/> medium (PT 20° - 30°)</p> <p><input type="checkbox"/> high (PT >30 °)</p>
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<p>Risk factors - Comorbidities</p> <p><input type="checkbox"/> none</p> <p><input type="checkbox"/> cardiovascular</p> <p><input type="checkbox"/> pulmonary</p>	<p><input type="checkbox"/> gastroenterological</p> <p><input type="checkbox"/> thrombembolic history</p> <p><input type="checkbox"/> hypertension</p>	<p><input type="checkbox"/> anticoagulation</p> <p><input type="checkbox"/> diabetes mellitus</p> <p><input type="checkbox"/> musculoskeletal comorbidities</p>
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Medication

<p>Medication for osteoporosis</p> <p><input type="checkbox"/> none</p> <p><input type="checkbox"/> calcium</p> <p><input type="checkbox"/> vitamine D</p> <p><input type="checkbox"/> teriparatide (Forsteo)</p>	<p><input type="checkbox"/> bisphosphonate</p> <p><input type="checkbox"/> denosumab (=Polia)</p> <p><input type="checkbox"/> other..... Please specify</p>	<p>Medication for spinal surgery/pathology — <i>perioperative only</i></p> <p><input type="checkbox"/> none</p> <p><input type="checkbox"/> NSAID,Paracetamol (WHO I)</p> <p><input type="checkbox"/> weak opiates (WHO II)</p>
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<p><input type="checkbox"/> strong opiates (WHO III)</p> <p><input type="checkbox"/> steroids</p> <p><input type="checkbox"/> antidepressives</p>	<p><input type="checkbox"/> vitamin B complex</p> <p><input type="checkbox"/> antibiotics</p> <p><input type="checkbox"/> other..... Please specify</p>
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DEXA/ osteoporosis signs

<p>DEXA</p> <p><input type="checkbox"/> not performed</p> <p><input type="checkbox"/> performed</p> <p><input type="checkbox"/> other..... Please specify</p>	<p>Location</p> <p><input type="checkbox"/> L1</p> <p><input type="checkbox"/> hip</p> <p><input type="checkbox"/> other..... Please specify</p>	<p>T-score</p> <p><input type="checkbox"/> >=-1</p> <p><input type="checkbox"/> -1 - -2,5</p> <p><input type="checkbox"/> <= -2,5</p> <p><input type="checkbox"/> <= -2,5 and fractures</p>	<p>Z-score</p> <p><input type="checkbox"/> >=-1</p> <p><input type="checkbox"/> -1 - -2,5</p> <p><input type="checkbox"/> <= -2,5</p> <p><input type="checkbox"/> <= -2,5 and fractures</p>
--	---	---	---

<p>Prior vertebral fractures</p> <p><input type="checkbox"/> none</p> <p><input type="checkbox"/> 1</p> <p><input type="checkbox"/> 2</p> <p><input type="checkbox"/> >2..... Please specify</p>	<p>Fx Location</p> <p><input type="checkbox"/> thoracic</p> <p><input type="checkbox"/> lumbar</p>
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Operation/ additional surgical measures — *period only*

<p>Osteotomy Classification (Schwab) <i>Details of Classification are provided in the Dictionary of terms.</i></p> <p><input type="checkbox"/> Grade I: <i>partial facet joint resection</i></p> <p style="font-size: x-small;">-> Specify levels / VBs</p> <p><input type="checkbox"/> Grade II: <i>complete facet joint resection (Smith-Petersen)</i></p> <p style="font-size: x-small;">-> Specify levels / VBs</p> <p><input type="checkbox"/> Grade III: <i>pedicle and vertebral wedge resection (PSC)</i></p> <p style="font-size: x-small;">-> Specify levels / VBs</p> <p><input type="checkbox"/> Grade IV: <i>Grade III plus resection endplate and disc</i></p> <p style="font-size: x-small;">-> Specify levels / VBs</p> <p><input type="checkbox"/> Grade V: <i>monosegmental vertebrectomy (including adj. discs)</i></p> <p style="font-size: x-small;">-> Specify levels / VBs</p> <p><input type="checkbox"/> Grade VI: <i>multisegmental vertebrectomy</i></p> <p style="font-size: x-small;">-> Specify levels / VBs</p>	<p><input type="checkbox"/> none</p> <p><input type="checkbox"/> Th1 <input type="checkbox"/> Th2 <input type="checkbox"/> Th3 <input type="checkbox"/> Th4 <input type="checkbox"/> Th5 <input type="checkbox"/> Th6 <input type="checkbox"/> Th7 <input type="checkbox"/> Th8 <input type="checkbox"/> Th9 <input type="checkbox"/> Th10 <input type="checkbox"/> Th11 <input type="checkbox"/> Th12 <input type="checkbox"/> L1 <input type="checkbox"/> L2 <input type="checkbox"/> L3 <input type="checkbox"/> L4 <input type="checkbox"/> L5</p>
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<p>Perioperative management of bleeding</p> <p><input type="checkbox"/> none</p> <p><input type="checkbox"/> FFP</p> <p><input type="checkbox"/> fibrinogen</p> <p><input type="checkbox"/> tranexamic acid</p> <p><input type="checkbox"/> fibrin glue</p> <p><input type="checkbox"/> thrombin</p> <p><input type="checkbox"/> other..... Please specify</p>	<p>Sacro-iliac fixation</p> <p><input type="checkbox"/> none</p> <p><input type="checkbox"/> S2-ala-screw</p> <p><input type="checkbox"/> S2-ala-ileum-screw</p> <p><input type="checkbox"/> ileum-screw</p>
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<p><input type="checkbox"/> right</p> <p><input type="checkbox"/> right</p> <p><input type="checkbox"/> right</p> <p><input type="checkbox"/> ev. both</p>	<p><input type="checkbox"/> left</p> <p><input type="checkbox"/> left</p> <p><input type="checkbox"/> left</p> <p><input type="checkbox"/> left</p>	<p>If Ilium screws - no. of</p> <p>Right <input type="checkbox"/>1 <input type="checkbox"/>2 <input type="checkbox"/>3</p> <p>Left <input type="checkbox"/>1 <input type="checkbox"/>2 <input type="checkbox"/>3</p>
--	---	---

Neuromonitoring

none

by surgeon

by neurophysiologist

Technique/ screw insertion

each level/VB bilaterally

each level/VB unilaterally

alternating

Material/ Rod specification

CoCr convex

CoCr concave

Titanium convex

Titanium concave

other convex.....

other concave..... Please specify

Abbreviations: PT = Pelvic Tilt (if not declared); PI = Pelvic Incidence; LL = Lumbar Lordosis; SVA = Sagittal Vertical Axis; LBP = low back pain; DEXA = Dual-Energy X-ray Absorptiometry, DXA/DEXA; VB = Vertebral Body; CoCr = cobalt-chrome; FFP = fresh frozen plasma

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The back side with the radiographic measurements is not displayed.

APPLICATION

Quality control, health service, comparative effectiveness and outcomes research, postmarket surveillance of implants, national and international study network

Internal quality control: assuming that you have a complete data collection Spine Tango enables you to monitor all types of surgery during a specific period, observing the date and duration of operation, patient characteristics and outcomes (patient- and physician-based). The comprehensive annual report that users currently receive will soon be available as online quarter annual reports that await the user in his download section.

External quality control: Benchmarking, the comparison of own performance with that of the national or international results in the Tango data pool is a powerful management tool because it overcomes “paradigm blindness.” Paradigm blindness can be summed up as the mode of thinking, “The way we do it is the best because this is the way we’ve always done it.” Benchmarking opens organizations to new methods, ideas and tools to improve their effectiveness. It helps overcome resistance to change by presenting successful methods of problem solving that are different to the ones currently employed. Enabling benchmarking possibilities is one of the fundamental goals of the Spine Tango venture. Similar to the annual report, a benchmarking report comparing the user’s accumulated data with the accumulated pool data will be available in the download section once a year.

Code of Conduct: the underlying principles for participation in the Spine Tango registry have been written up by the ST committee and will be distributed in the near future. The Code of Conduct shall serve as a common agreement between all registry stakeholders for ensuring that the collected data itself is of an acceptable quality which does no compromise the overall goals of the project. The Code of Conduct can be read in the appendix of this annual report.

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Health service research: as a subdiscipline of health systems research, this young science is an interdisciplinary field that describes and causally explains the provision of health services to the diseased and the healthy, contributes to the development of new concepts for delivery of health services and scientifically accompanies their implementation, and evaluates the effectiveness of structures and processes of healthcare delivery under routine day-to-day conditions. The focus of health service research is the “last mile” of the health care system, where the concrete and decisive delivery of care takes place in hospitals, practices and other institutions.

Outcomes research: this aspect is actually just taking a different view for the same basic activity, i.e. the systematic and prospective collection of key data regarding interventions and outcomes for and of spinal pathologies. While quality assurance is rather used for the purposes of improving ones` own standards of care, outcomes research wants to generate new medical and scientific knowledge and make it available in the peer-reviewed literature.

Postmarket surveillance of implants: implants play a major role in modern spine surgery and just like in the domains of total joint arthroplasty their true performance can only be evaluated by systematically following the devices after implantation and documenting their outcomes in large clinical databases like the Tango.

National and international study network: the Tango is a technology backbone and currently networks about 60 active hospitals in Europe, North and South America, Australia and Asia. This provides a great opportunity for national and international multicenter studies that piggyback on the ongoing routine data collection, add some hypothesis based questions and collect this extra information for the time of primary and follow-up data collection as specified in the joint study protocol.

DATA ENTRY

There are **5 possible ways** data can be transferred to the database (figure1)

1. Online data entry via the web-interface using stationary computers or wireless tablet devices (no software to be installed)

2. OMR (Optical Mark Reader) i.e. scanner-assisted entry of paper forms.

3. Paper based data capture with mailing to the IEFO or other partner institutions for OMR scanner-assisted entry of paper forms.

4. Hybrid method of online data entry and OMR scanner-assisted entry of paper forms (not pictured).

In the rectangles multiple methods of gathering patient and physician generated data are shown (by mail, inhouse, outpatient clinics, telephone and new electronic media).

5. A handheld barcode scanner with USB (cable) or bluetooth (wireless) interface can be used to enter the exact implant information into the surgery form. Alternatively the online supplier catalogues or a section for manual entry of implant data is available.

The goal to generate a comprehensive database is achieved by collecting data of the patient layer and the clinic/physician layer. Having created a consistent data set the options of analyses are almost unlimited. Outcome evaluation can now be done in particular.

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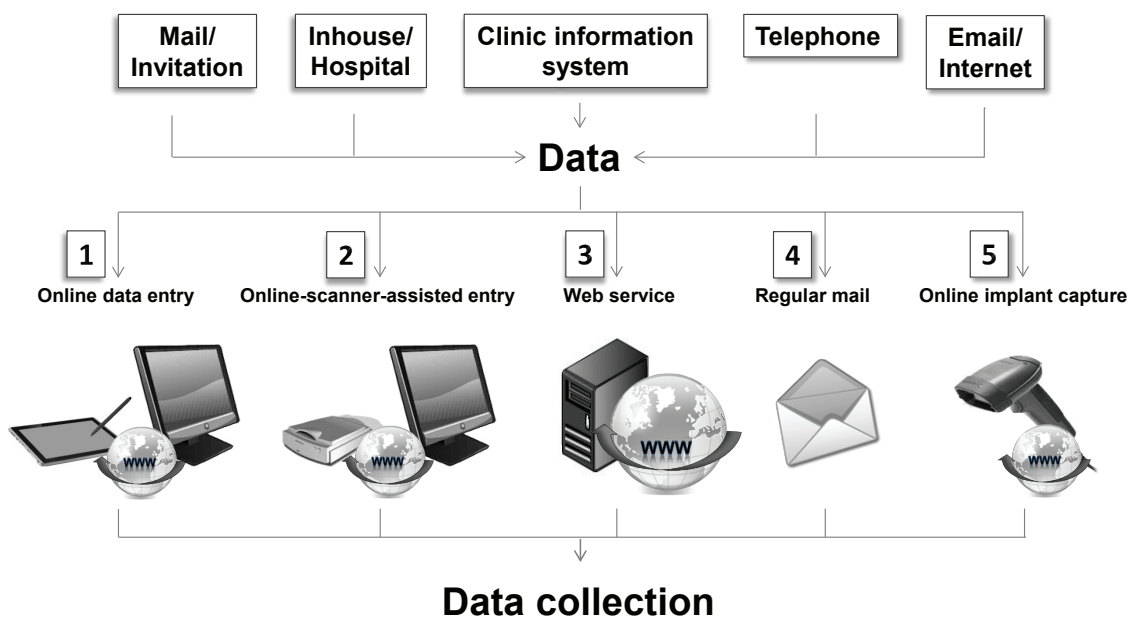


Figure 1: Spine Tango methods of data entry

A COMPLETE CASE

Following Ernest Codman’s “end result system” the result of a surgical intervention should be recorded if the outcome can be considered as definitive (3). In most cases of spinal surgery, this can be done after a minimum of 3 months after surgery as demonstrated by Mannion et al (4). In accordance with figure 02. EuroSpine encourages one physician and patient based follow-up in the first year after surgery, ideally later than 3 months postop, and further, at least patient based follow-ups around year one and two after surgery. The registration of complications at any time during the postoperative period is self understood. Patient based outcome documentation with the COMI (Core Outcome Measure Index) questionnaires for neck and back pain has become an essential part of the Spine Tango documentation (5). Figure 03 on the next page illustrates the ideal case of a completely documented treatment (6).

3. Codman, Ernest A. (1916). A Study in Hospital Efficiency. Boston, Mass., privately printed
4. Mannion AF, Porchet F; Kleinstück FS, Lattig F, Jeszenszky D, bartanusz V, Dvorak J, Grob D. (2009) The quality of spine surgery from the patient’s perspective. Part 1: the Core Outcome Measures Index in clinical practice. Eur Spine J. 18 Suppl 3:367-73
5. Mannion AF, Elfering A, Staerke R, Junge A, Grob D, Semmer NK, Jacobshagen N, Dvorak J, Boos N (2005) Outcome assessment in low back pain: how low can you go? Eur Spine J 14:1014-1026
6. Zweig T, Mannion AF, Grob D, Melloh M, Munting E, Aebi M, Tuschel A, Röder C. (2009) How to Tango – a manual for implementing Spine Tango. Eur Spine J 18 Suppl 3:312-2

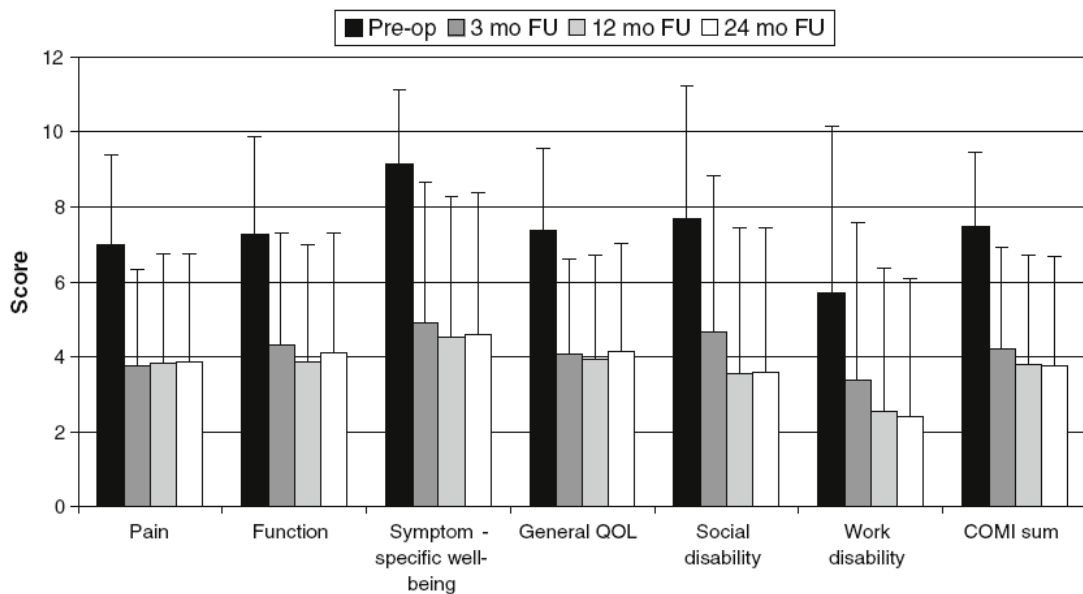


Figure 2: Patient based outcome documentation with the COMI (Core Outcome Measure Index) questionnaires, AF Mannion et al. (2009)(4)

PRE- & POSTOPERATIVE DOCUMENTATION WORKFLOW OF A CASE

14

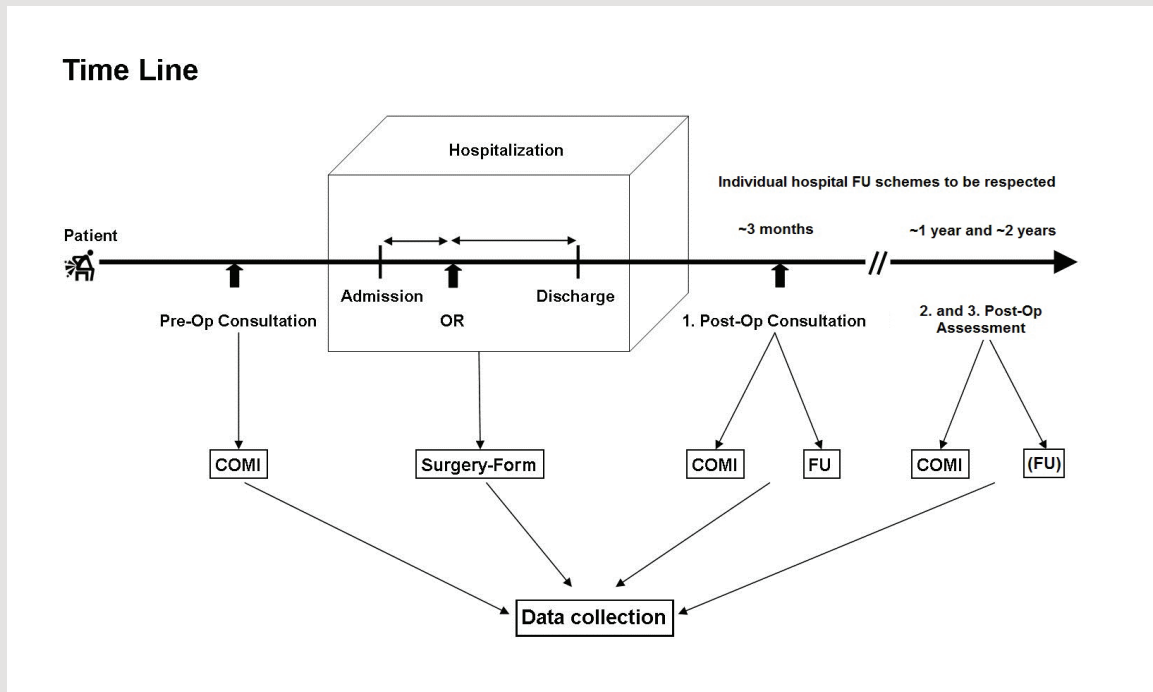
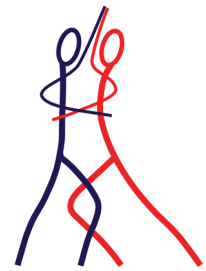


Figure 3: Timetable of data collection

Apart from the preoperative assessment of patients' quality of life and the recording of the surgical intervention, the Spine Tango code of conduct recommends one physician and patient based follow-up around the 3 months postoperative time interval. In accordance with international standards in the medical literature, an additional and at least patient based follow-up for the follow-up intervals 1 year and 2 years is highly desirable. If a surgeon based follow-up can also be achieved, a perfect outcome documentation is in place.



STATISTICS AND COMMENTS

A study of the weighting and frequency of statistical reports was published by Windish in JAMA in 2007 (7). This work comprises the study of 239 original articles in 6 journals (American Journal of Medicine, Annals of Internal Medicine, BMJ, JAMA, Lancet, New England Journal of Medicine) with regard to statistical evaluation. 91.6% of the articles included descriptive statistics and 50.2% were compiled from simple statistical methods. Multivariate analyses were used for 68.6% of the cases. All the above mentioned methodologies can be used in Spine Tango. The Spine Tango international pool offers currently close to 65'000 cases. The number of entries increases constantly. Below you will find a short summary of all the documented surgeries in Spine Tango followed by a detailed assessment of the patient subgroup with various types of spondylolisthesis.

15

7. Windish D, Huot SJ, Green ML (2007).
Medicine Residents' Understanding of the Biostatistics and Results in the Medical Literature;
JAMA. 2007;298(9):1010-1022.

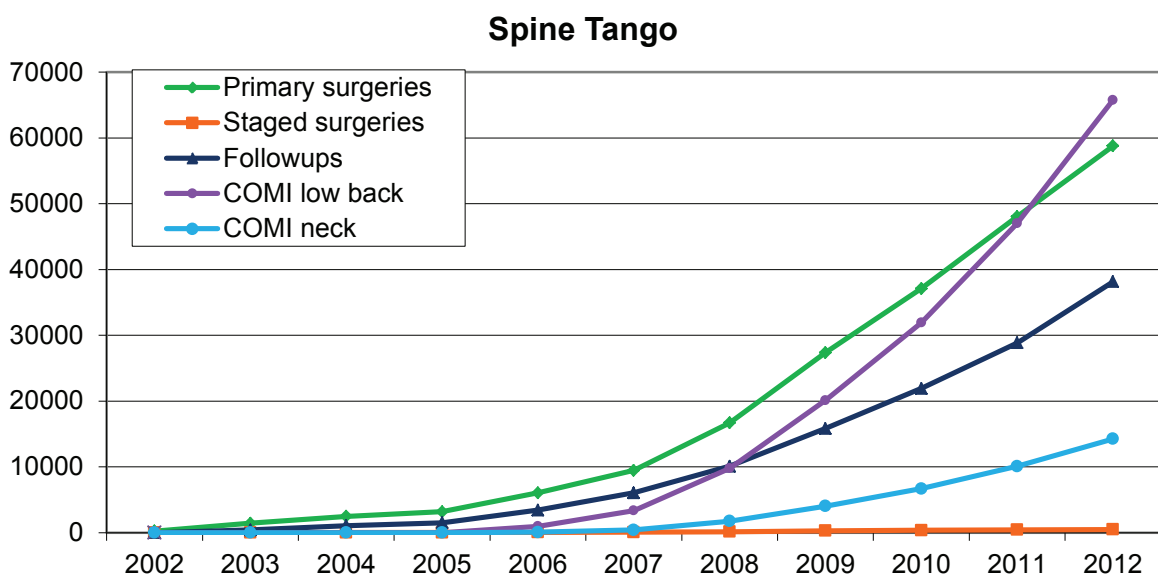


Figure 4: Growth curves of implemented forms (primary and staged surgery and follow-up) as well as COMI low back and neck over the years.

PART I: DESCRIPTIVE ANALYSIS FORM VERSION 2011 AND 2005/2006
Population description

Since January 2012 the newly developed Spine Tango form version 2011 were exclusively used for data collection. Consequently, the information gained during the year 2012 is based on these new forms while the previous annual report covered the complete data pool based on the SSE forms versions 2005 and 2006.

This year we would like to highlight the new variables and new possibilities in information retrieval with the form version 2011.

In order to point out the differences to the former forms the distribution of some parameters in the 2005/2006 patient sample is also shown.

In total the form version sample 2005 and 2006 counts 41`735 surgeries.

Until the end of 2012 8`946 new surgeries could be registered with the form version 2011.

Figure 5 and figure 6 show the age and gender distribution for both samples.

