J. Krämer

The LIRCE principle: a risk-value score for the spine

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When we chose Kos for the 1997 annual meeting of the European Spine Society, we had in mind that the place where Hippocrates started scientific medicine in Europe may give us some inspiration for our challenges.

Hippocrates left us an oath which is still an ethical guide and moral basis for the practice of medicine. It includes some remarkable words, which could be guidelines for the diagnosis and treatment of spine diseases.

“I swear by Apollon, Aesculapis etc. ...I would never do harm to anyone...” If we apply just this part to the spine, we all think about the iatrogenic spine. The iatrogenic spine includes:

1. Failed back surgery syndrome, postdiscectomy syndrome (PDS)
2. Instability caused by manipulation
3. Muscle weakness caused by orthoses
4. Psychological low back pain

The use of some diagnostic procedures, such as discography, should also be looked into, given that a less invasive MRI study could give the same information. With MRI we have to consider the cost, which hurts the insurance company that has to pay for the patient's treatment.

So we can summarize: “never do harm to anyone” could mean in our time: less invasive techniques; less risk; less cost.

On the other hand, our patients expect some effectiveness. They want to be cured of their pain and disability.

If there is a severe problem such as a disc herniation with a lot of pain and a footdrop, heat and massage alone, which are not invasive and have low risk and cost, cannot solve the problem – only an open discectomy could do so.

So there is another point in the Hippocratic oath: “Only for the good of my patients”. This means that we must be as effective as possible in our diagnostic and therapeutic procedures, but within reasonable invasiveness, risk, and cost limits. We come to a risk-value score, which we call in German “WIRKE-Prinzip”: Weniger invasiv, Risiko, Kosten, dafür effektiv [2].

This means in English: less invasive risk cost but effective: the LIRCE principle.

In Italian: meno invasiv rischio costo ma effetto

In Spanish: menos invasiv riesgo costo pero eficaz

In French: moins invasiv risque coût mais efficace

And in Greek: ligótero epemvatikí rísiko cóstos alá kä apotelsmatikí

Our languages in Europe are after all not very different, especially when we use words of Latin and Greek origin like “principle” “invasive” “risk” “cost” “effective”. Only the “buts” differ a little more.

The LIRCE principle should be considered particularly in dealing with the spine, because there are some diagnostic and therapeutic procedures that are of a questionable value and are, of course valued differently in each doctor's mind.

To find out more about the risk-value score for each well-known method we sent a questionnaire to different groups of doctors in Germany. The topic for our European Spine Society questionnaire was the LIRCE principle: Less Invasive Risk Cost but Effective.

Those interviewed had to rate from 0 (low) to 5 (high) on a visual analog scale for invasivity, risk, and cost on the negative side and from 0 to 10 for effectiveness on the positive side. In the evaluation we both added to a risk

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J. Krämer (✉)
Orthopedic University Hospital, Gudrunstrasse 56,
D-44791 Bochum, Germany

Please note: **low** . . . . . **high** for each in its field

	don't know	Invasivity	Risk	Cost	Effectivity	Score
Diagnostic						
Manual med.	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
EMG	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
X-ray (plain)	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
CT	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
MRI	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Discogr.	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Myelogr.	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Radiculogr.	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Ultrasound	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Therapeutic						
Manual med.	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Physioth.	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
TENS	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Electroth.	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Medication	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Orthoses	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Psychoth.	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Massage	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Acupuncture	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Loc. inj.	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Laser intrad.	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Perc. Nucl.	☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Chemonucl.	☐	☐				

Age: ..... Orthop. Pract. ☐ Gen. Pract. ☐ Orthop. Surg. ☐ Orthop. Assist. ☐
Sex: m ☐ f ☐

Fig.1 European Spine Society Questionnaire: the LIRCE principle for spine: **L**ess **I**nvasive, **R**isk, **C**ost, but **E**ffective

$n = 73$		Effectivity	Score 1
		E-(1+R+C)	
Diagnostic			
Manual med.	5.1	3.4	
EMG	5.0	1.3	
X-ray (plain)	6.6	3.5	
CT	7.2	1.8	
MRI	8.4	3.5	
Discogr.	4.5	-4.0	
Myelogr.	5.8	-3.6	
Radiculogr.	3.9	-3.3	
Ultrasound	1.8	0.75	

Fig.2 The risk-value score for diagnostic procedures in spine

value score or better reputation score for standard methods.

Respondents were asked to rate every technique “each in its field”, which means as applied to degenerative spine diseases in general. Where there are special indications, for instance in the case of an open discectomy for a herniated disc with a cauda syndrome, the effectivity score of the technique should be increased by a value multiplier.

This questionnaire was sent to (1) general practitioners, (2) orthopedic practitioners, (3) orthopedic surgeons, (4) orthopedic assistants in our country. A total of 73 questionnaires were returned.

In the *diagnostic* procedures, manual medicine, plain radiographs, and MRI had the best reputation; discography and myelography the worst. Younger orthopedic practitioners and the residents of orthopedic clinics, in particular, had a good opinion of manual medicine in diagnostics.

Electromyography was given different invasiveness ratings depending on whether needles were used or not. The general opinion was that its effectivity was not very good.

MRI had the highest effectivity rating under the diagnostics. MRI gets better almost every day and gives us a lot of information without any invasiveness or risk. We use it more and more for orthopedic diagnostics in children, for instance to control scoliosis and spondylolisthesis.

Personally I must confess that I only do microdisc surgery if I have a good MRI study of the patient. The reputation score for MRI would be even higher were it not for the high cost.

$n = 73$		Effectivity	Score 1
		E-(I+R+C)	
Therapeutic			
Manual med.	5.0	1.9	
Physioth.	6.0	2.9	
TENS	3.4	1.3	
Electroth.	3.7	1.5	
Medication	5.3	0.3	
Orthoses	3.8	0