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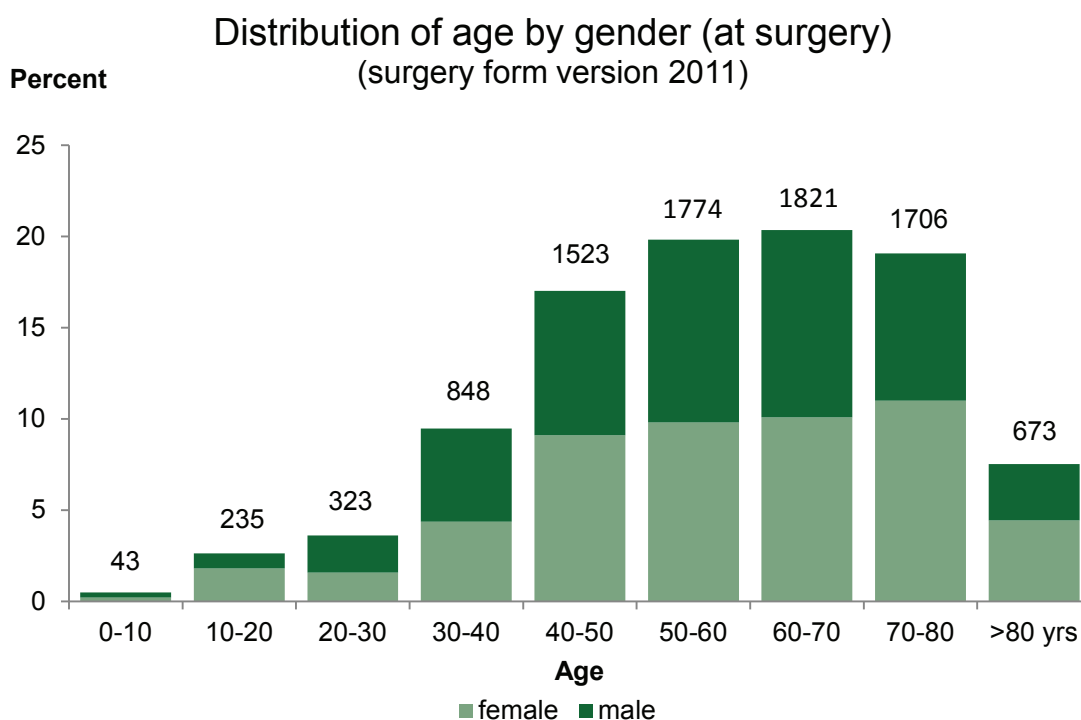


Figure 5: Distribution of age by gender (at surgery), all cases based on surgery form version 2011 (N=8`946)

A similar age and gender distribution can be seen for both form versions.

Demographic data
Lengths of stay (LOS)

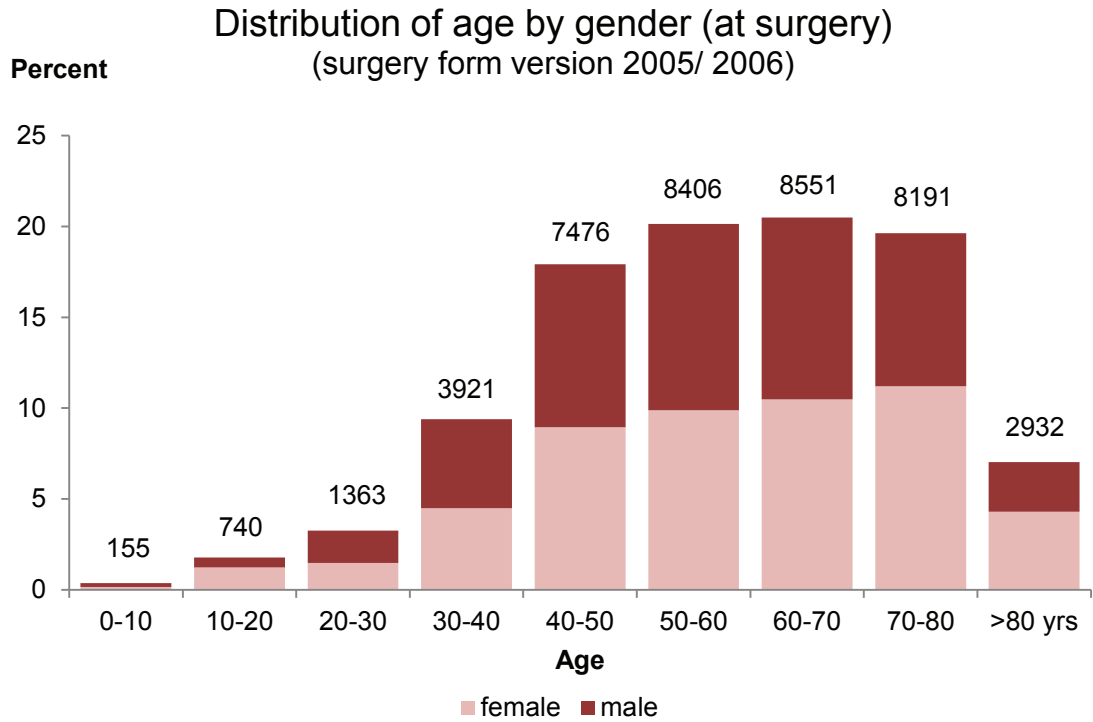


Figure 6: Distribution of age by gender (at surgery), all patients with surgery form version 2005/2006 (N=41'735)

The hospitalization times (length of stay (LOS)) reveal some differences. The form version 2011 displays a slightly higher percentage of LOS between 0-2 and 3-5 days and lower percentage of longer LOS compared to the 2005/2006 forms. This may reflect the trend of shorter hospitalizations over the past years.

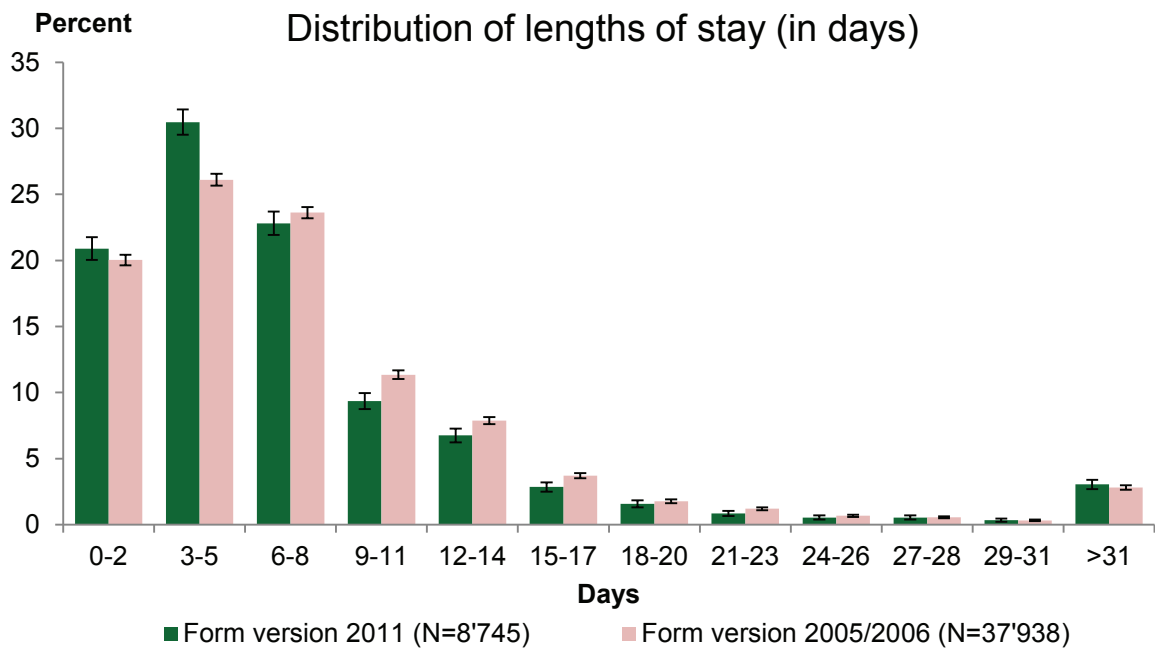


Figure 7: Length of stay for the surgery form version 2011 (N=8'745) and version 2005/2006 (N=37'938)

SURGERY FORM
New parameters: BMI / smoker

Further description of the patient sample can be made with new risk parameters such as body mass index (BMI) and smoking status which are newly evaluated with the 2011 forms.

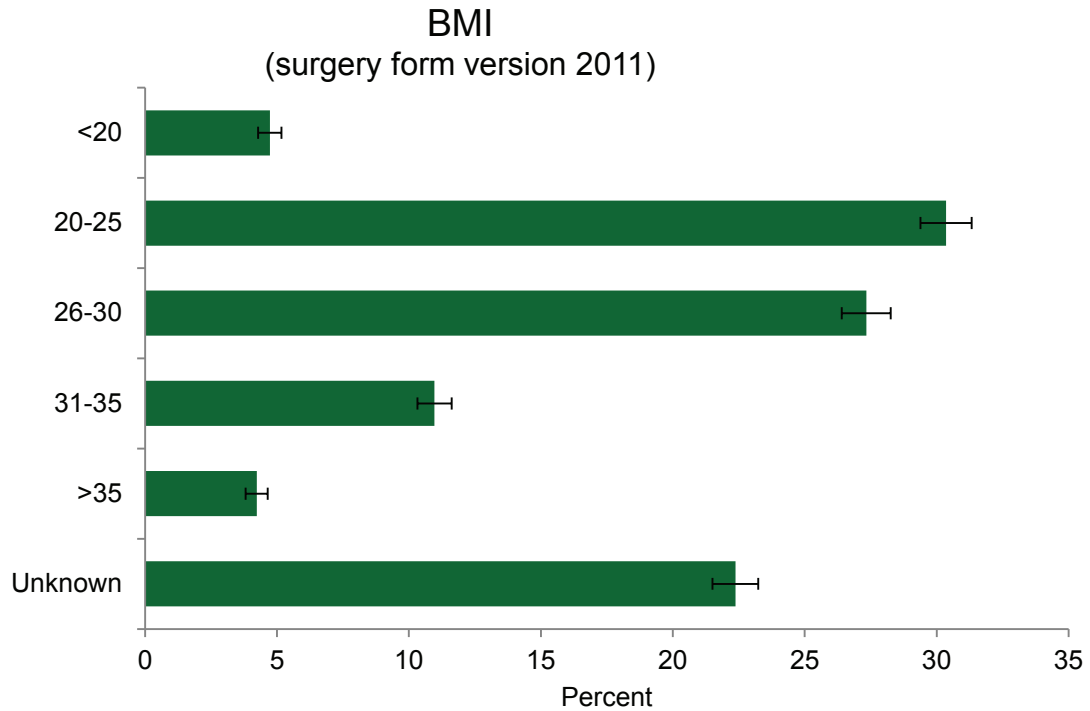


Figure 8: Distribution of body mass index (BMI), surgery form version 2011 (N=8'770)

For BMI the classification underweight: < 20, normal weight: 20 – 25, overweight: 26-30, moderately obese: 31-35 and severely obese: >35 was used for categorization. A total of 42.3% of cases have a BMI over 25 which means they are at least overweight or even obese (15.2%).

38.7 % of patients receiving spinal surgery were labeled as currently smoking, in 13.8% of cases the smoking status was unknown.

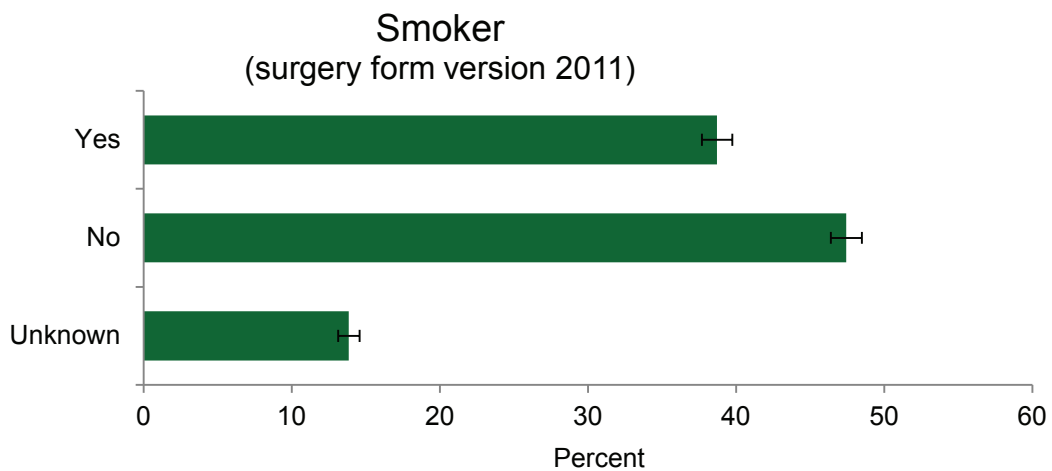


Figure 9: Distribution of current smoking status, surgery form version 2011 (N=8'770)

SURGERY FORM
New parameters: risk factors - flags

Risk factors - Flags
(surgery form version 2011)

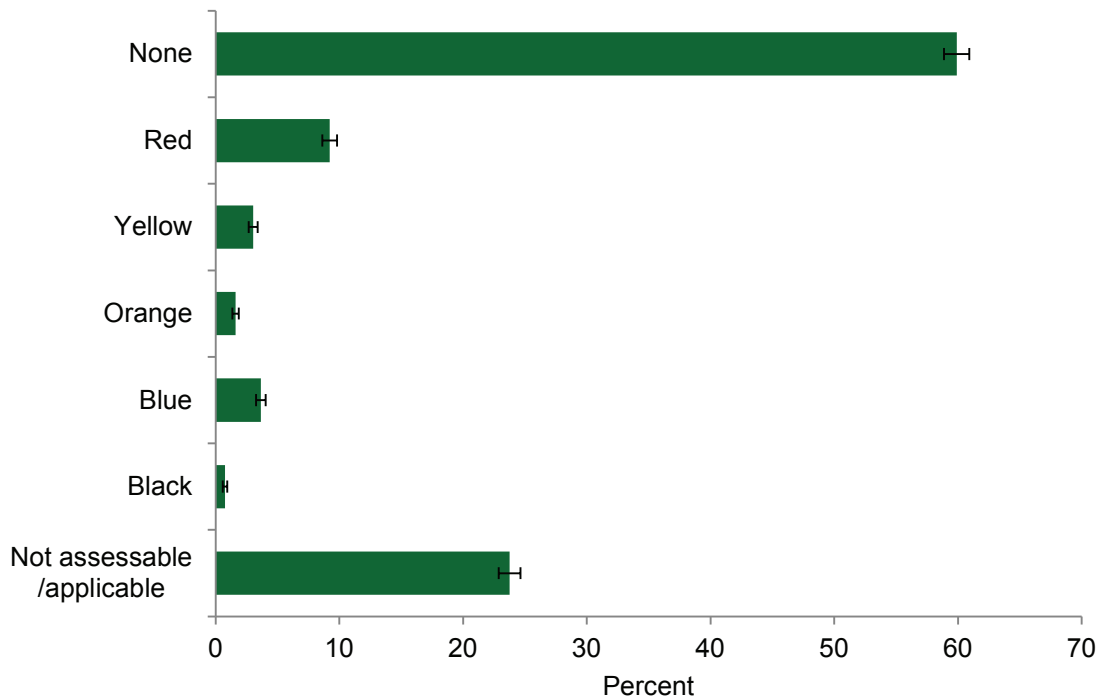


Figure 10: Distribution of risk factors - flags, all patients with surgery form version 2011 (N=8'940)

The flags are an additional new parameter. It is a classification/ assessment for the treatment of low back pain (LBP) patients considering psychosocial risk factors. The psychosocial flag system can help e.g. occupational health practitioners to create suitable rehabilitation plans for employees.

A brief legend of the meanings of the different colors is given in table 1.

Table 1: Description of flag types

Flag	Short description
<i>Red:</i>	<i>Biomedical Factors; serious spinal pathology</i>
<i>Yellow:</i>	<i>Psychosocial or behavioral factors</i>
<i>Orange:</i>	<i>Abnormal psychological processes indicating psychiatric disorders</i>
<i>Blue:</i>	<i>Socioeconomic/ work factors</i>
<i>Black:</i>	<i>Occupational and societal factors</i>

SURGERY FORM

Distribution of main pathology

Degenerative disease remains the most frequent main pathology in the form version 2011 with 76.5% (74.9% in the versions 2005/2006).

Spondylolisthesis seemed to be slightly more frequent in the 2005/2006 versions. This can be explained by the fact that the degenerative type of spondylolisthesis was previously included, which is different in the version 2011. Now the degenerative spondylolisthesis and degenerative deformity are both part of the degenerative diseases.

Another trend is seen in the higher proportion of the “repeat surgery” in version 2011 (7.4%) compared to the percentage of the “failed surgery” in the former forms (4.0%). This might be due to renaming of the question from “failed surgery” to “repeat surgery” with additional answer options like e.g. adjacent segment pathology, hardware removal or failure to reach therapeutic goals.

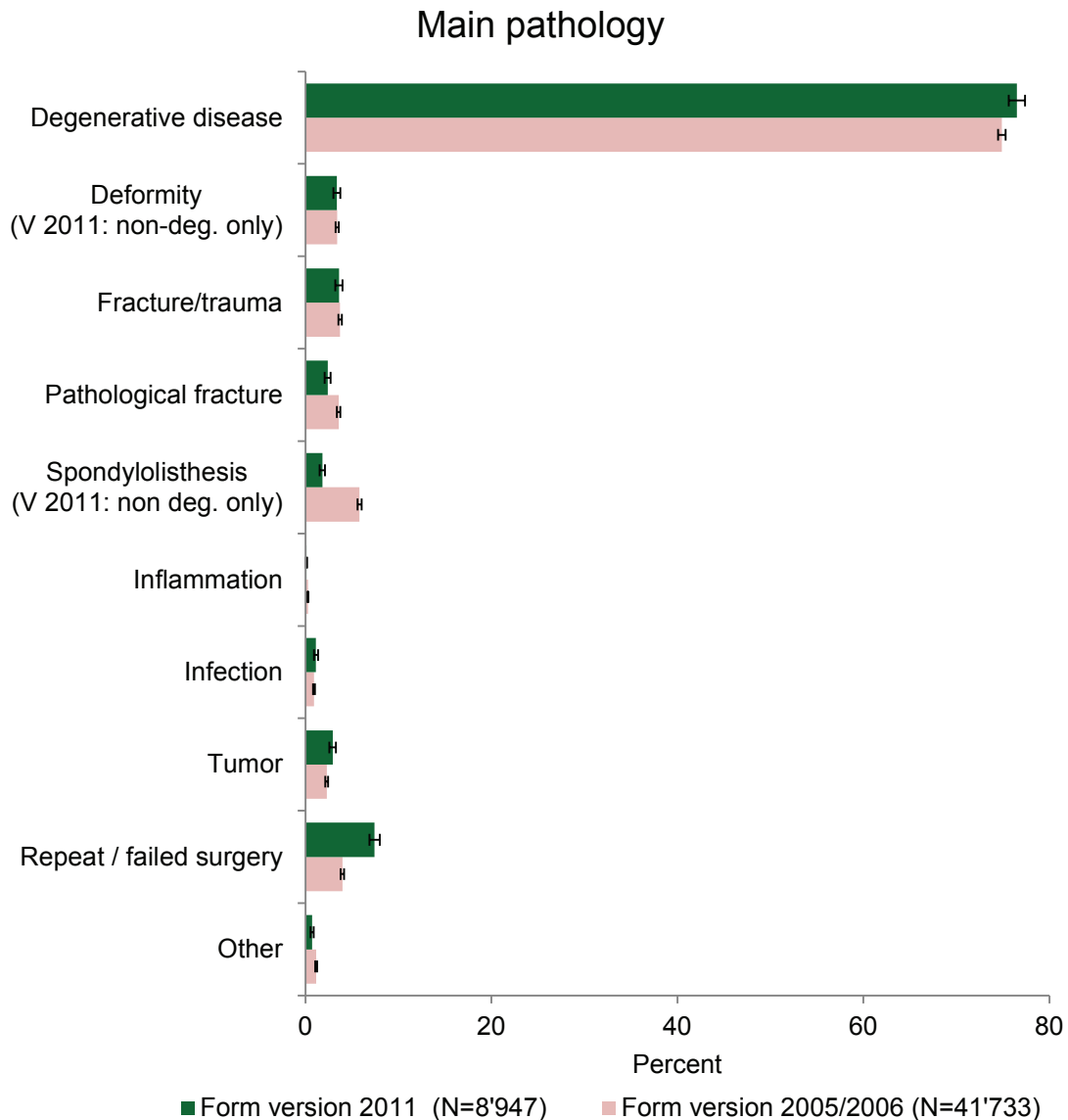


Figure 11: Distribution of main pathology for the surgery form version 2011 (N=8'947) and the form version 2005/2006 (N=41'733)

SURGERY FORM Specification of degenerative disease

Fig. 12 shows the distribution of the old and new answer categories of degenerative disease. Spinal stenosis was replaced and can now be further specified in central, lateral and foraminal stenosis. Degenerative deformity, degenerative spondylolisthesis, other instability and myelopathy are new categories. Adjacent segment degeneration was transferred to the section “repeat surgery” in the version 2011. A direct comparison is difficult due to the different categories.

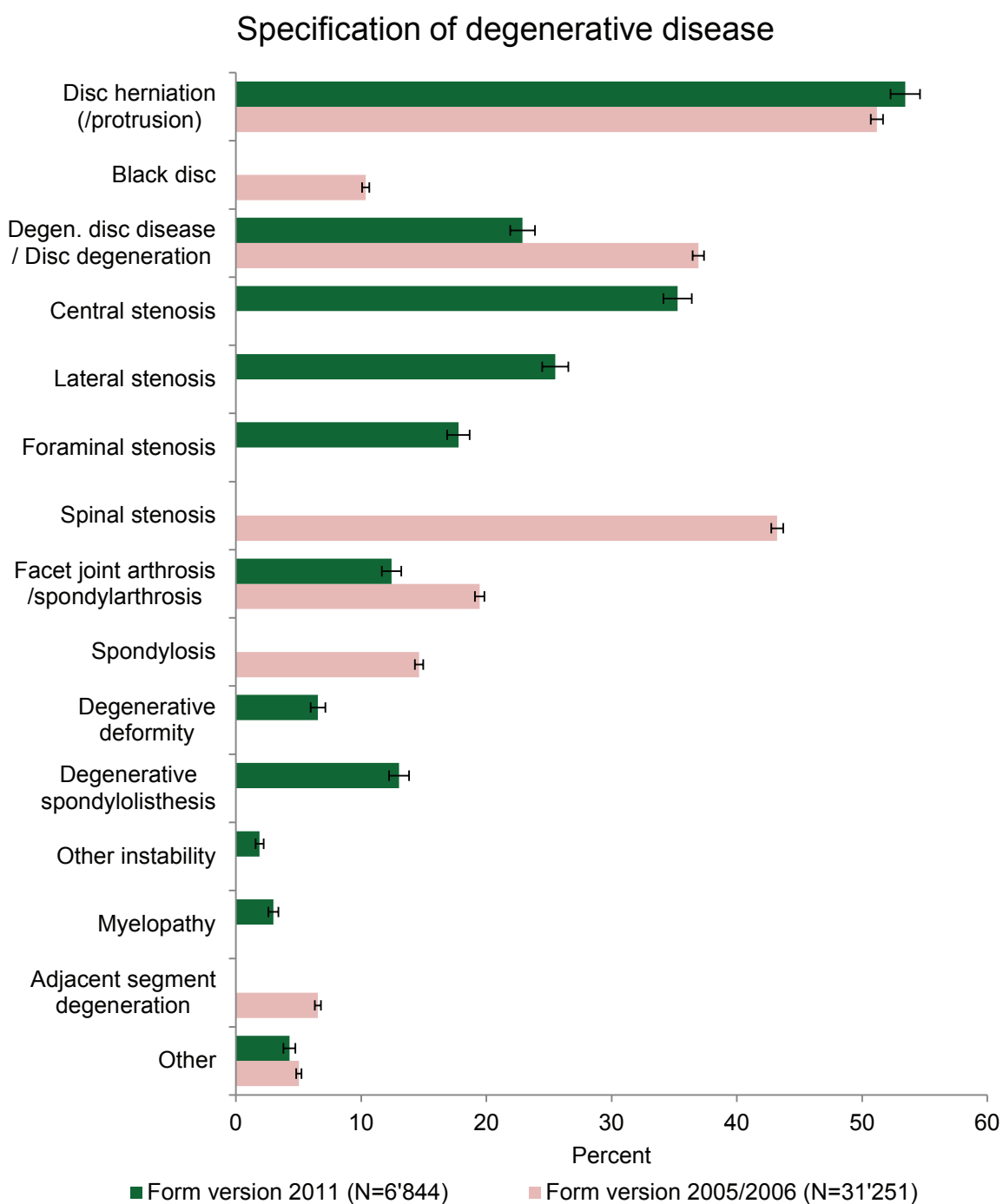


Figure 12: Specification of degenerative disease for the surgery form version 2011 (N= 6'844) and the form version 2006/2005 (N=31'251)

SURGERY FORM Type of spondylolisthesis

The degenerative type of spondylolisthesis is more pronounced in the version 2011 with 84.5% compared to 60.2% in the former versions. The isthmic type seems to be regressive with 12.8% in the version 2011 compared to 29.3% in the 2005/2006 versions.

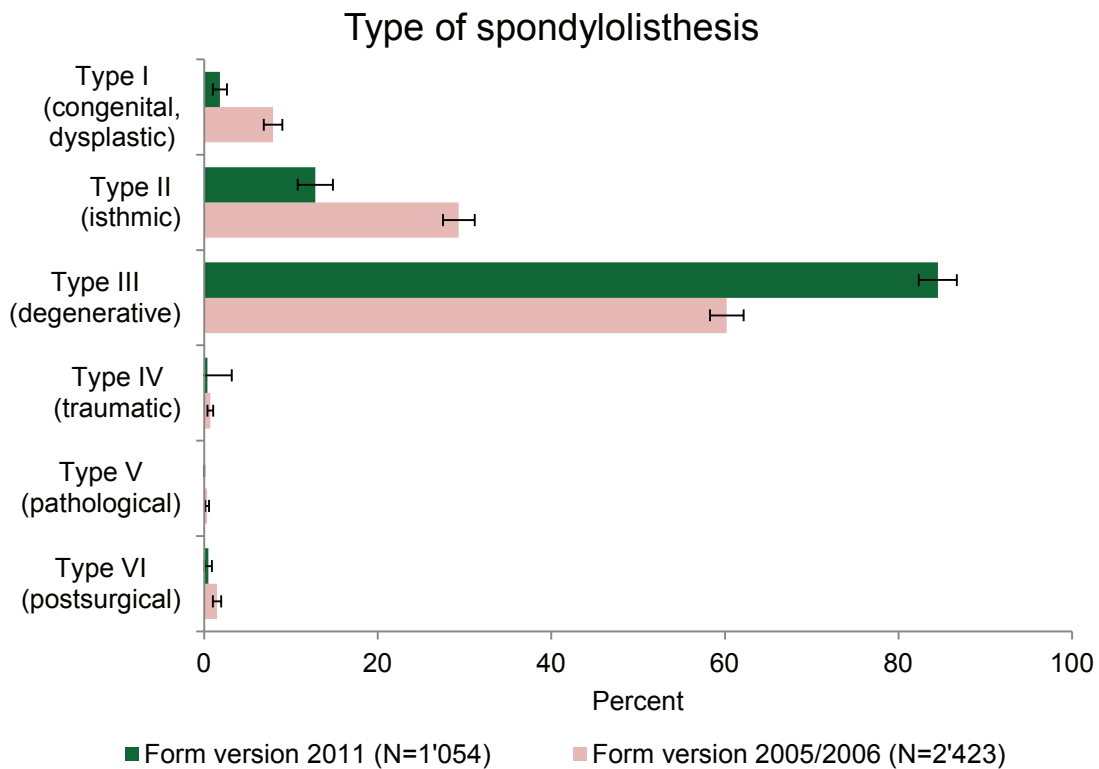


Figure 13: Distribution of type of spondylolisthesis for the surgery form version 2011 (N=1'054) and the form version 2005/2006 (N=2'423)

The classification of the degenerative spondylolisthesis is now (in the version 2011) included into the specification of degenerative disease as main pathology which gives the possibility to declare further degenerative pathologies which can be seen later in fig. 13.

Table 2: Classification of the various types of spondylolisthesis of Neugebauer & Newman, adapted by Wiltse et al.

Type I	<i>congenital, dysplastic</i>	Type IV	<i>traumatic</i>
Type II	<i>isthmic</i>	Type V	<i>pathological</i>
Type III	<i>degenerative</i>	Type VI	<i>postsurgical</i>

SURGERY FORM Aetiology of deformity

The changes in the distribution of type of spondylolisthesis are similar to the distribution of the aetiology of deformities. Idiopathic is the most frequent predominant aetiology for deformity in the 2005/2006 form versions (39.6%) whereby in the newer form version 2011 degenerative is the most frequent aetiology. This is probably due to transferal into the section “specification of degenerative disease” which might lead to a more frequent selection of this pathology.

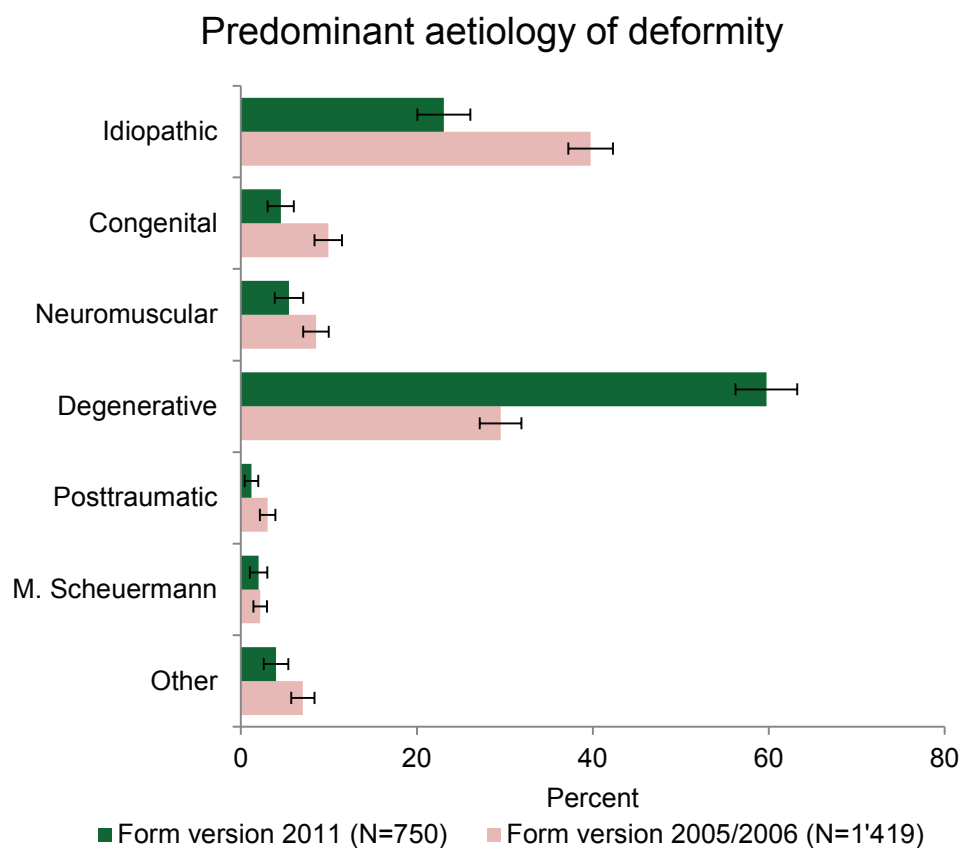


Figure 14: Distribution of predominant aetiology of deformity for the surgery forms version 2011 (N=750) and the forms version 2005/2006 (N=1'419)

SURGERY FORM
Additional deg. diseases for patients with deg. spondylolisthesis or deformity

Fig. 15 demonstrates the new possibilities of the description of additional degenerative pathologies in patients with deg. spondylolisthesis and deg. deformity. The degenerative disc disease and facet joint arthrosis seem to occur more often in patients with deg. deformity with 60.0% and 44.6% compared to 33.7% and 30.0% in patients with deg. spondylolisthesis.

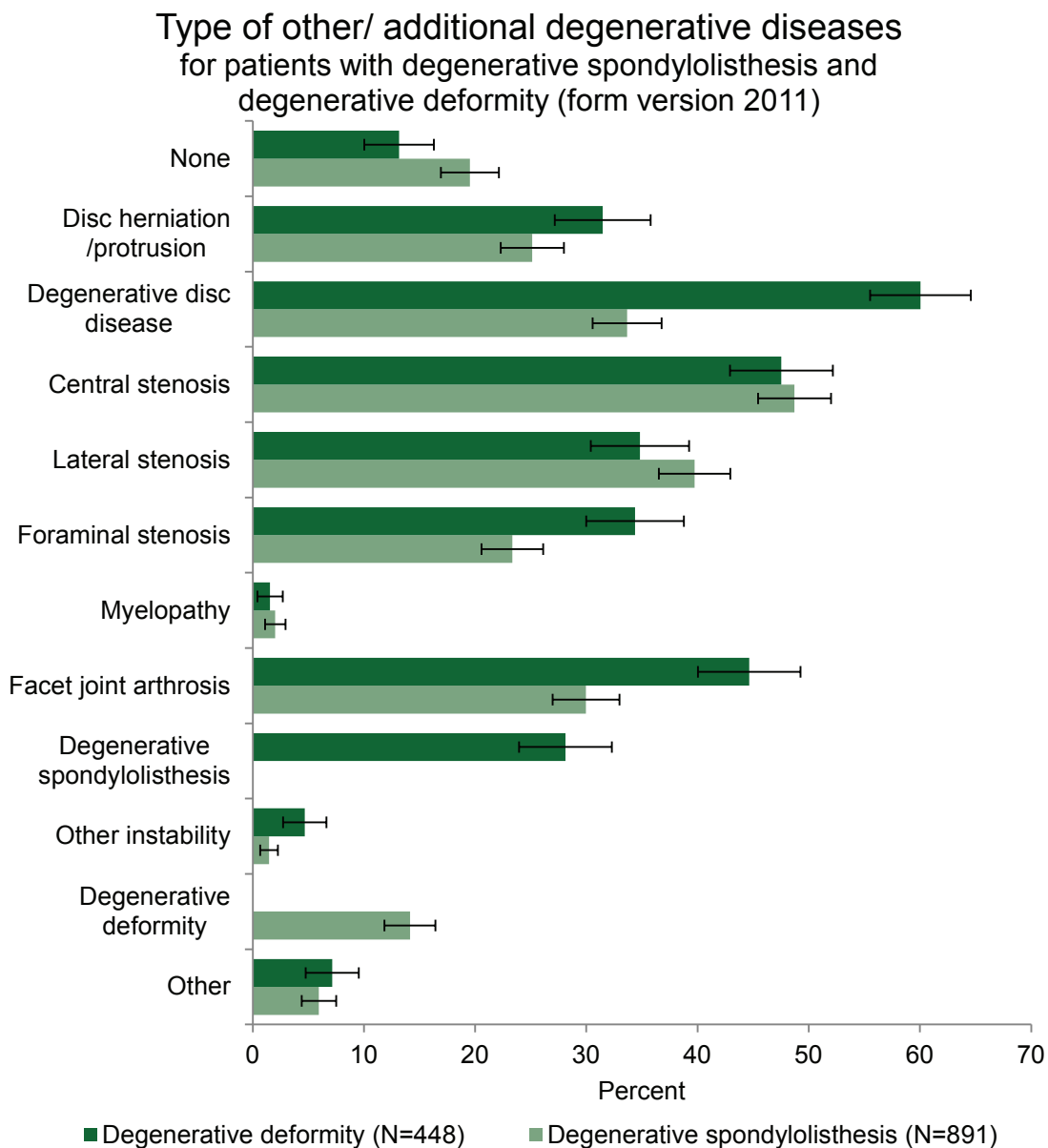


Figure 15: Distribution of type of other/ additional degenerative diseases for patients with degenerative spondylolisthesis (N=891) and degenerative deformity (N=448), surgery form version 2011

The parameter failed surgery was renamed to repeat surgery and some more specifications were added in the version 2011. The postoperative infection can now be further specified into superficial or deep infection. Other new specifications are hardware removal, failure to reach therapeutic goals, implant malposition and adjacent segment pathology.

SURGERY FORM
Type of repeated / failed surgery

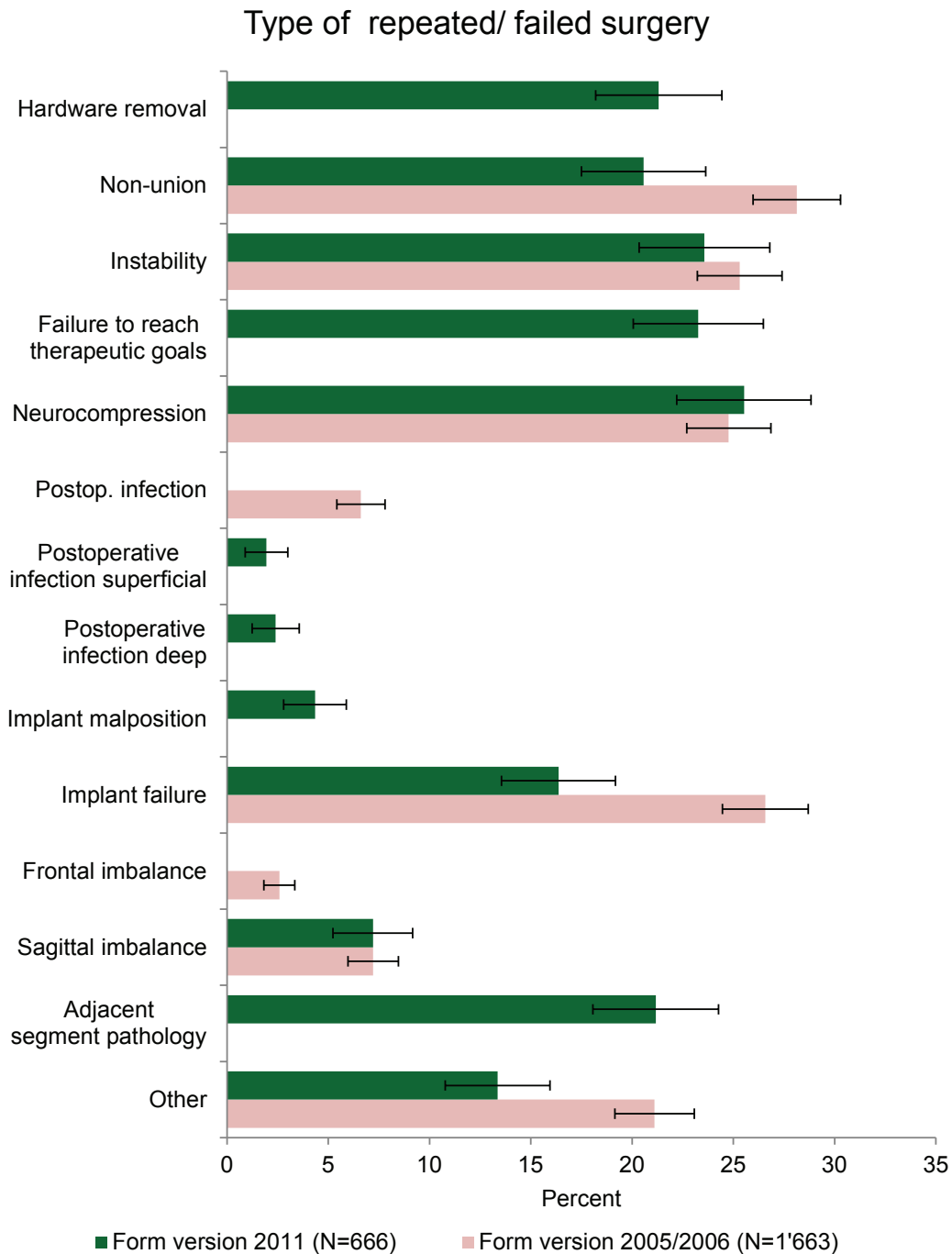


Figure 16: Type of failed/ repeated surgery for the surgery form version 2011 (N=666) and the form version 2005/2006 (N=1'663)

In the year 2012 666 cases with repeat surgeries were recorded in the database. Hardware removal covered 21.3% of cases, and adjacent segment pathology another 21.2%. These specifications do not necessarily imply a failed index surgery, which explains the new variable name. Failure to reach the initial therapeutic goals was given as a reason for repeat surgery in 23.3% of cases.

SURGERY FORM
Infection / tumor

The parameters “Affected structures of infection” and “Localization of tumor” were newly defined. The former forms considered only the disc and vertebra as affected structure of infection. The new answer possibilities in the version 2011 also take the epidural space and the paravertebral soft tissue into account.

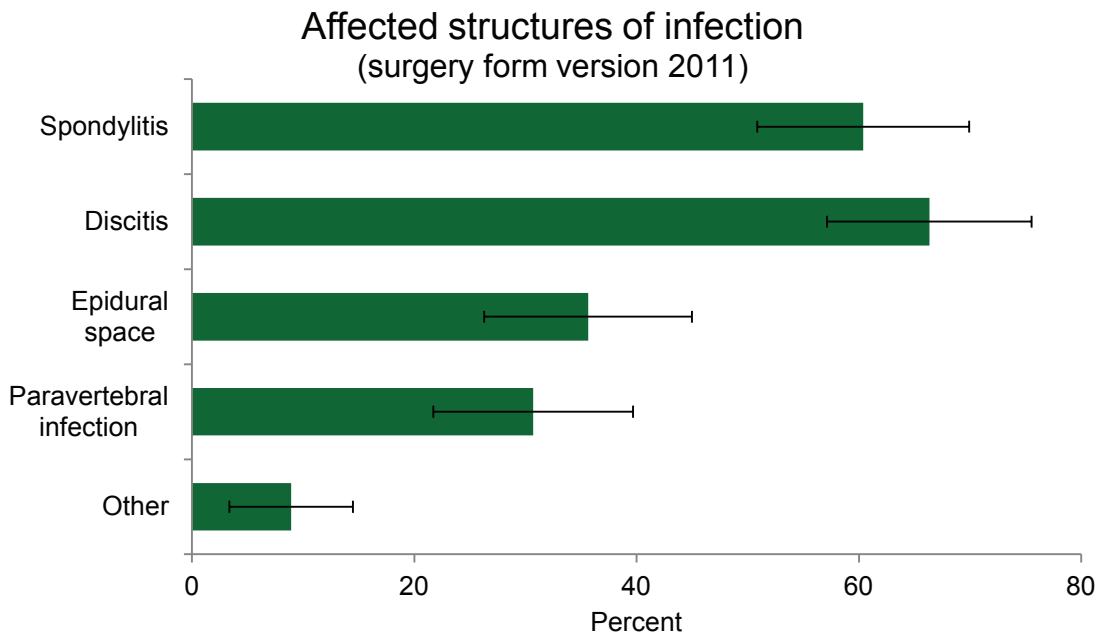


Figure 17: Distribution of affected structures of infection, surgery form version 2011 (N=101)

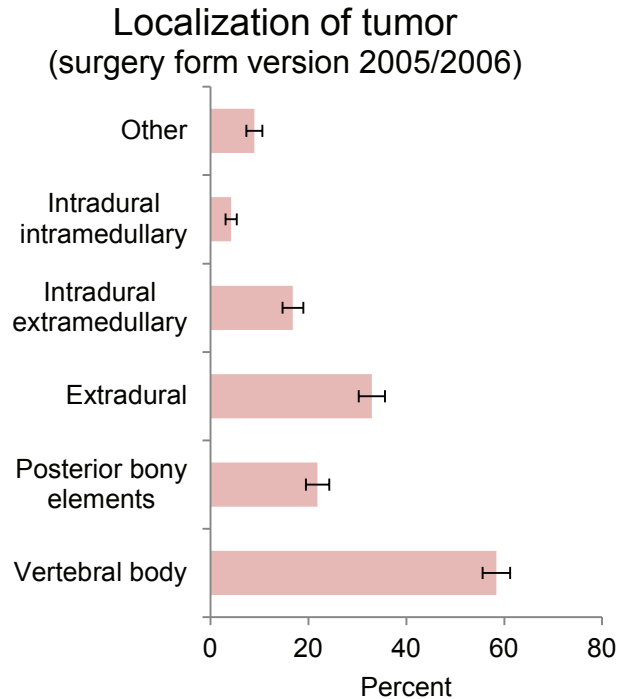
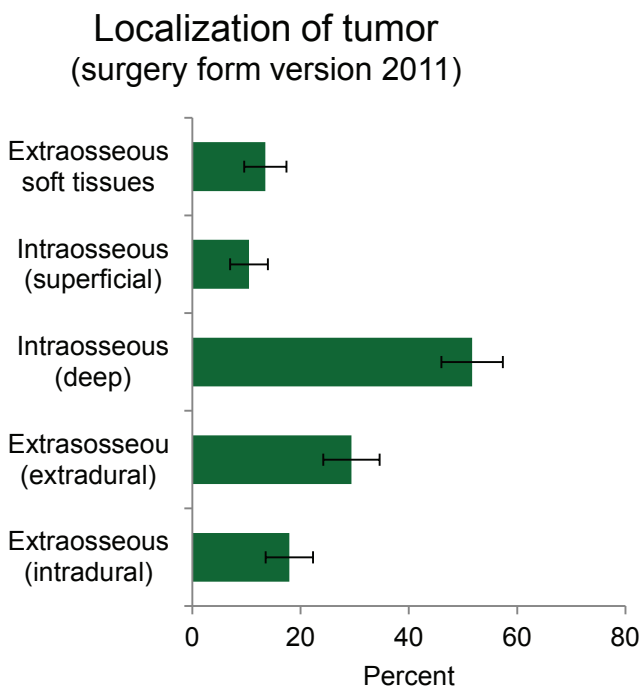


Figure 18a/ b: Distribution of localization of tumor for a: the surgery form version 2011 (N=296) and b: the form version 2005/2006 (N=1'171)

SURGERY FORM
Therapeutic goals / goals of surgery

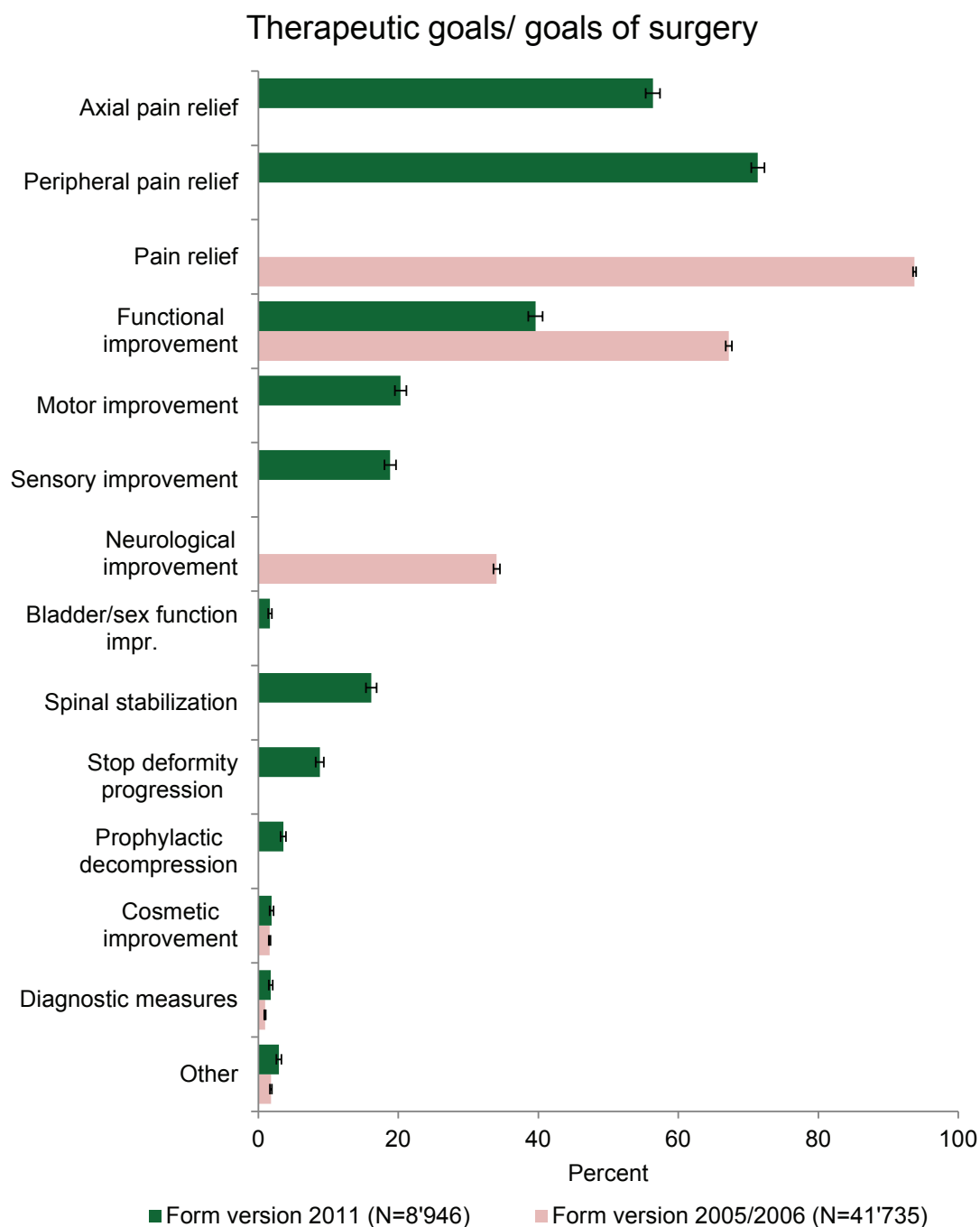


Figure 19: Distribution of therapeutic goals/ goals of surgery for the surgery form version 2011 (N=8'946) and the form version 2005/2006 (N=41'735)

The therapeutic goals can be more precisely defined in the form version 2011. Pain relief was split-
 ted into axial and peripheral pain relief to consider back/ neck and leg/ arm pain. The neurological
 improvement can now be specified as sensory, motor and bladder/sex function improvement. Further
 new answer options are spinal stabilization, stop deformity progression and prophylactic decompres-
 sion.

SURGERY FORM
Prophylaxis / fusion promoting measures

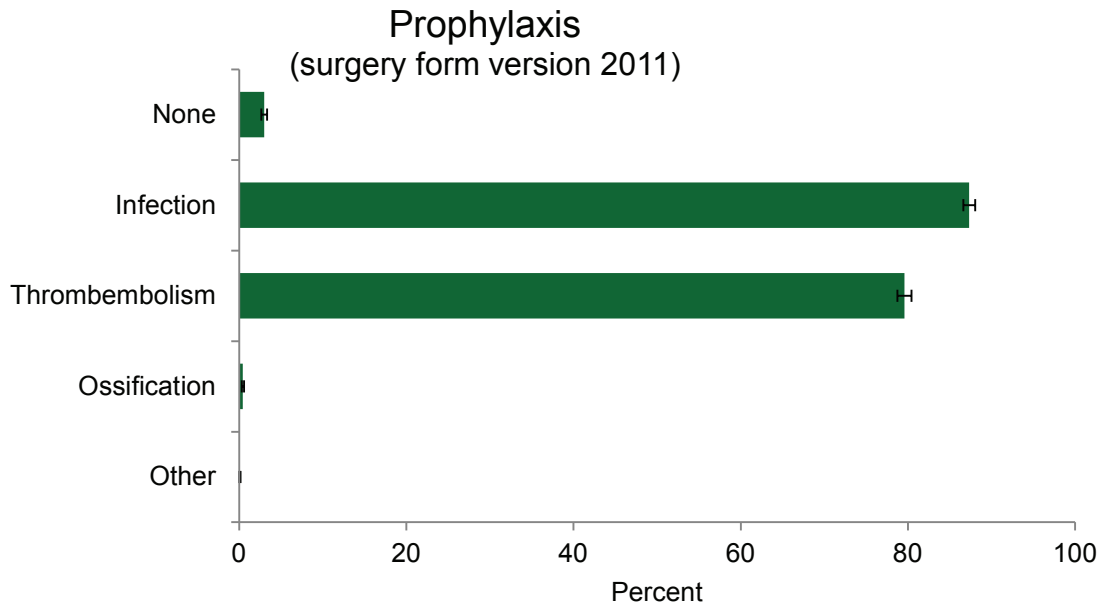


Figure 20: Distribution of type of prophylaxis, surgery form version 2011 (N=8'769)

Prophylaxis is a new question in the form version 2011. Infection prophylaxis was performed in 87.3% of cases, thromboembolic prophylaxis in 79.6% of cases.

Specification of fusion promoting measures (surgery form version 2011)

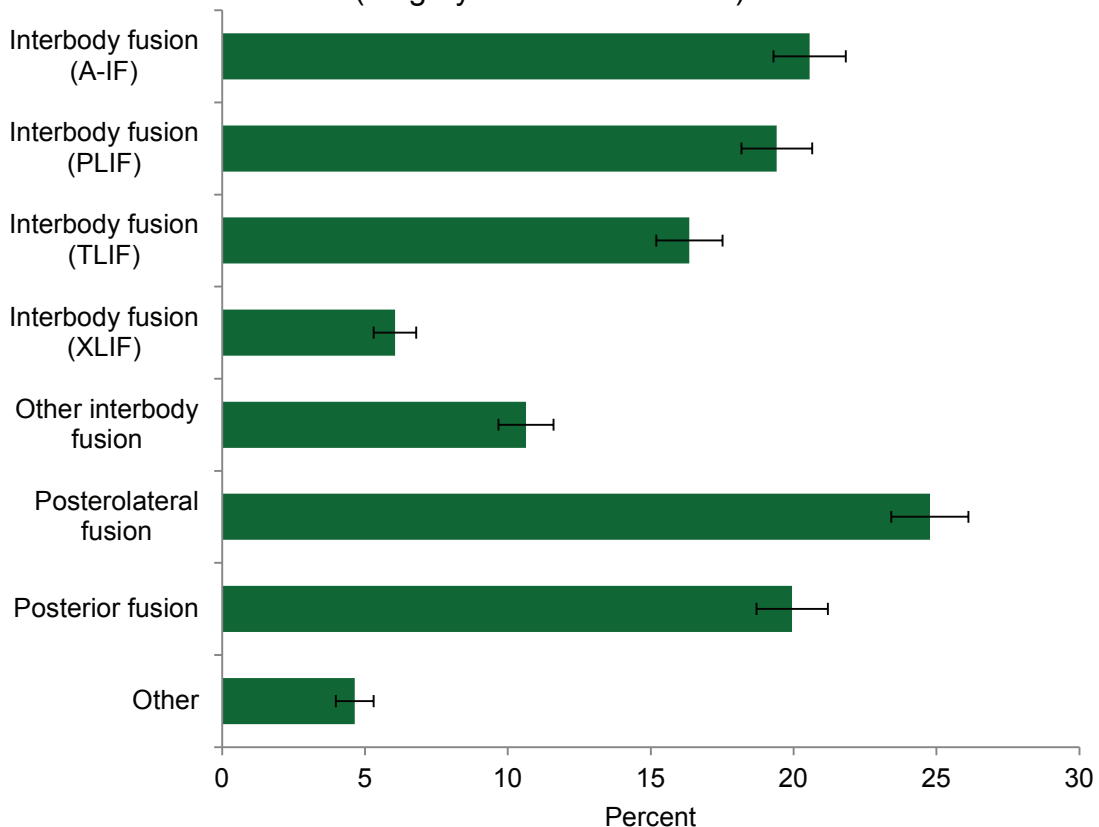


Figure 21: Specification of fusion promoting measures, surgery form version 2011 (N=3'920)

SURGERY FORM Fusion material

The fusion promoting measures can now be more precisely specified in terms of the different types of interbody fusion. The most frequently performed interbody fusions are A-IF and PLIF with 20.6% and 19.4%. A TLIF was performed in 16.3% and a XLIF in 6.1% of cases where a fusion was performed. The posterolateral fusion was the most frequently performed fusion promoting measure in total with nearly 25%.

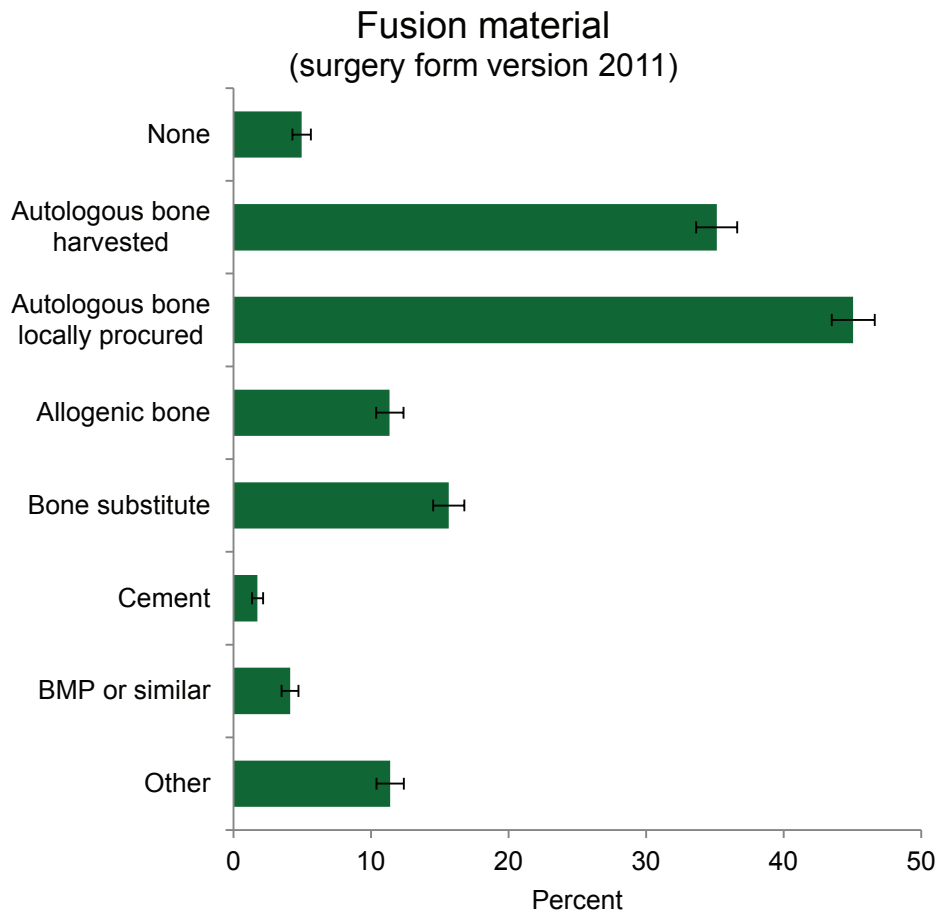


Figure 22: Specification of fusion material, surgery form version 2011 (N=3'920)

The specification of the fusion material was also redesigned. Especially for autologous bone it can now be distinguished whether the bone was locally produced e.g. during decompression or whether the bone was harvested e.g. via beck crest biopsy.

SURGERY FORM Intraoperative complications

The surgical complications are now divided into intraoperative complications and complications occurring during hospitalization before discharge.

For intraoperative complications which are shown in fig. 23 the dura lesion was the most frequent complication with 4.3%. This rate is similar to the distribution of the complications of the form version 2005/2006 (see figure 25). No intraoperative surgical complications occurred in 93.4% of the cases, in 1.3% of the cases they were not documented.

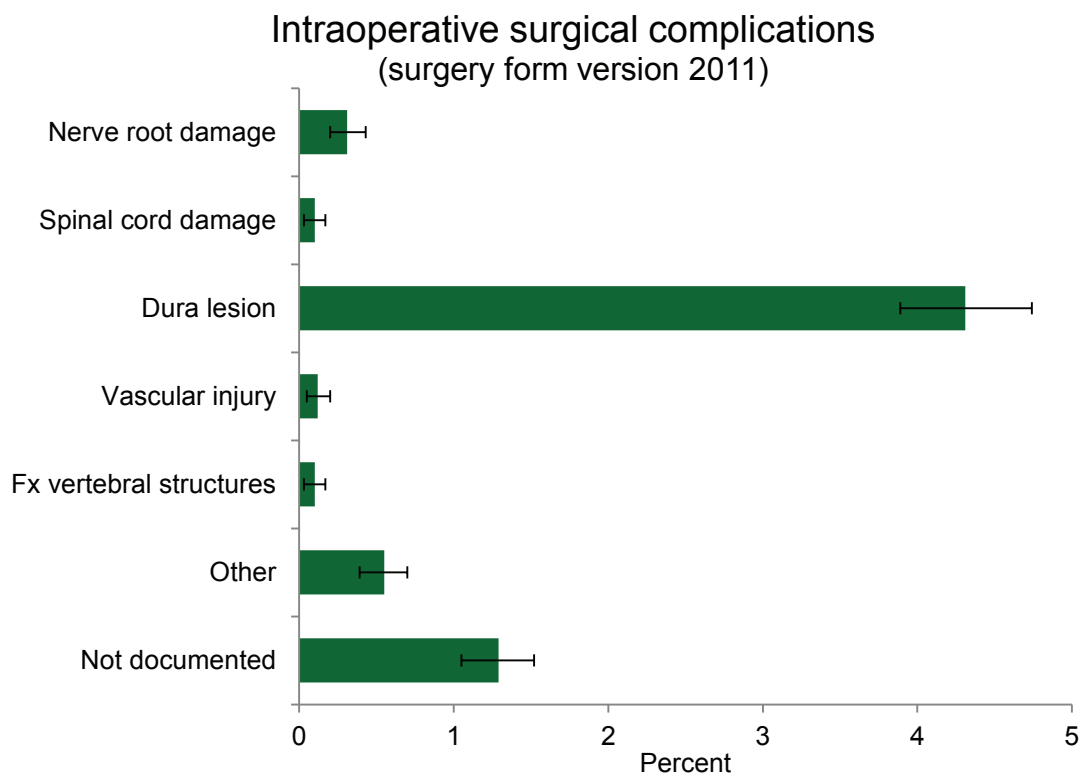


Figure 23: Distribution of intraoperative surgical complications, excluded was the answer "none", surgery form version 2011 (N=8'947)

Postoperative complications which occurred during hospitalization are shown in figure 24.

The most frequent complications were motor dysfunction with 1.1%, sensory dysfunction with 0.8% and radiculopathy with 0.7%. Even though a dura lesion was the most frequent complication during surgery, a CSF leak/ pseudomeningocele occurred in only 0.4% of cases. In 1.1% of cases the complications before discharge were not documented, in 94.2% of cases no complications occurred.

SURGERY FORM
Postoperative complications

Surgical complications before discharge
(surgery form version 2011)

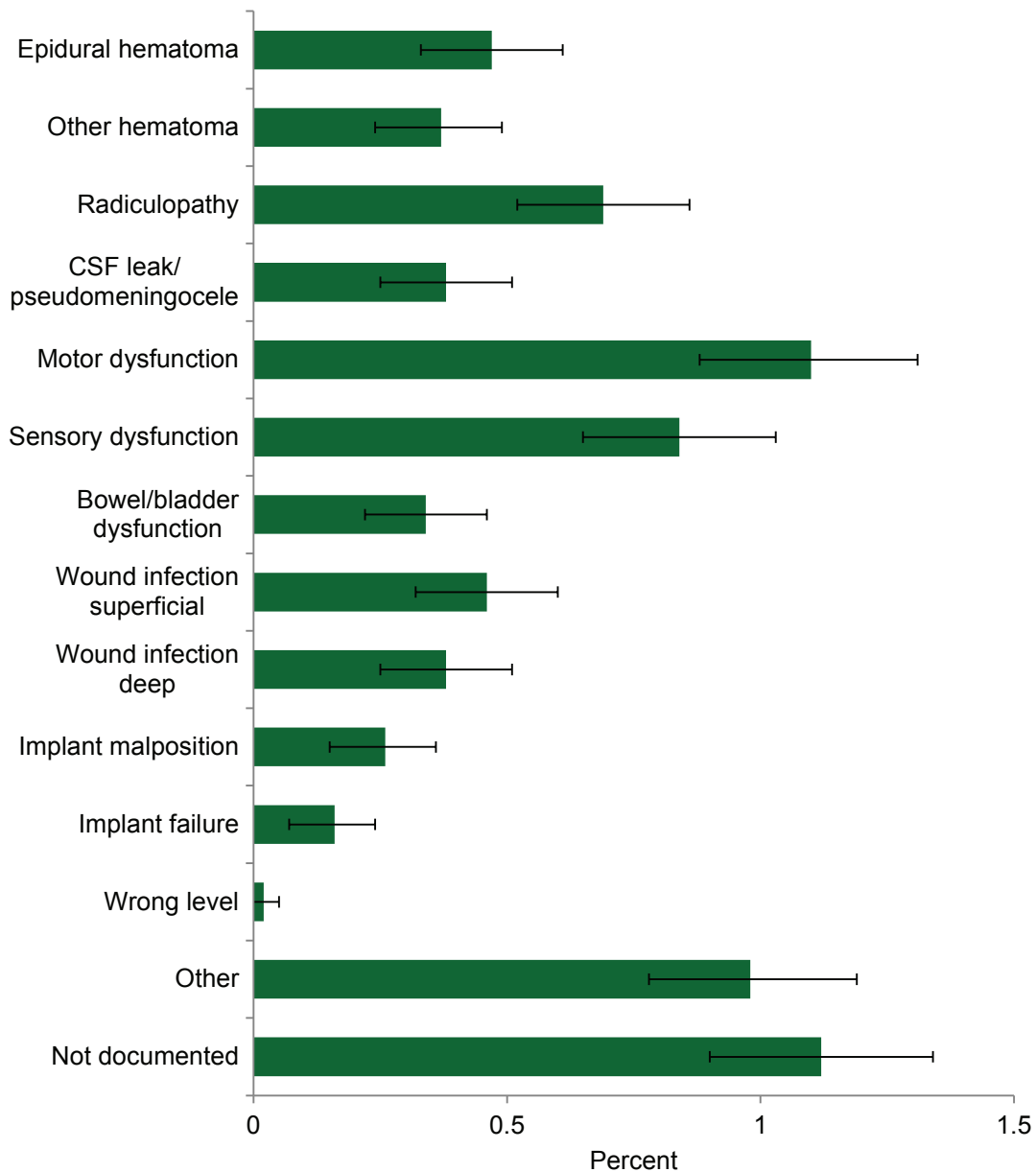


Figure 24: Distribution of surgical complications before discharge, excluded was the answer "none", surgery form version 2011 (N=8'947)

SURGERY FORM Complications

The distribution of surgical postoperative complications in the former form version 2005/2006 is given in figure 25. The dura lesion rate was 2.8%. Bleeding in and outside of the spinal canal occurred in 0.4% of cases. The wound infection rate was 0.5% like the implant failure rate. In 94.4% of these 39'721 surgeries documented with the form version 2005/2006 no surgical complications appeared.

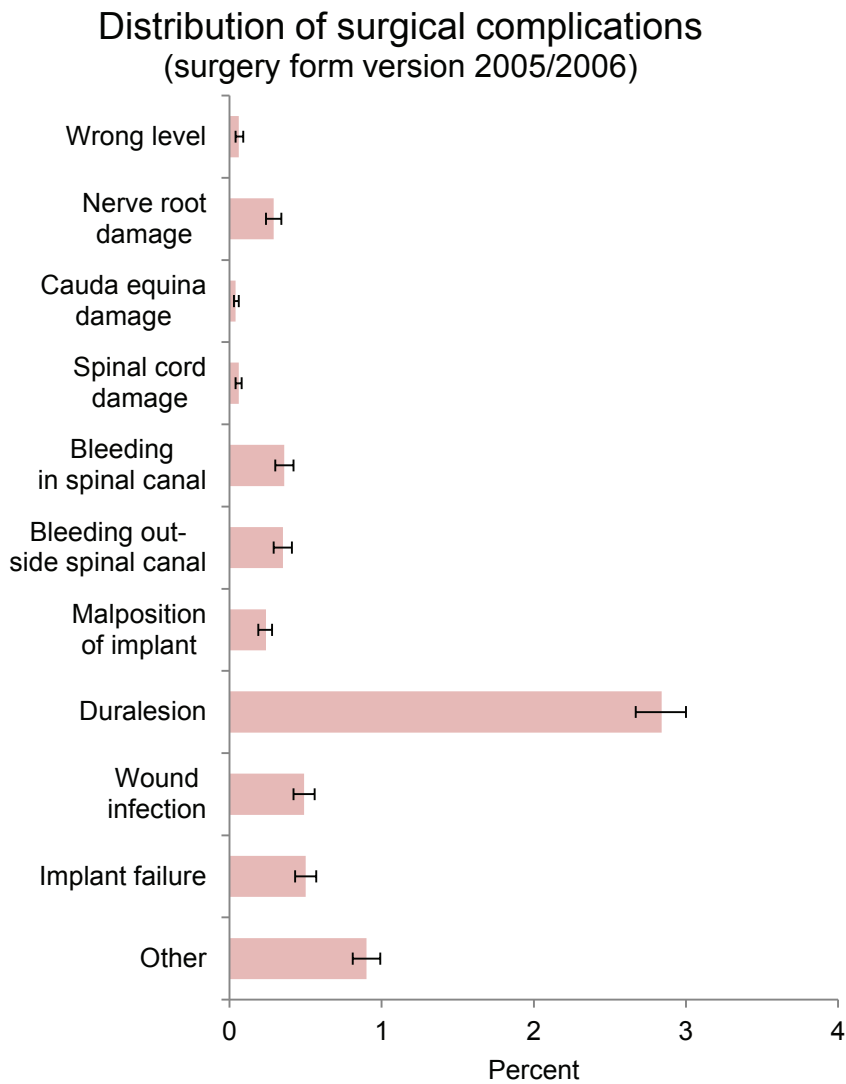


Figure 25: Distribution of surgical complications, excluded was the answer "none", surgery form version 2005/2006 (N=39'721)

SURGERY FORM Status of complications / FU forseen

The status of complications at discharge refers to all cases with an intra and/ or postoperative complication at hospitalization. For the sample based on the form version 2011 812 cases with complications were documented. In 61.6% of those cases the complications were resolved at discharge, in 9.0% they were persisting. The sample based on the form version 2005/2006 had a higher rate of resolved complications at discharge with 77.7%. Here in only 5.7% of cases the complications were persisting at discharge.

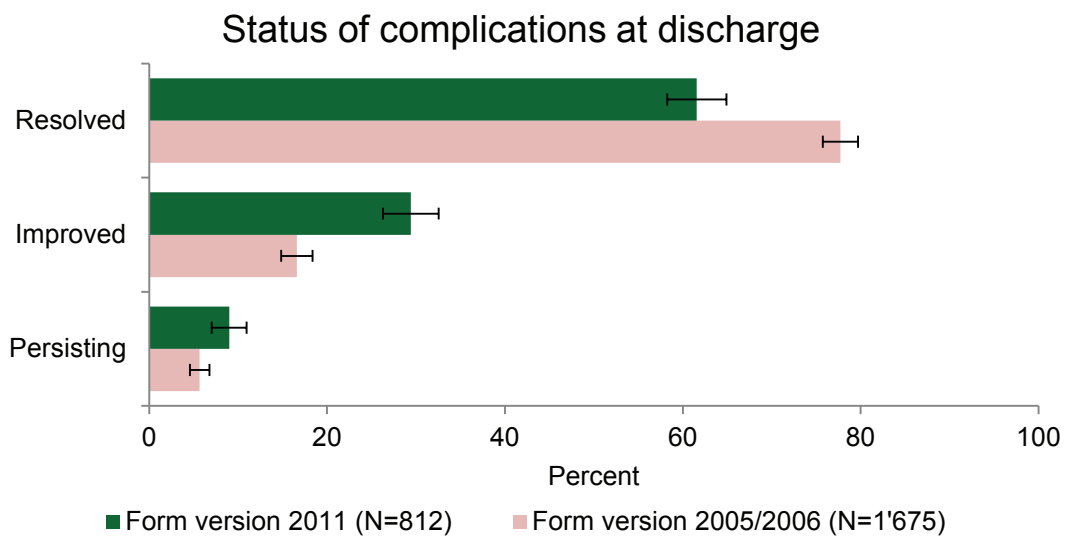


Figure 26: Status of complications at discharge for patients with an intraoperative complication and/ or a complication after discharge, for surgery form version 2011 (N=812) and form version 2005/2006 (N=1'675)

A new question is the foreseen follow-up. This parameter was added to have the opportunity to calculate realistic follow-up rates. In 96.1% of cases a follow-up was foreseen.

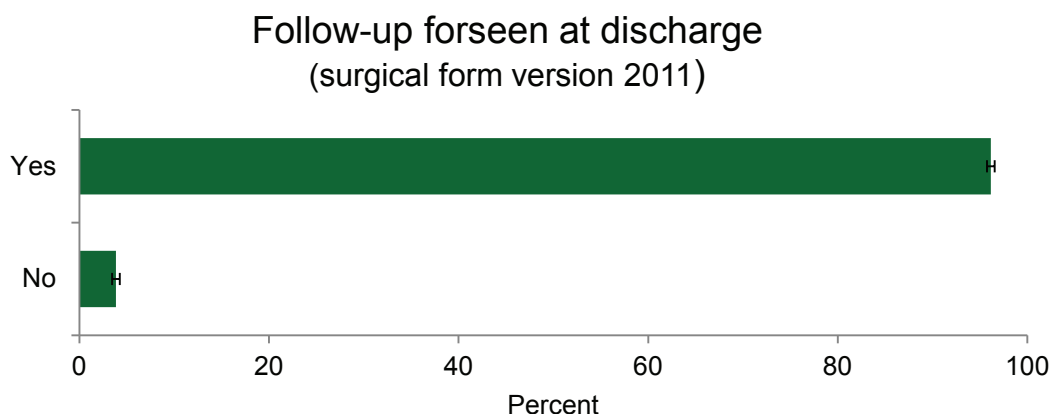


Figure 27: Follow-up foreseen, surgery form version 2011 (N=8'749)

FOLLOW-UP FORM Distribution of follow-up interval

In the following section we refer to the Spine Tango follow-up form.

The majority of documented follow-ups in the routine clinical setting are captured at 6 weeks and 3 months after surgery. The literature suggests that at least the mid-term outcomes at three months can basically be considered as the final outcomes (Mannion et al (2009) (4); Swespine: the Swedish spine register: The 2012 report (8)). 6-month, 1-year and longer follow-ups are strongly desired, but remain a major challenge of the registry.

Distribution of follow-up interval
all available follow-up forms for patients with failed surgery

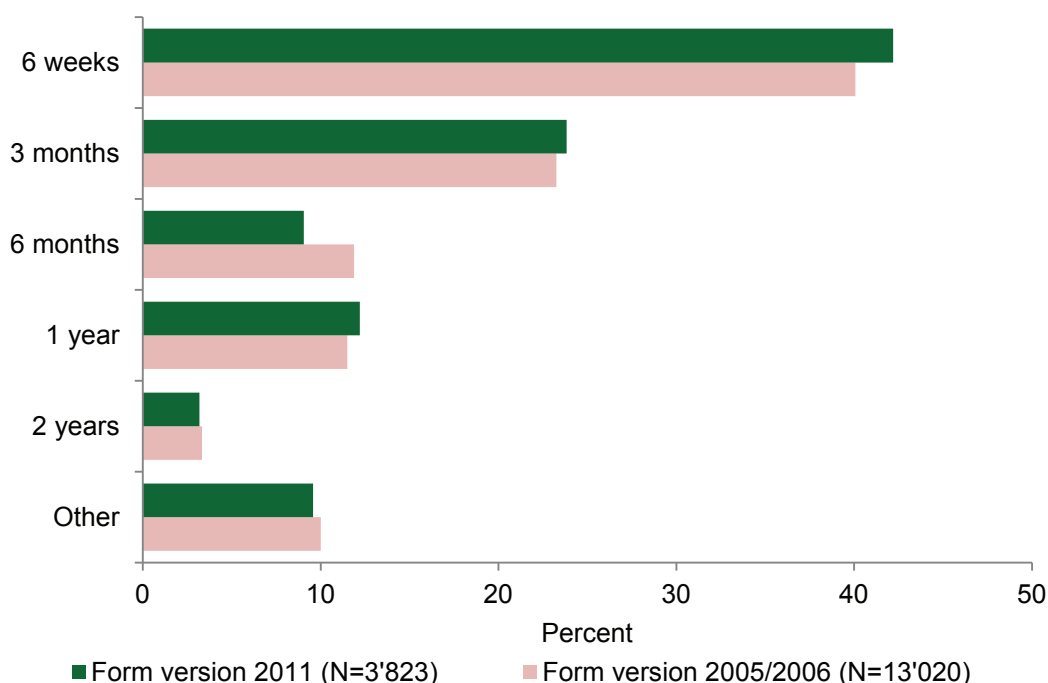


Figure 28: Distribution of follow-up interval for the follow-up form version 2011 (5'905 forms for 3'823 patients) and the form version 2005/2006 (38'466 forms for 13'020 patients)

Form version 2011: 5'905 FUs / 3'823 patients: current mean FU at 101.3 days, if last available FU is considered. Due to the young age of the form version, the mean FU times will most likely increase in the future.

Form version 2005/2006: 38'466 FUs / 13'020 patients: Mean FU 348.9 days, if last available FU per patient is considered.

4. Mannion AF, Porchet F; Kleinstück FS, Lattig F, Jeszenszky D, Bartanusz V, Dvorak J, Grob D. (2009) The quality of spine surgery from the patient's perspective. Part 1: the Core Outcome Measures Index in clinical practice. *Eur Spine J.* 18 Suppl 3:367-73
 8. Strömqvist B, Fritzell P, Hägg O, Jönsson B, Sandén B; Swedish Society of Spinal Surgeons (2013) Swespine: the Swedish spine register : The 2012 report. *Eur Spine J.* 2013 Apr;22(4):953-74.

FOLLOW-UP FORM
Overall outcome / surgical goal - pain relief

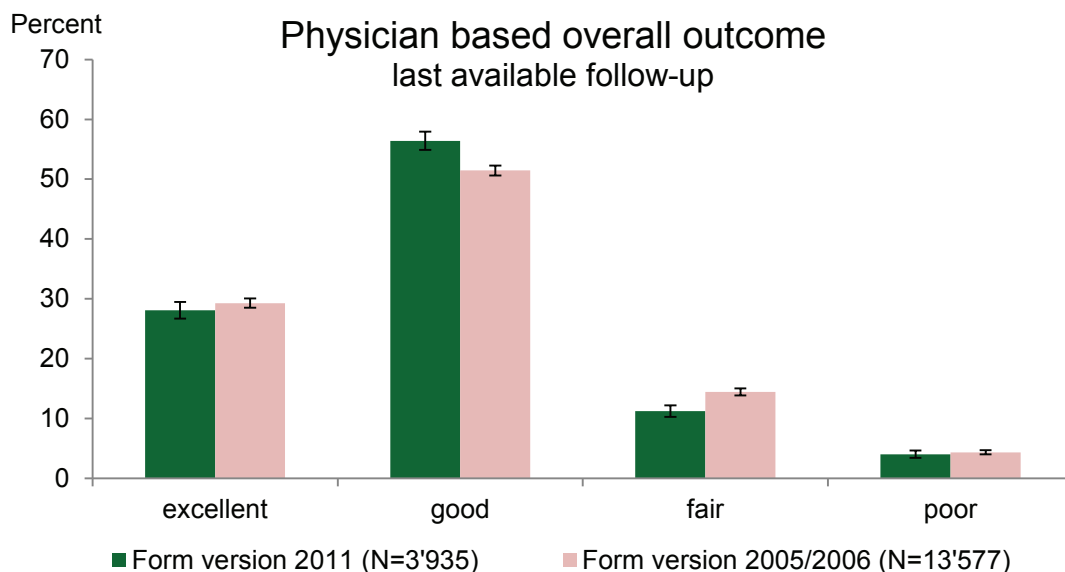


Figure 29: Physician based overall outcome (surgeon) for the follow-up form version 2011 (N=3'935) and the form version 2005/2006 (N=13'577)

Converting the surgeon based outcome rating into a binary format, about 4 out of 5 cases have a desired outcome, and 1 out of 5 cases has an undesired outcome.

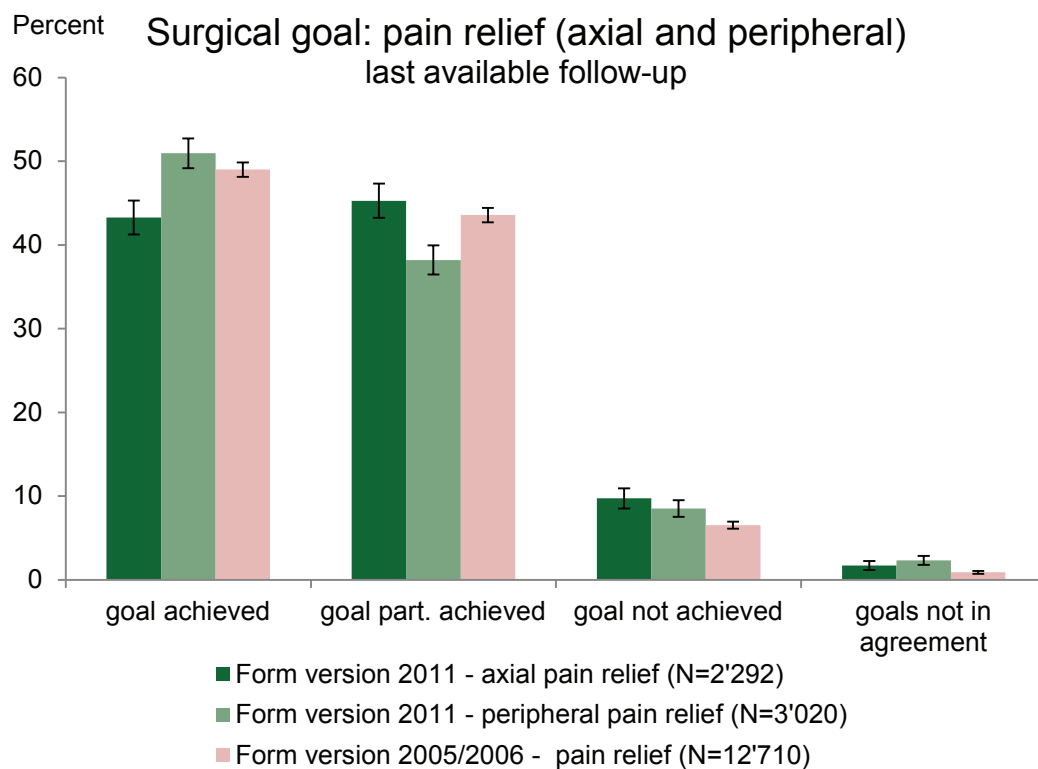


Figure 30: Achievement of the surgical goal pain relief (axial and peripheral) for the follow-up form version 2011 and 2005/2006

Peripheral pain relief seems the easier to achieve surgical goal compared with axial pain relief.

FOLLOW-UP FORM
Surgical goal – neurological improvement

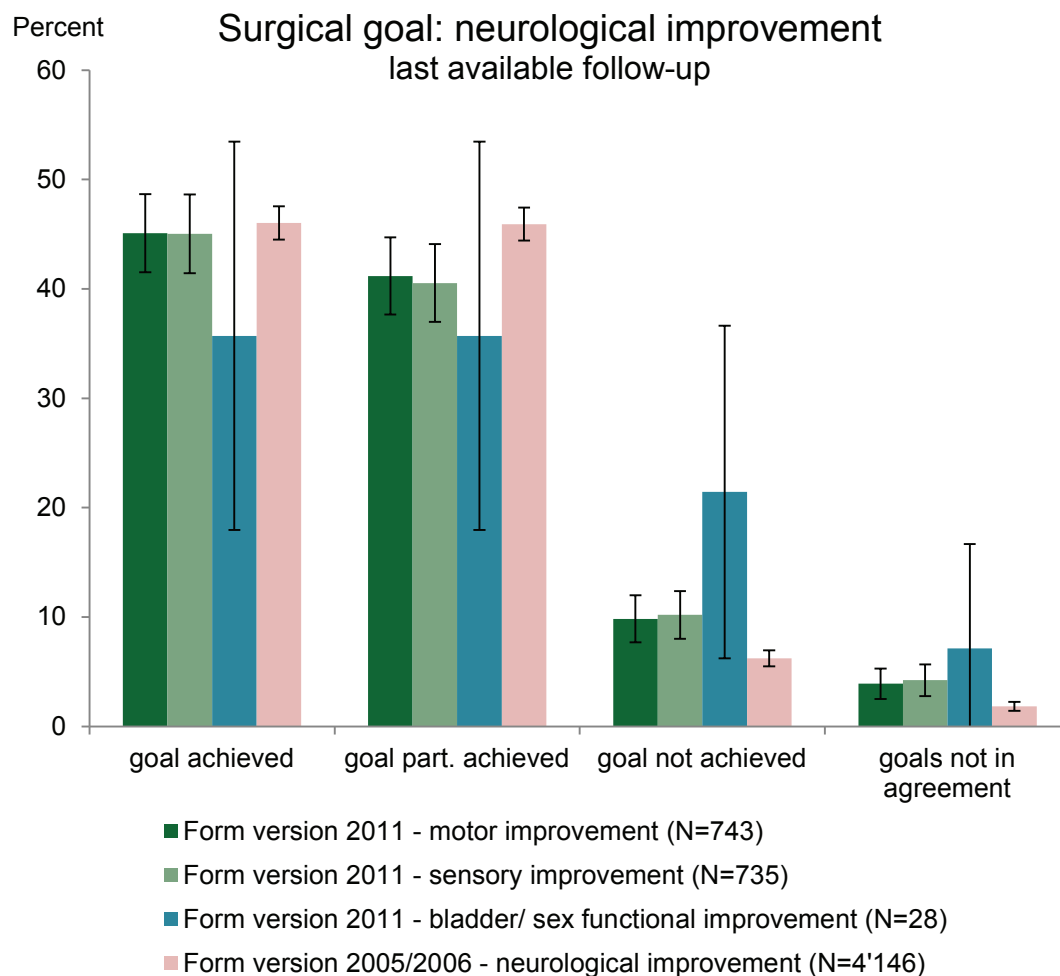


Figure 31: Achievement of the surgical goal neurological improvement (motor, sensory, bladder and sex function) for the follow-up form version 2011 and 2005/2006

The main focus of neurological improvement lies on motor and sensory function, which is equally likely achieved. Improvement of bladder and sexual function is a less frequently desired goal, but also one that is more difficult to achieve.

FOLLOW-UP FORM
Surgical goals – functional improvement / additional goals

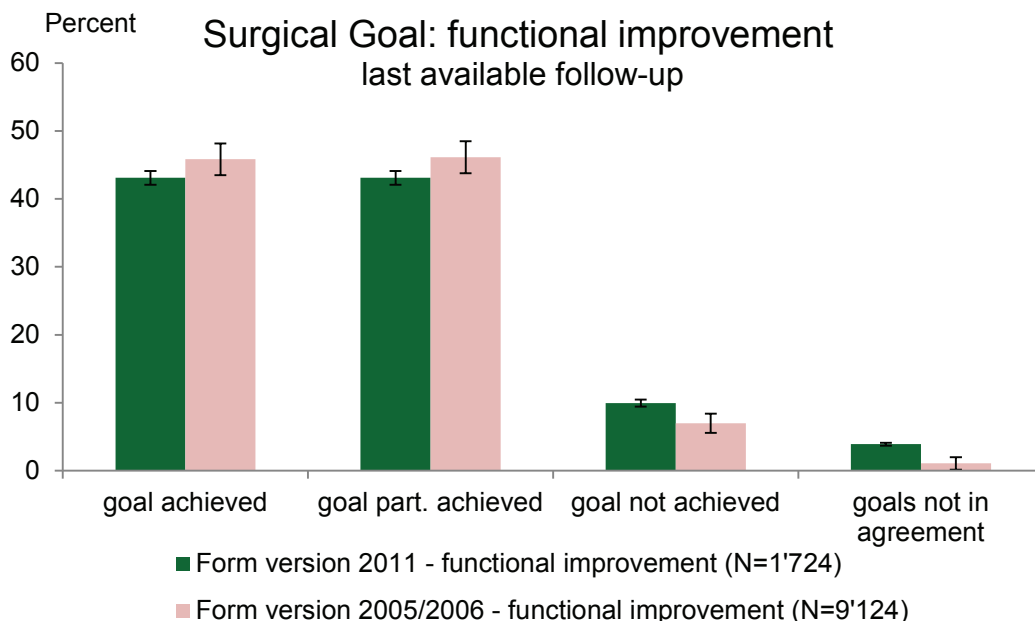


Figure 32: Achievement of the surgical goal functional improvement for the follow-up form version 2011 and 2005/2006

In only about 1 out of 10 patients, a functional improvement could not be achieved.

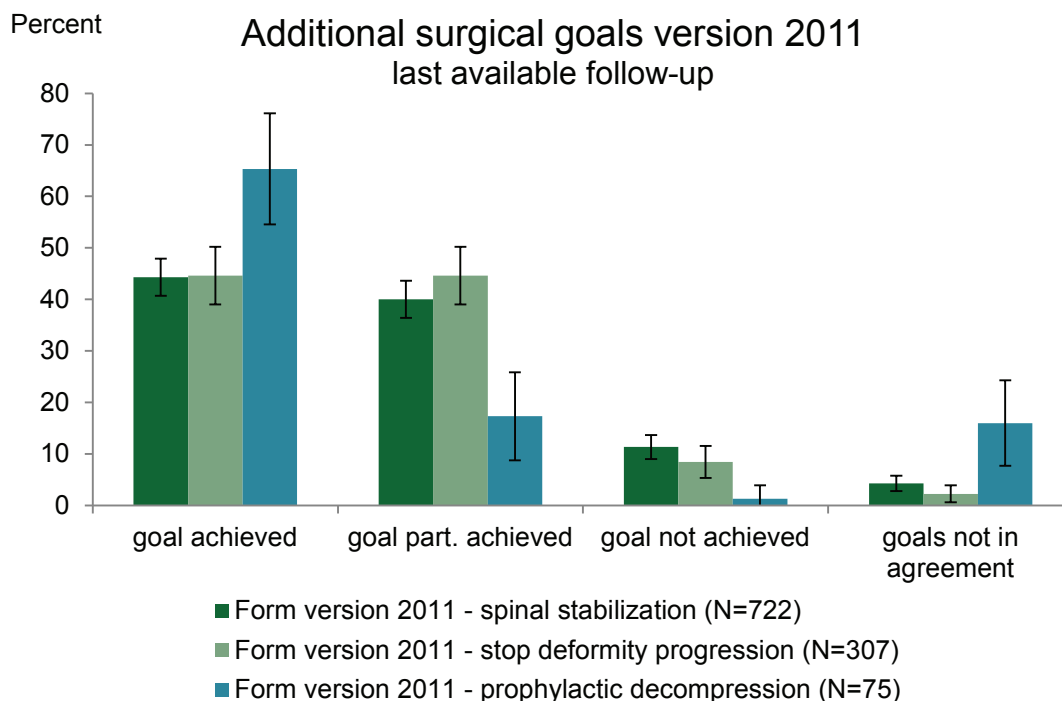


Figure 33: Achievement of additional surgical goals (spinal stabilization (N=722), stop deformity progression (N=307) and prophylactic decompression (N=75)) for the follow-up forms version 2011

Spinal stabilization and stopping deformity progression are equally likely to achieve as surgical goals, and in the majority of patients they are completely or partially achieved. A prophylactic decompression is not a frequent goal, but it seems one of the easiest goals to achieve or partially achieve.

PART II:
FAILED SURGERY ANALYSIS

PREFACE

38

For this year's annual report an analysis of failed surgeries in the Spine Tango pool was performed. After transition to the 2011 version, only the surgery forms 2005/06 were considered. The definition of failed surgery, revision and reoperation procedures is not an easy one, since elective procedures like metal removal, repeat procedures concerning an implant (revision) or repeat procedures leaving all implanted material in place (reoperation) all need to be accommodated with one question title. Therefore, in the new 2011 form generation, the term "repeat surgery" was introduced, in order to cover more scenarios of a repeat intervention for various reasons.

Form version 2006

Failed surg.	Type of failed surgery _____		
	<input type="checkbox"/> non-union	<input type="checkbox"/> postop. infection	<input type="checkbox"/> frontal imbalance
	<input type="checkbox"/> instability	<input type="checkbox"/> implant failure	<input type="checkbox"/> other
	<input type="checkbox"/> neurocompression	<input type="checkbox"/> sagittal imbalance	

Form version 2011

Repeat surg.	Type or reason of repeat surgery		
	<input type="checkbox"/> hardware removal	<input type="checkbox"/> neurocompression	<input type="checkbox"/> implant failure
	<input type="checkbox"/> non-union	<input type="checkbox"/> postop. infection	<input type="checkbox"/> sagittal imbalance
	<input type="checkbox"/> instability	<input type="checkbox"/> superficial	<input type="checkbox"/> adjac. segment pathology
	<input type="checkbox"/> failure to reach therapeutic goals	<input type="checkbox"/> postop. infect. deep	<input type="checkbox"/> other
	<input type="checkbox"/> implant malposition		

FAILED SURGERY Demographic data

To generate a more homogeneous group the following inclusion criteria were set to define the analyzed sample of cases.

- Main pathology: failed surgery
- Number of previous surgeries: 1, at the same or partially same level.

With these inclusion criteria 1'747 cases were identified.

The epidemiology of patients with failed spinal surgery shows the following distribution of age groups and gender (figure 34).

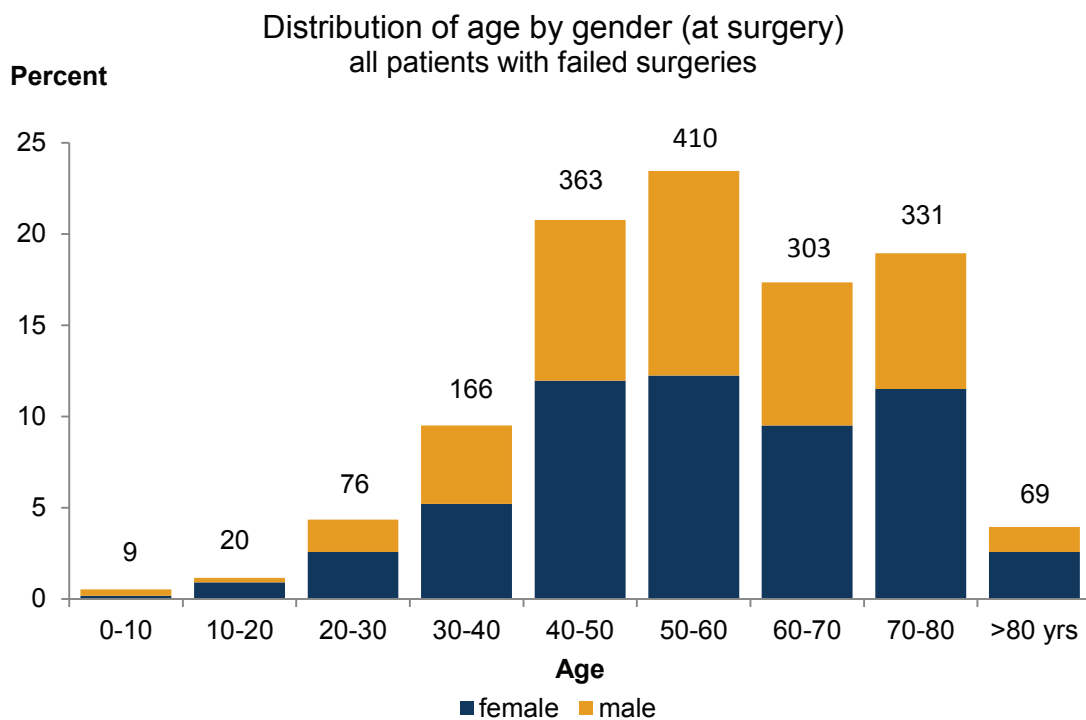


Figure 34: Distribution of age by gender for all patients with failed surgery (N=1'747)

In total 990 female and 757 male patients were found. With 44.2% most of the patients were between 40 and 60 years old at the time of revision surgery. 36.3% were in their 6th or 7th life decade. Compared to the demographic distribution of age at surgery seen for all surgeries in the general section (pages 14/15) the population with failed surgery has a slightly lower proportion of older patients.

FAILED SURGERY Type of failed surgery

The specification of the type of failed surgery of the sample is given in figure 35.

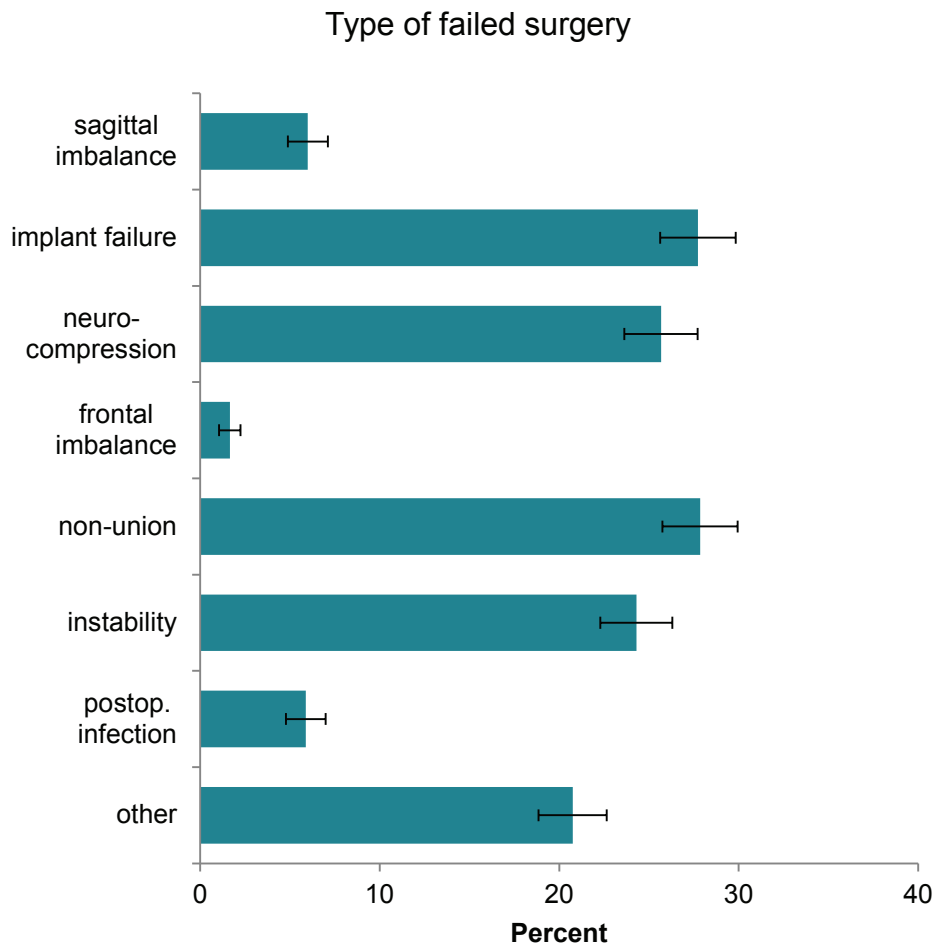


Figure 35: Distribution of type of failed surgeries (N=1'749)

The multiple choice format of the question “Type of failed surgery” needs to be considered as often more than one type of failure was defined. The most frequent failure modes were non-union, implant failure, neurocompression and instability with 24.3 to 27.8%.

A cluster analysis helped us to define the most frequent failure groups around the 5 following key events:

- implant failure
- instability
- neurocompression
- non-union
- postoperative infection.

We allowed some combinations of failed surgery types but only included combinations with certain homogeneity.

FAILED SURGERY Demographics of the groups

The Implant Failure group (N= 330) consists of patients with a sole implant failure and of patients who had a combination of Implant Failure with “Other” failure reasons or with Instability or Neurocompression.

For the Instability group we allowed a combination with Neurocompression or “Other” failure reasons. 175 cases were found.

For the Neurocompression (N= 311) and Postoperative Infection group (N= 77) only a combination with “Other” failure reasons was accepted.

Combinations of Non-Union with Neurocompression, Instability or “Other” reasons as well as a sole Non-Union were included into the Non-Union group which counted 350 cases.

The distribution of age and gender for each group is given in the following graphs.

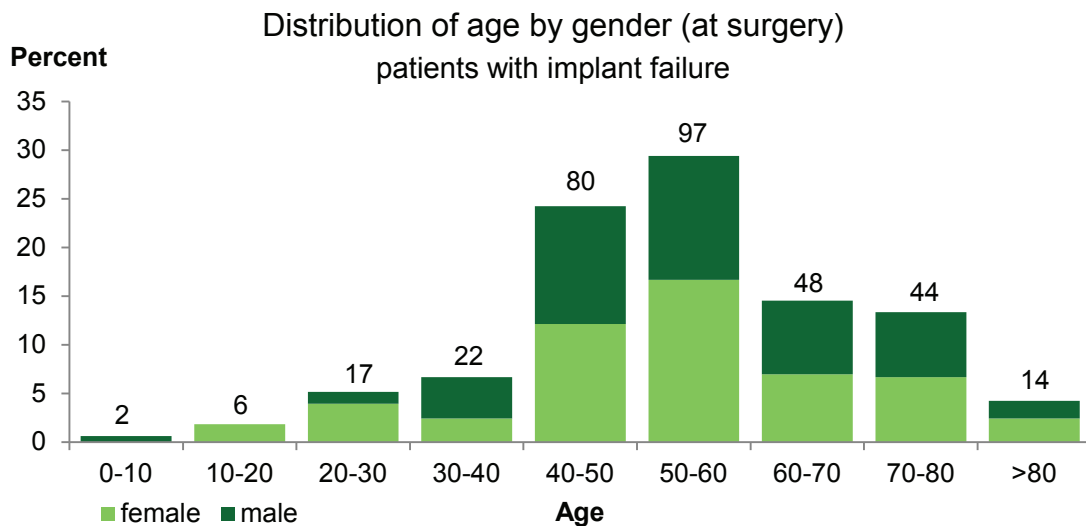


Figure 36: Distribution of age by gender for patients with implant failure as type of failed surgery (N=330)

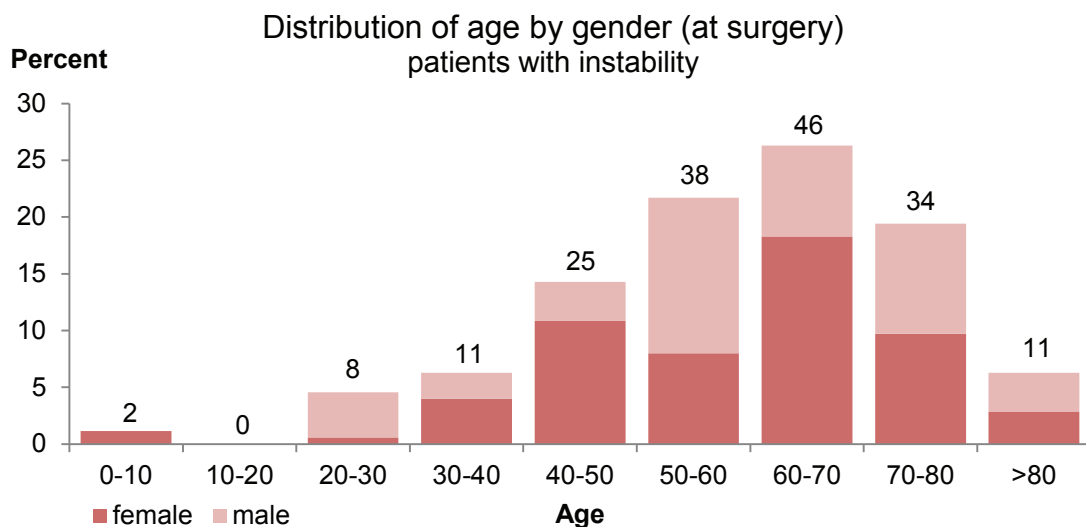


Figure 37: Distribution of age by gender for patients with instability as type of failed surgery (N=175)

FAILED SURGERY
Demographics of the groups

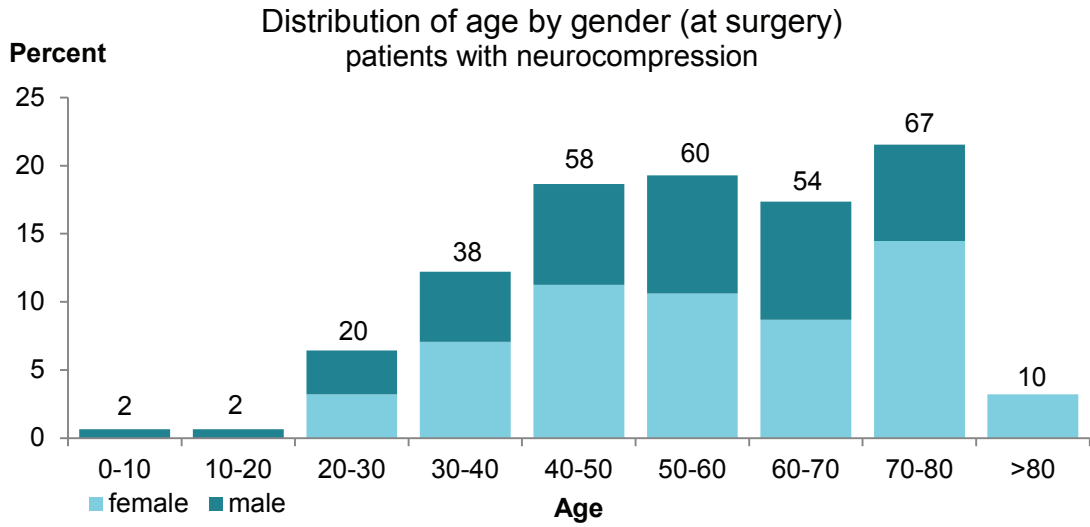


Figure 38: Distribution of age by gender for patients with neurocompression as type of failed surgery (N=311)

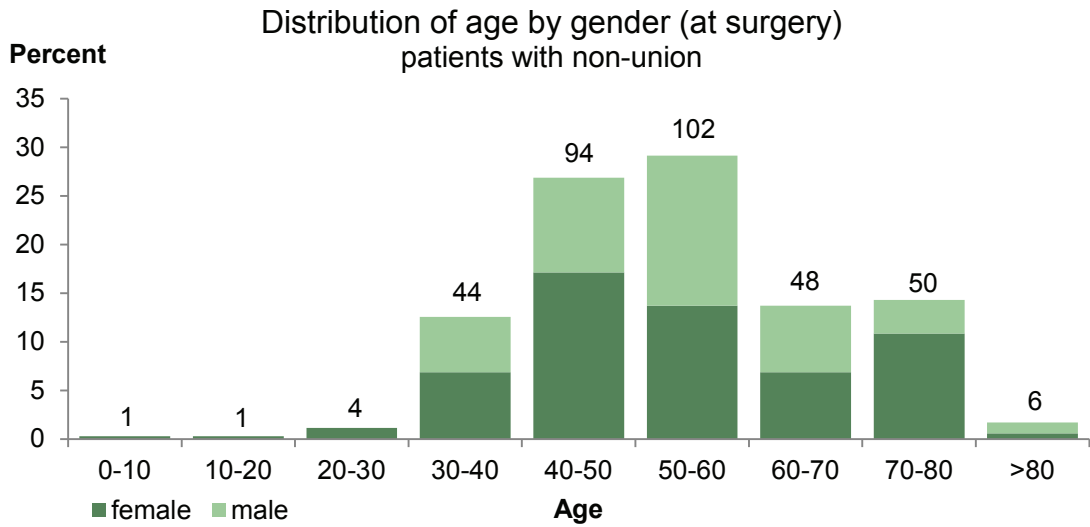


Figure 39: Distribution of age by gender for patients with non-union as type of failed surgery (N=350)

For patients with implant failure (Fig. 36) and non-union (Fig. 39) over 50% of the sample was between 40 and 60 years old at the time of revision surgery.

FAILED SURGERY Demographics, location

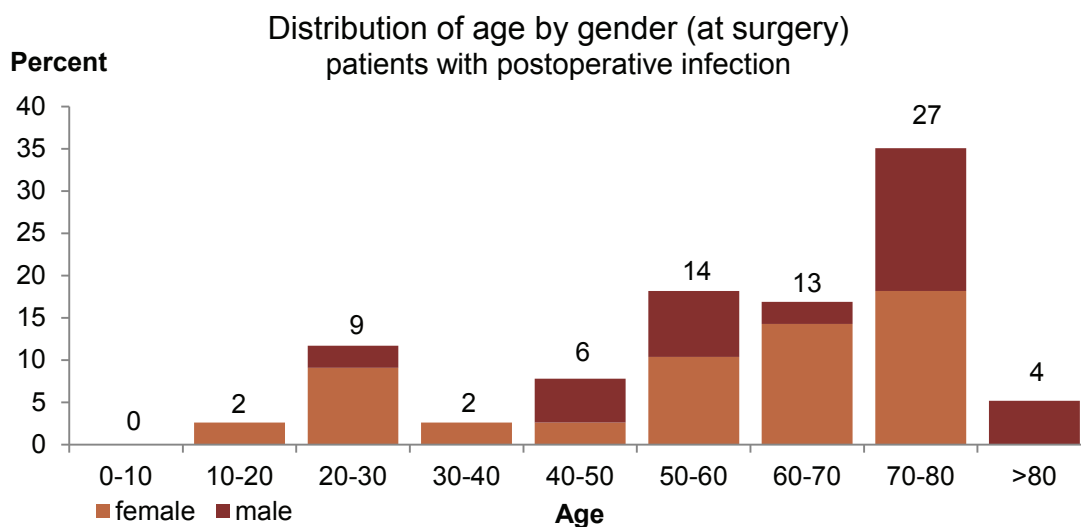


Figure 40: Distribution of age by gender for patients with postoperative infection as type of failed surgery (N=77)

In the smallest of all groups, the one with postoperative infections, 35.1% of patients were in their 7th life decade at the time of surgery.

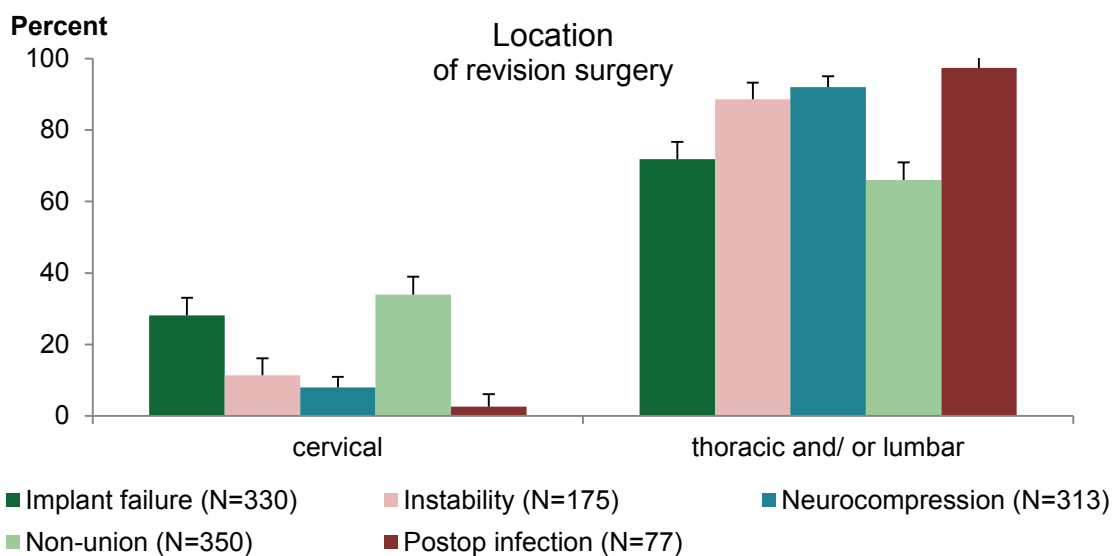


Figure 41: Location of revision surgery for all five groups.

As shown in figure 41 most of the revision surgeries were performed in the thoracic and or lumbar spine. The highest proportion of cervical revision surgeries is found for the Non-Union and the Implant Failure group.

FAILED SURGERY Index surgery, interval

In about 600 cases, the index surgery was also found in the Spine Tango data pool. The interval between failed index surgery and the revision surgery is given in fig. 42 for each group.

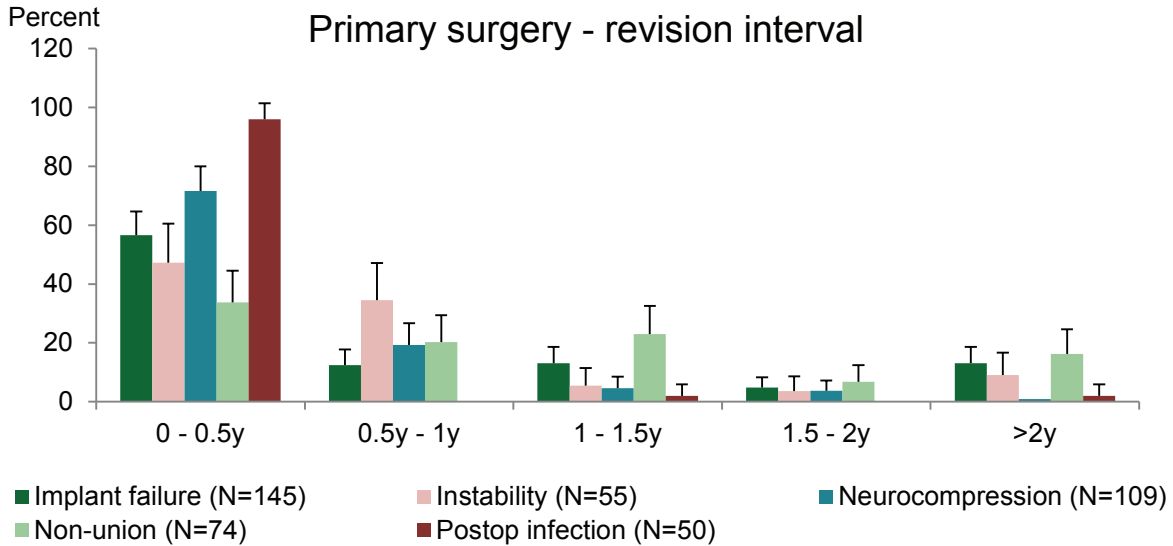


Figure 42: Distribution of interval between failed index surgery and revision surgery for all five groups.

For all groups most of the failures seem to become evident in the first months after surgery and accordingly the revision surgeries are performed within the first 6 months after the index surgery. This is most pronounced in the postoperative infection group where 96% of cases are revised within this time period. For the Neurocompression group 71.6% of cases fall within this range.

For patients with instability 34.5% are only revised between 6-12 months after the index surgery. The Non-Union group shows a relative high proportion (16.2%) of patients which are only revised 2 years after the index surgery or later.

FAILED SURGERY
Diagnosis at index surgery

Diagnosis at index surgery
patients with failed surgery

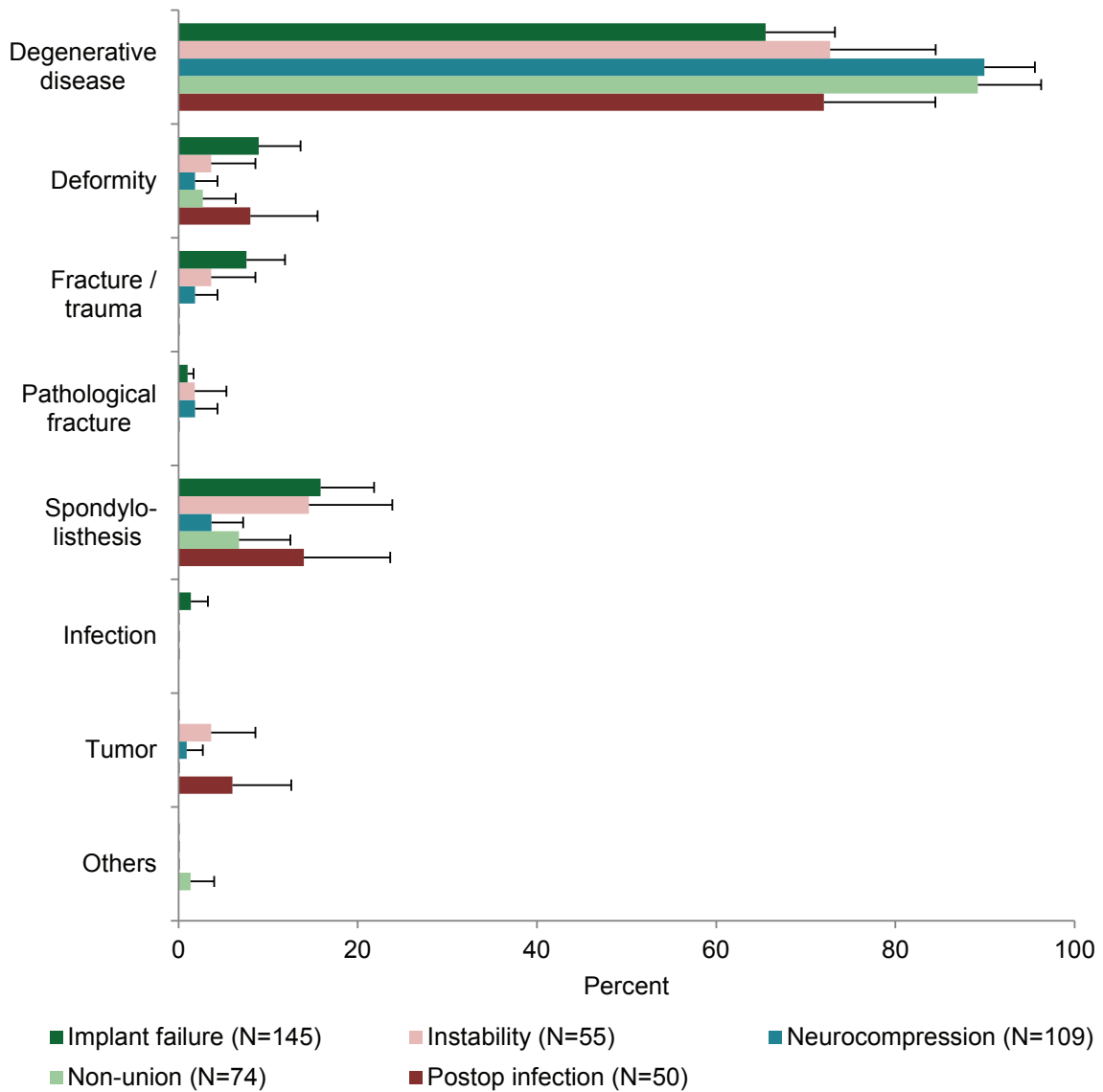


Figure 43: Distribution of diagnosis at failed index surgery for all 5 groups.

The diagnoses at index surgery are given in fig 43 for the 5 groups. Degenerative disease is the most frequent diagnosis, whereby the distribution is similar to the general distribution of main pathologies in the Spine Tango pool (see fig 16). Implant failure, Instability and Non-union show a higher proportion of spondylolisthesis (14-16%) as main pathology at index surgery.

The surgical measures which were performed during the index surgery and the revision surgery are listed in the following figures.

FAILED SURGERY
Surgical measures at index surgery

Surgical measures at index surgery
patients with failed surgery

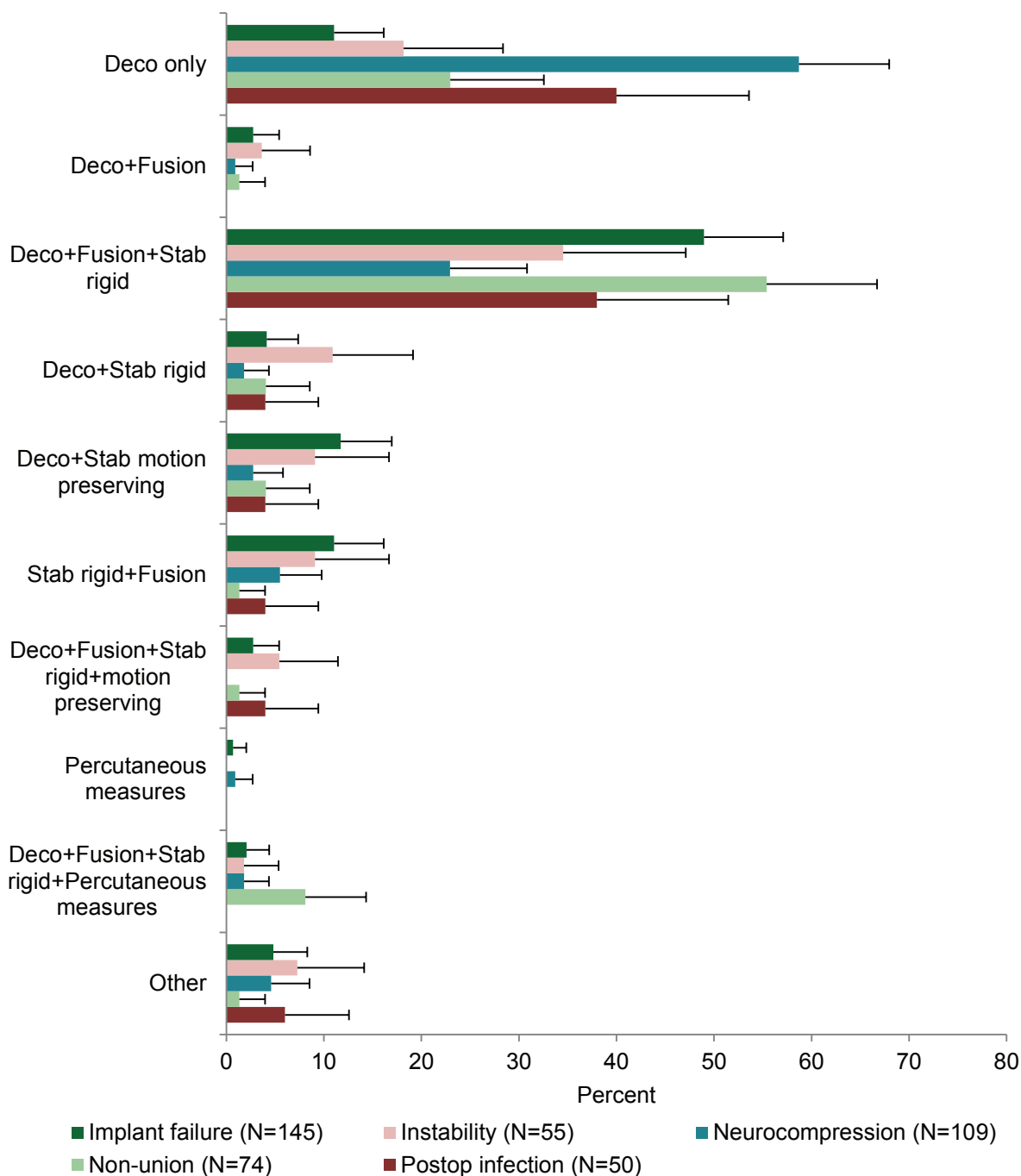


Figure 44: Surgical measures performed during failed index surgery for all five groups

The most frequently performed surgical measures for all groups were decompression alone and decompression in combination with fusion and rigid stabilization. Decompression only had the highest percentage of Neurocompression as type of failed surgery (58.7%). If decompression was performed in combination with fusion and stabilization rigid the most frequent types of failed surgeries were Non-Union with 55.4% and Implant Failure with 49.0%.

FAILED SURGERY
Surgical measures at revision surgery

Surgical measures at revision surgery
patients with failed surgery

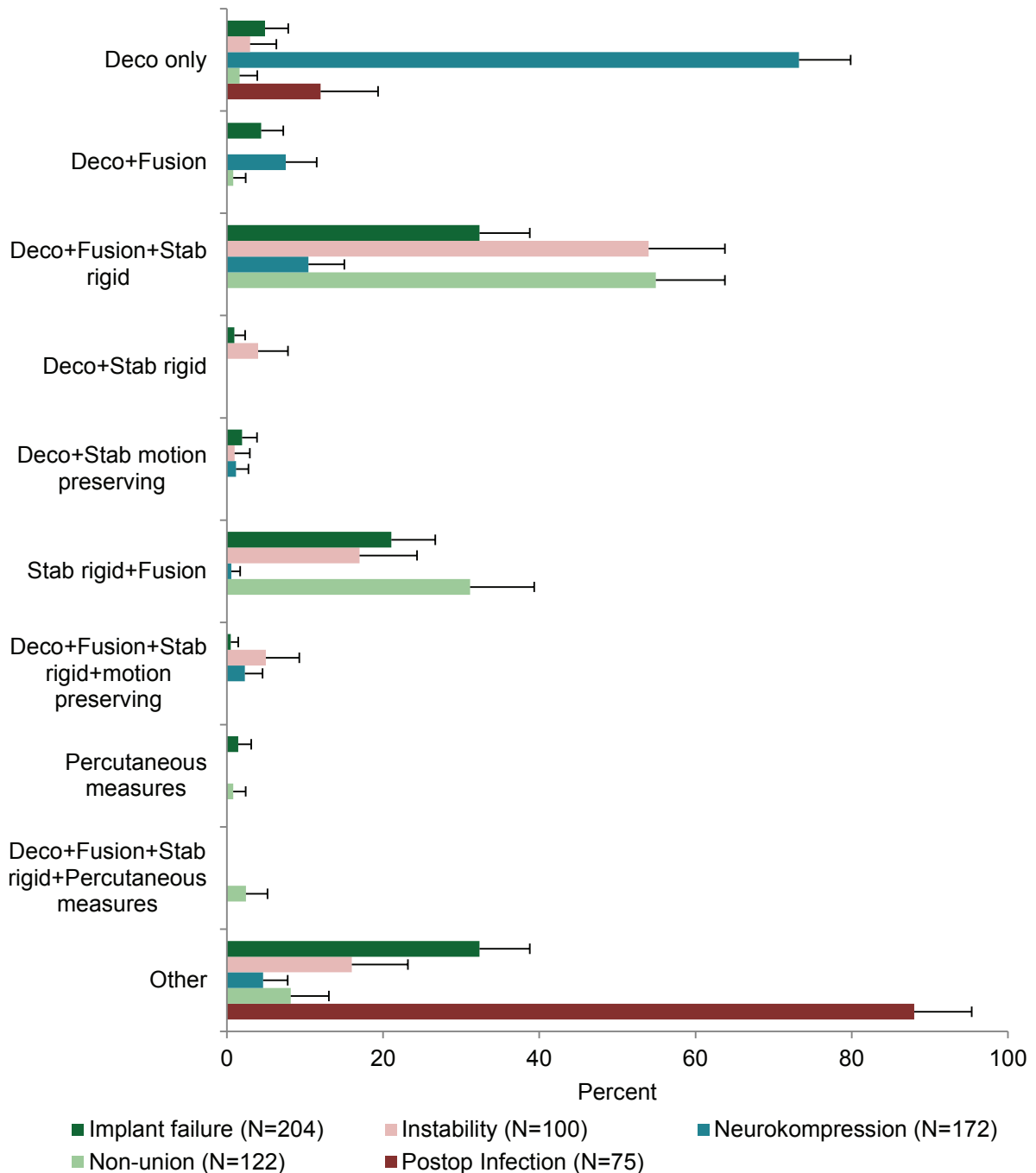


Figure 45. Surgical measures performed during revision surgery for all five groups

The most frequent surgical measures performed during revision surgery were (further) decompression alone for Neurokompression and Other measures for postoperative infection. In cases of Implant failure, Instability or Non-Union, fusion with stabilization rigid with or without decompression were the principal measures.

FAILED SURGERY Complications at index surgery

The complications documented for the failed index surgery are shown in fig 46.

Surgical complications at failed (index) surgery patients with failed surgery

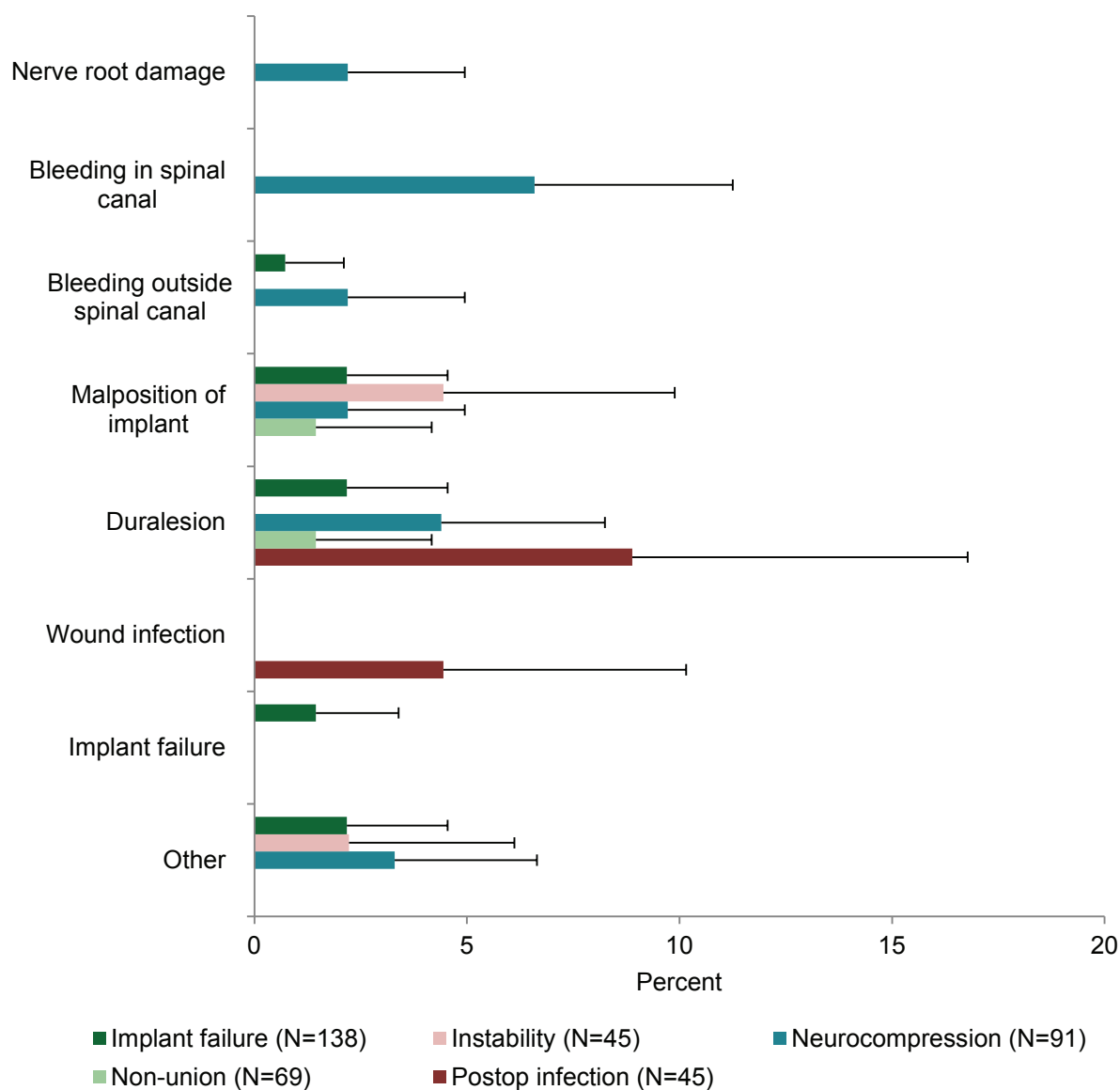


Figure 46: Surgical complications at failed index surgery for all five groups.

During index surgery the neurocompression group showed the highest complication rates with 6.6% bleeding in the spinal canal, 4.4% dura lesion and 2.2% malposition of implant, bleeding outside the spinal canal and nerve root damage each. In patients who were revised due to postoperative infection 8.9% suffered from a dura lesion during index surgery; in 4.4% a wound infection occurred. In revisions due to Instability a malposition of the implant was documented at index surgery in 4.4% of cases.

FAILED SURGERY Outcome lumbar

To analyze the outcomes all cases with available pre- and postoperative COMI Back forms were considered (N=246). For this subsample the outcome of back/leg pain as well as COMI score improvement is shown. The demographic details of this lumbar group are given in figure 47. The cervical sample resulted in too few cases for making meaningful analyses.

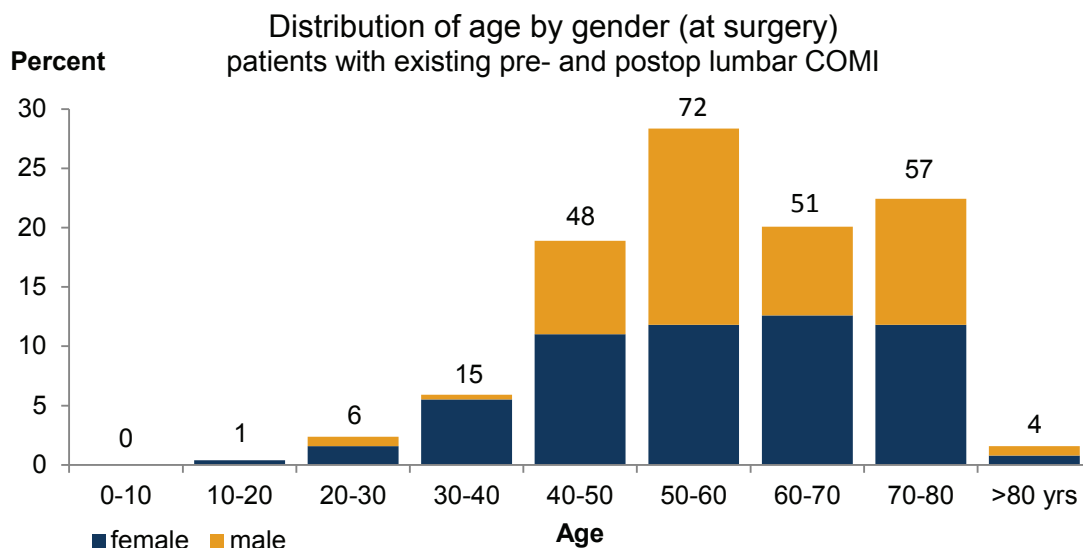


Figure 47: Distribution of age by gender for patients with failed surgery and existing pre- and postoperative COMI back (N=246)

The last available COMI Back form was taken into account. The mean FU time for all patients was 177.7 days after revision surgery.

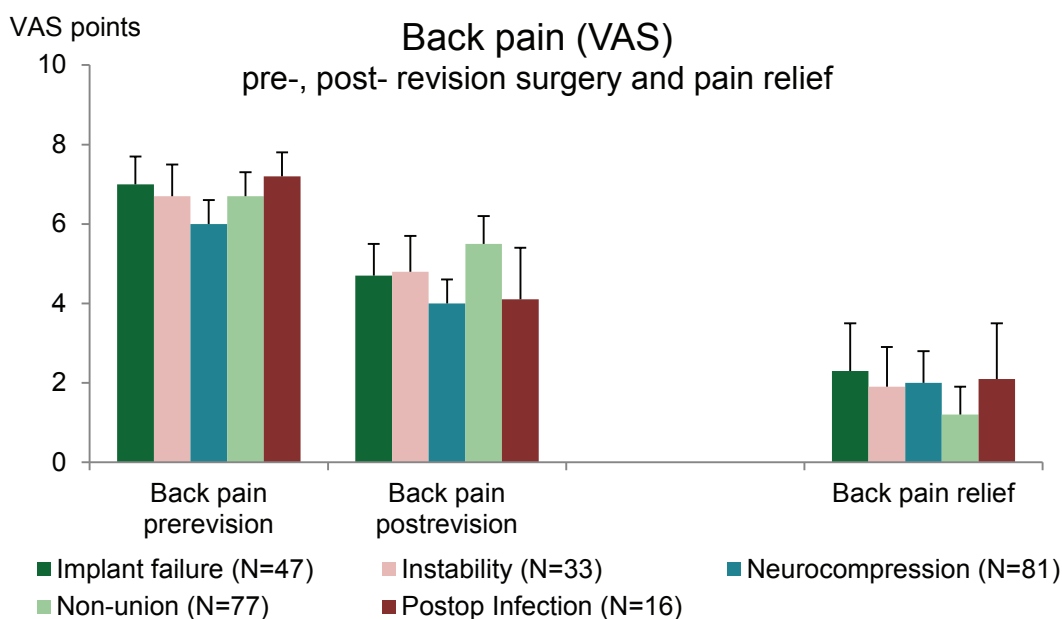


Figure 48: Back pain pre- and post- revision surgery and back pain relief for all five groups

Back pain reduction was similar for all groups with about 1.2-2.3 VAS points after revision surgery.

FAILED SURGERY Outcome lumbar

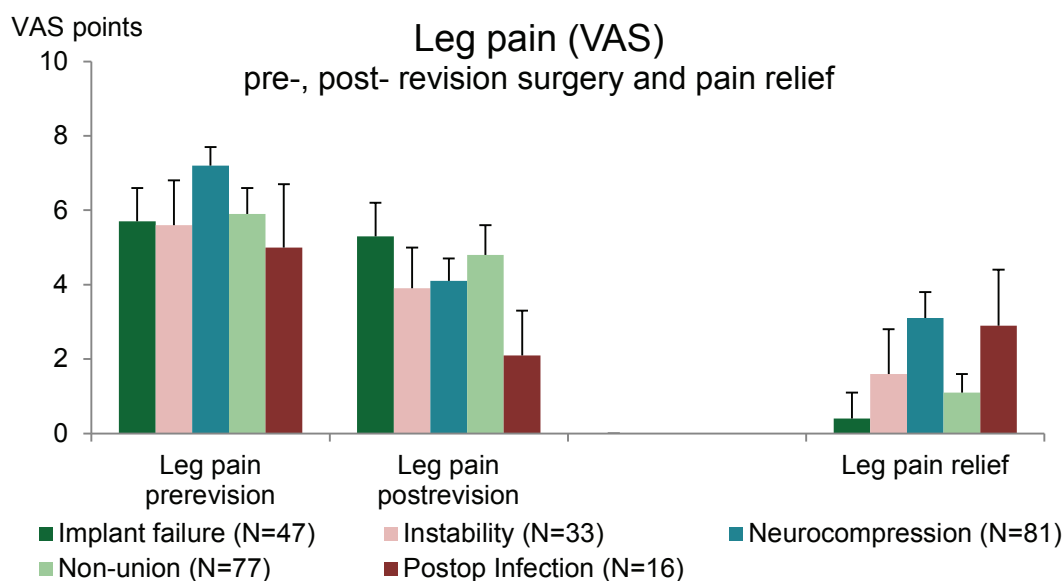


Figure 49: Leg pain pre- and post- revision surgery and leg pain relief for all five groups

Leg pain improved more in the Neurocompression and Postoperative Infection group, nearly no improvement was seen in the Implant Failure group.

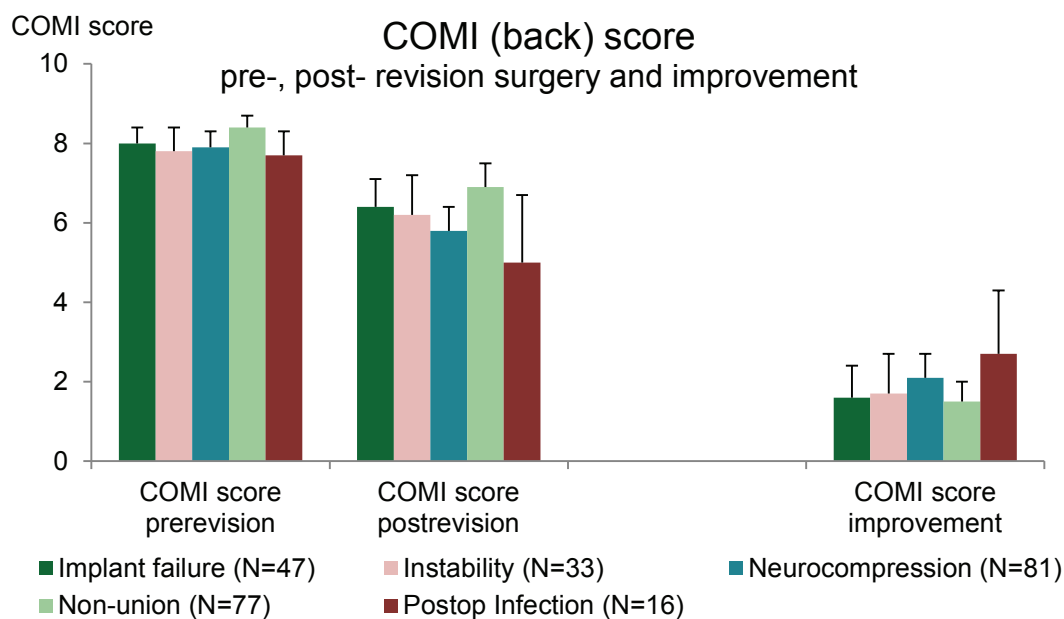


Figure 50: COMI (back) score pre- and post- revision surgery and COMI score improvement for all five groups

The COMI score improved on average 1.78. The biggest functional improvement was seen in patients with Infection (mean difference preop- postop 2.7).

FAILED SURGERY Outcome lumbar

A perfectly documented case should carry outcome information about all important time points, which are pre-index-surgery, post-index-surgery, pre-revision-surgery, post-revision-surgery. However, this complete outcome documentation was only available for a small patient group (N=19). Due to the relative small sample size no further subgroups regarding type of failed surgery were built.

These 19 cases were comprised of 11 female and 8 male patients; their mean age at surgery was 63.2 years.

The mean follow-up interval from the index surgery to the post-index COMI was 177 days (~6 months). The mean follow-up interval after revision surgery was 239 days (~8 months). The mean interval index surgery - revision surgery was 437 days (~14 months).

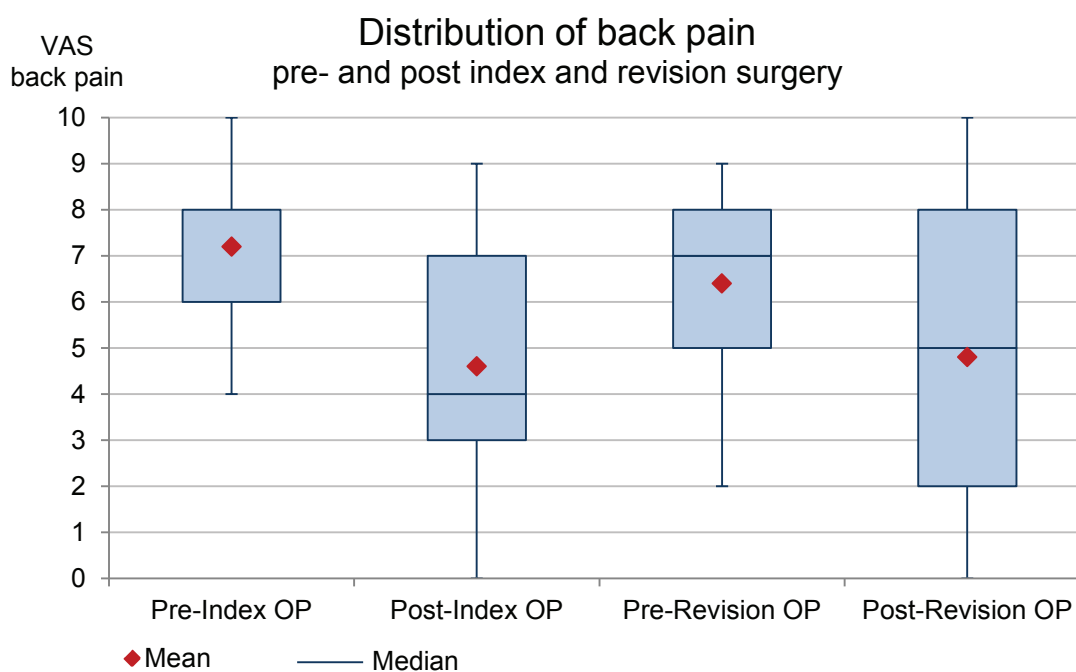


Figure 51: Distribution of back pain pre- and post- index and revision surgery (N=19)

Despite the small sample size one can hypothesize that pain levels after failed index surgery return to those before the index intervention. Despite clear pain alleviation after revision surgery, pain levels may not go back to those after the index intervention. More data is needed to confirm these observations.

FAILED SURGERY
Outcome lumbar

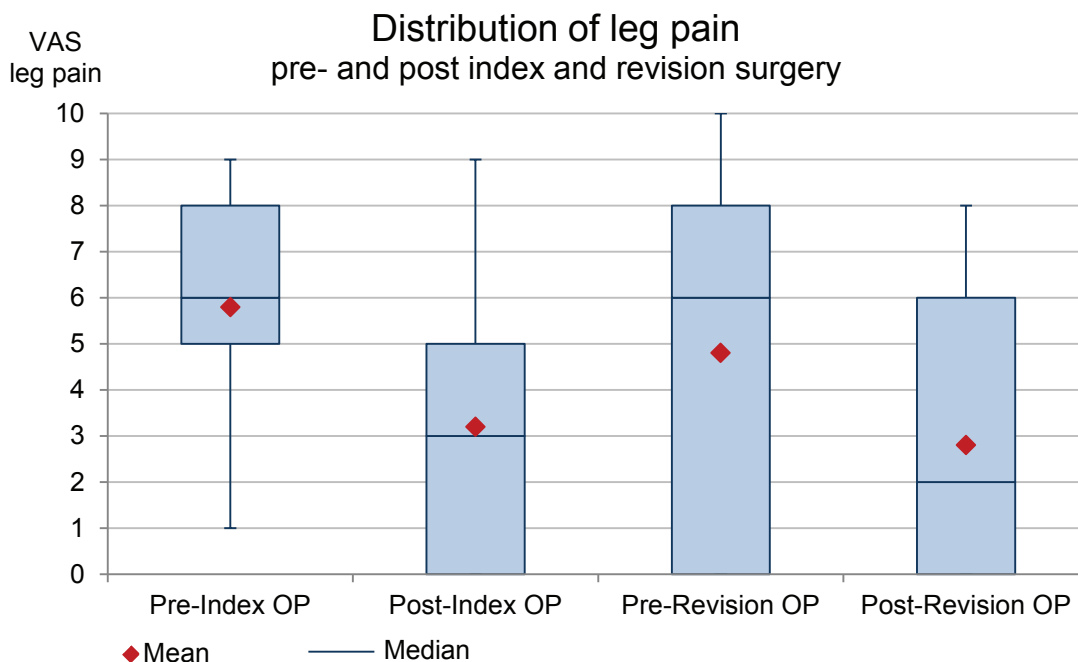


Figure 52: Distribution of leg pain pre- and post- index and revision surgery (N=19)

Despite the extremely large box-plots a similar dynamic of pain intensification and alleviation can be seen. Leg pain levels after revision surgery, may, however, be lowered to a larger extent than back pain levels.

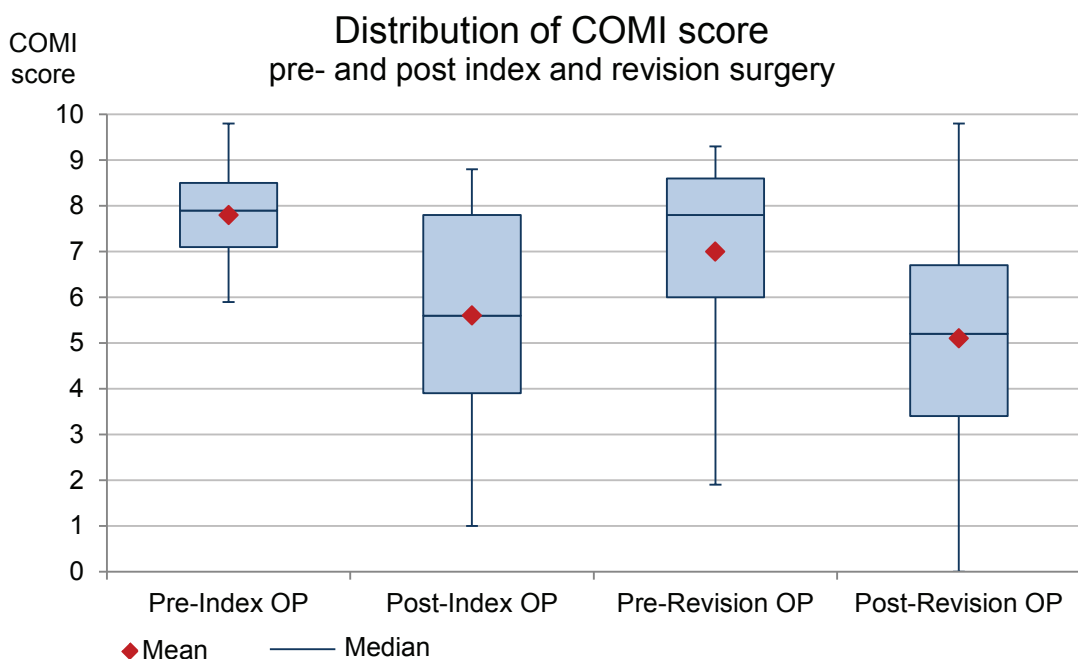


Figure 53: Distribution of COMI score pre- and post- index and revision surgery (N=19)

COMI scores, reflecting back specific function, are also lower after revision surgery compared with the failed index surgery.

European Spine Journal

Case Reports

Accepted between
04 May 2012 and
04 May 2013

Publication of Case Reports

Case Reports will be published electronically only in a yearly online supplement to the journal.

Check out
the additional Spine Tango annual
report 2012 in the
ESJ Liverpool Supplementum

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Affiliated societies

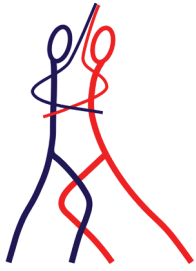
- European Spine Society
- Brazilian Spine Society
- Cervical Spine Research Society (European Section)
- Czech Spine Surgery Society
- Deutsche Wirbelsäulengesellschaft
- European Spine Society
- EuroSpine Society
- French Society of Spine Surgery
- GEER (Grupo de Estudio de Enfermedades del Raquis)
- G.I.S. (Italian Spine Society)
- Hellenic Spine Society
- Polish Society of Spinal Surgery
- SILACO (Sociedad IberoLatinoamericana de Columna)
- South African Spine Society
- Turkish Spine Society

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22 (Suppl 3) S297–S525 May 2013



PARTICIPANTS/ MODULE ANALYSIS

Figure 54 displays the cumulative growth curves of the various national modules. The different starting dates of the modules need to be considered (Swiss/International 2005, Austria 2005; Germany 2006; North America 2007; Brazil/South America 2008; Italy 2008; Mexico 2008; Great Britain 2010; Australia 2010). During 2012 the North American, South American and Mexican modules have been combined to the Pan American Module. The Swiss/ International module was divided into one Swiss and one International module.

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The Australian and British modules are both not available via www.eurospine.org because of national data privacy regulations, but the contact persons for these modules are displayed on the Spine Tango web page.

The hospitals classification of all participating 63 Spine Tango clinics can be seen in figure 55. The highest proportion is made up by university or teaching hospitals with 40%.

Figure 56 shows an overview of the Spine Tango participating hospitals and their country of origin until the end of 2012. We divided their total case load into primary forms and follow-up forms.

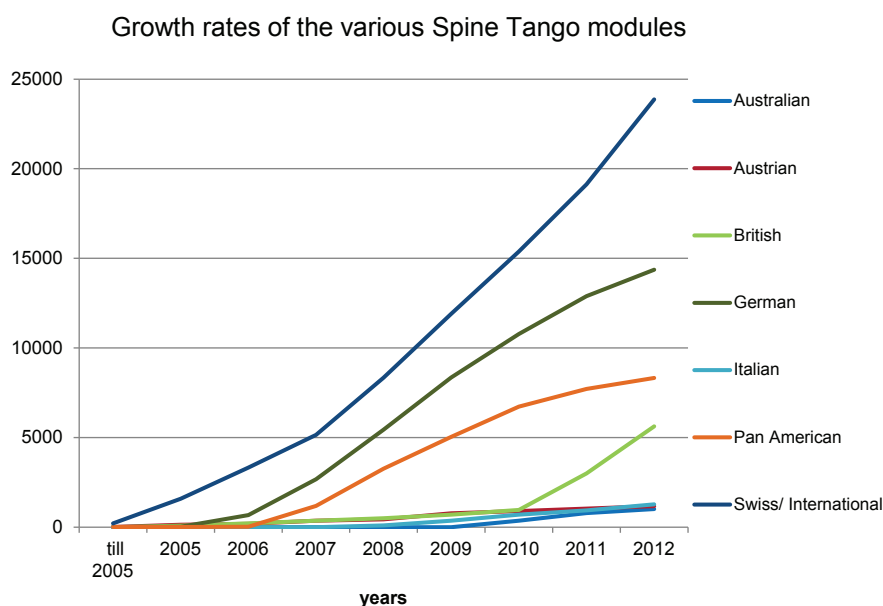


Figure 54: Growth curves (number of cases of the single Spine Tango modules over the years)

Hospital classification

63 Spine Tango clinics

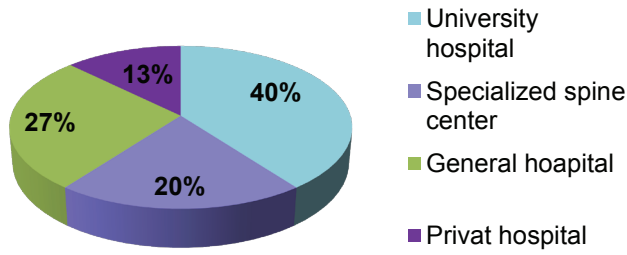


Figure 55: Hospital classification for the 63 Spine Tango clinics

Spine Tango forms per participating country (active hospitals) by the end of 2012

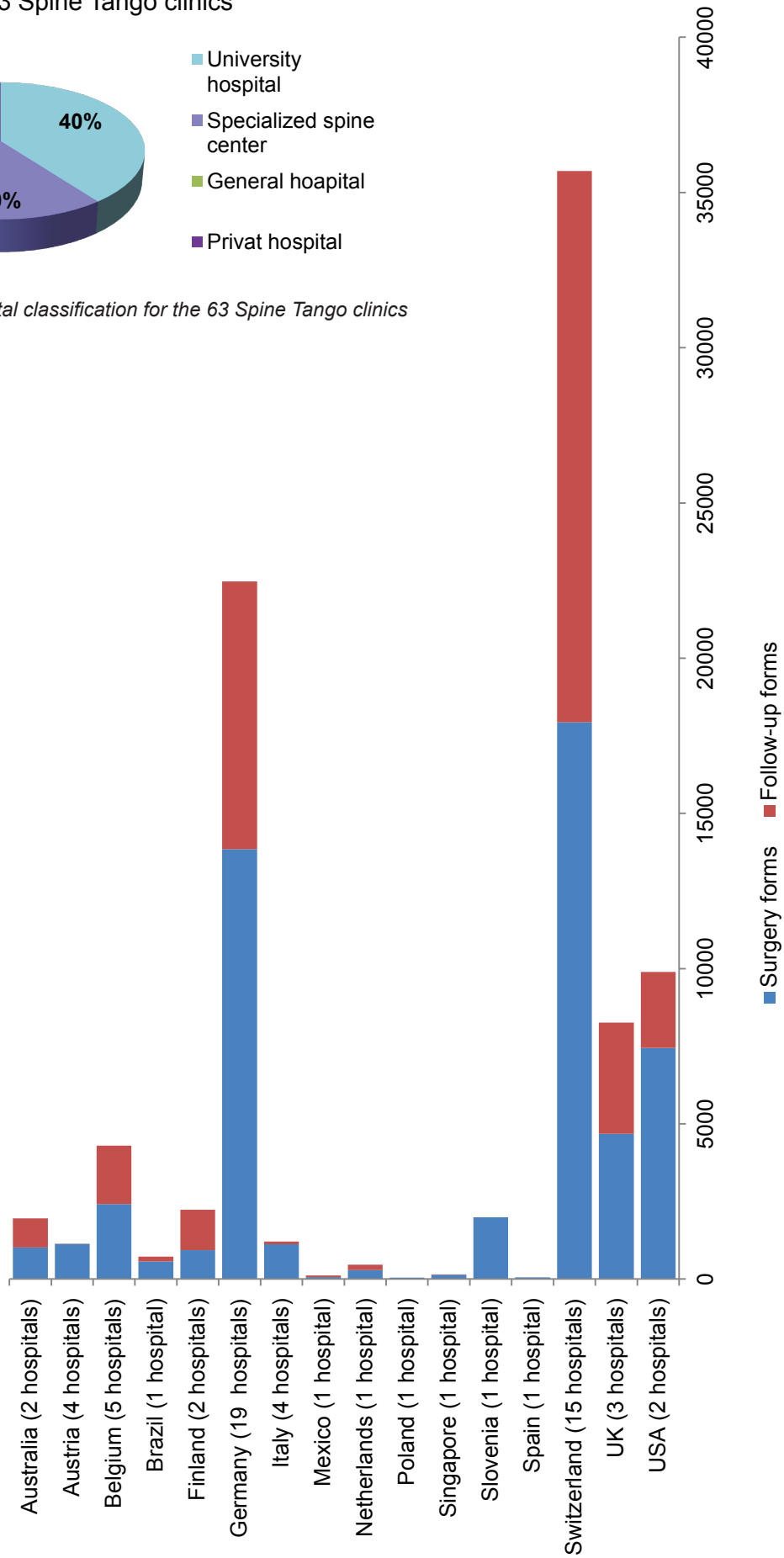
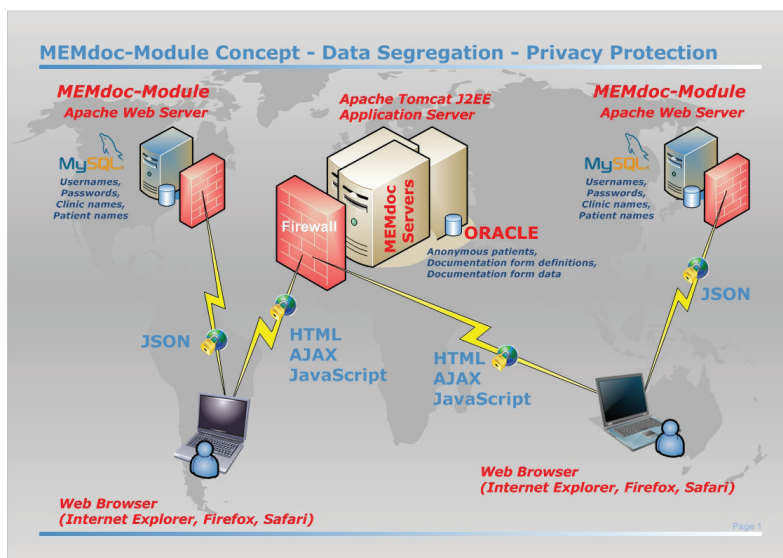


Figure 56: Overview of the Spine Tango participating hospitals according to their country of origin with case load divided into primary forms and follow-up forms until the end of 2012.

SECURITY

56

The model of the MEMdoc and MEMdoc-Module system is designed around the principle of data separation. The MEMdoc central server, housed at the MEM Research Center (MEMcenter) in Bern, hosts the main application and the central database containing all study definitions and clinical study data. Satellite MEMdoc-Module servers located throughout the world store all personal data about users, institutions and patients. At the core of the system is an innovative and patent-pending architecture in which the web browser of the client is used as a hub to seamlessly segregate and integrate the data between the MEMdoc-Module and the MEMdoc central server. This design provides tightly integrated communication between the servers while increasing the security and privacy of both systems. This has been accomplished using a light weight JSON server and incorporation of SSL encryption on each module. Flexible data sharing options have been designed to restrict or expand data access to suit individual needs. Finally, data consistency is controlled through systematic validation of received data and a rollback in case of errors. Each module server contains a local MySQL database, an Apache web server and the custom MEMdoc-Module application. This server can sit within the same clinic as the user or in some remote location depending on the needs of the group hosting the module. The physical and network security of this server is left up to the hosting entity. Some groups choose to restrict access to the module to users within the local subnet while others allow open access from anywhere. The module database contains all user and clinic information as well as the basic demographic data of patients. No medical data is stored on the module server.



All users from every MEMdoc-Module make their initial connection to the MEMdoc central server that houses the core MEMdoc application as well as all clinical study definitions. The MEMdoc application then recognizes the URL of the connection to determine which MEMdoc-Module to utilize and delivers the appropriate custom module application to the user's web browser. Each time a user requests data the application contacts both the local MEMdoc-Module and MEMdoc central database (Oracle) to seamlessly integrate the data from each for display. Newly entered data is likewise split so that only internal numeric identifiers for the user, patient, clinic, department and module are stored on the MEMdoc central database. All medical data is retrieved from and stored directly to the MEMdoc central server and linked to the module by these internal identifiers. Medical data never passes through the MEMdoc-Module server and is never stored on the MEMdoc-Module server. The birth year and gender of each patient are the only pieces of personal information stored on the MEMdoc central database for performing pooled statistics.

The physical and network security of all the MEMdoc servers is maintained by IEFO (Institute for Evaluative Research in Orthopedic Surgery) at the MEM Research Center. This includes the MEMdoc central (web) server, the MEMdoc database server and the MEMdoc statistics (SAS) server. All servers are physically housed at the MEMcenter in a dedicated, locked, climate controlled and monitored server room. The network is protected by a Sonicwall NSA 3500 firewall with real-time gateway anti-virus, anti-spyware, anti-spam and intrusion prevention. The firewall only allows access to the servers from the outside via port 443. Additional access is restricted to connections from within the MEMcenter. Web security is controlled by a DigiCert certified SSL web server certificate with 256-bit encryption on the MEMdoc central server and on each satellite module. Each server is continuously monitored to log all connections and to detect any suspicious activity. Additionally, any modules that are hosted at the MEMcenter fall within the same security parameters.

The following hardware is recommended for a MEMdoc-Module:

- Processor (1 CPU) Intel Xeon 3500 / AMD Opteron
- Memory 4 GB RAM
- Hard drive (2 drives) 250 GB, SATA or SAS
- RAID-Controller with battery backup unit (Raid 1)
- Debian 6

or a virtual machine with comparable performance



b
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IMPLANT CAPTURE

58

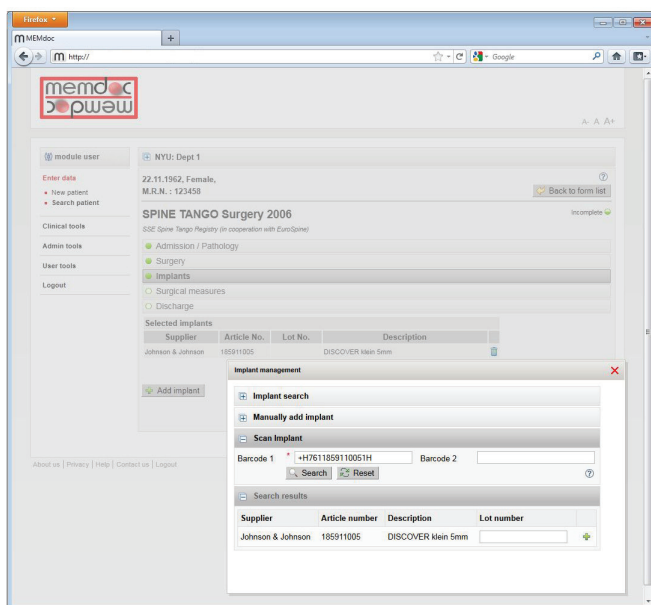
Application flow and features, although much appreciated by users, are secondary to easy and flexible data collection methods. With this in mind the MEMdoc application has expanded data collection facilities for all forms of medical data including image and implant data. OMR (optical mark recognition), a proven technology for data collection, has long been a staple of the MEMdoc application and has been expanded and simplified in Release 4 with support for both Windows and Mac users from all popular web browsers. Image capture has been extended with a redesigned image upload function that allows multiple uploads for a single case as well as simplified image retrieval for subsequent analysis and presentations. The SEDICO (secure data integration concept) implant capture tool, previously only available to users documenting on the MEMdoc central server, is now available to MEMdoc-Module users. Users who do not use the SEDICO interface can now use an inexpensive hand-held barcode reader to scan implant barcodes directly into the recorded questionnaires. Finally, access to the ever growing list of online suppliers and products has been enhanced with a faster search engine and the ability to segregate products by category (e.g. cups, heads, stems, liners, etc.) and anatomical location of use.

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MEM Research Center

While one of the major advantages of the MEMdoc system lies with its web-based access that allows contributions from users around the world to create a global data pool, IEFO is keenly aware that MEMdoc is not the only documentation solution available. Users of other systems, however, may still want to contribute to a nationally endorsed data pool like Spine Tango housed exclusively on MEMdoc. To this end IEFO developed the MEMdoc Web Service. This tool provides an interface that can be integrated into existing hospital information systems (HIS) and virtually any third-party data collection system to facilitate data entry, reduce physician workload and decrease data entry errors. Through our web service, applications can request the latest version of the definition of our data collection forms along with the complete set of validation rules. It is then up to the third-party application to collect the data and apply the rules. Once the data is collected it can then be contributed to the MEMdoc central repository. We developed such a system to ensure that the data received from external sources was of the same quality as that recorded directly on MEMdoc. Hence, redundant data entry is reduced while the value of the collected information is increased via silent synchronization of local data with a central instance. Such an interface between commercial systems and an academic documentation portal is unique and the combination of the advantages of both approaches goes beyond the current state of art of medical documentation.



AVAILABLE QUESTIONNAIRES

Table 3: Available questionnaires in the SSE Spine Tango registry (01.01.2013)

Forms used in Spine Tango Registry - 01.01.2013		online available											OMR paper forms available										
		multilingual	english	german	french	italian	spanish	english	german	french	italian	spanish	portuguese	turkish	polish	greek	hungarian	norwegian	dutch	russian			
Registry Forms																							
Spine Tango	Surgery 2006	✓	✓					✓	✓	✓	✓												
Spine Tango	Staged 2006	✓	✓					✓	✓	✓	✓												
Spine Tango	Follow-up 2006	✓	✓					✓	✓	✓	✓												
Spine Tango	Surgery 2011	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓			
Spine Tango	Staged 2011	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓			
Spine Tango	Follow-up 2011	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓			
Spine Tango	Conservative treatment 2011	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓			
Patient Forms																							
Spine Tango	Core Outcome Measures Index: COMI Neck	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓			
Spine Tango	Core Outcome Measures Index: COMI Back	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓			
Spine Tango	Core Outcome Measures Index: COMI Neck Conservative	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓												
Spine Tango	Core Outcome Measures Index: COMI Back Conservative	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓												
Spine Tango	Oswestry Disability Index ODI 2.1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓			
Spine Tango	Neck Disability Index NDI	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓			
Spine Tango	Scoliosis Research Society: SRS 30	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓												
Spine Tango	EuroQoL™: EQ-5D™	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									✓			
Spine Tango	RMQ - Low Back and Disability Questionnaire	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									✓			
Spine Tango	SAQ Scoliosis appearance Questionnaire	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓												

IP = in process
 OMR = Optical Mark Reader

PUBLICATIONS

PAPERS IN PEER REVIEWED JOURNALS

Aghayev E, Henning J, Munting E, Diel P, Moulin P, Röder C; SWISSpine and Spine Tango Registry group

Comparative effectiveness research across two spine registries.

Eur Spine J. 2012 Aug;21(8):1640-7. Epub 2012 Mar 14.

Fankhauser C, Mutter U, Aghayev E, Mannion A

Validity and responsiveness of the Core Outcome Measures Index (COMI) for the neck.

Eur Spine J 2012 Jan;21(1):101-14.

Lattig F, Fülöp Fekete T, Kleinstück FS, Porchet F, Jeszenszky D, Mannion AF

Lumbar Facet Joint Effusion on MRI as a Sign of Unstable Degenerative Spondylolisthesis: Should it Influence the Treatment Decision?

J Spinal Disord Tech. 2012 Jul 24. [Epub ahead of print]

Röder C, Errico TJ, Spivak JM, Murray M, Protopsaltis T, Lis A, Nordin M, Bendo J

Hospital for Joint Diseases participates in international spine registry Spine Tango after successful pilot study.

Bull NYU Hosp Jt Dis. 2012;70(4):254-8.

Sobottke R, Aghayev E, Röder C, Eysel P, Delank S, Zweig T

Predictors for surgical, general and follow-up complications in lumbar spinal stenosis relative to patient age.

Eur Spine J 2012 Mar;21(3):411-7.

ORAL PRESENTATIONS

May 2012

Eysel P, Röder C, Aghayev E, Sobottke R

The influence of age on outcome after surgical decompression of degenerative lumbar spinal stenosis.

13th EFORT Congress 2012, Berlin, Germany.

23rd - 25th May 2012

October 2012

Sobottke R, Munting E, Röder C, Aghayev E

Lumbar spinal stenosis: Are there objective reasons for fusion or instrumented surgery? A Spine Tango registry study.

German Conference for Orthopedics and Traumatology (DKOU: Deutscher Kongress für Orthopädie und Unfallchirurgie), Berlin, Germany.

23rd – 26th October 2012

Röder C

Potentials of analyzing an international spine register - from assessing standards of care to creating benchmarks.

Annual meeting of the Norwegian Orthopaedic Society, Spine Symposium, Oslo, Norway.

25th October 2012

December 2012

Sobottke R, Siewe J, Eysel P, Röder C, Aghayev E

Influence of number of reoperations and reoperation cause on the post-revision patient results

7th Annual conference of the German Spine Society (DWG), Stuttgart, Germany.

6th-8th December

POSTER PRESENTATIONS

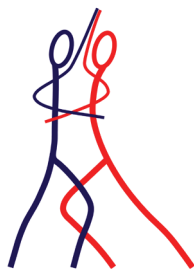
December 2012

Röder C, Aghayev E, Munting E

The Spine Tango Benchmarking Project: Comparison of instrumented fusion and total disc arthroplasty in patients with cervical disc protrusion with radiculopathy.

7th Annual conference of the German Spine Society (DWG), Stuttgart, Germany.

6th-8th December 2012



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Orthopaedic surgeon, EuroSpine (Past Fellow)

Thomas Zweig, MD
Orthopaedic surgeon, EuroSpine (Past Fellow)

Everard Munting, MD
Former Chair Spine Tango Committee, EuroSpine
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Tim Pigott, MD
New Chair Spine Tango Committee, EuroSpine
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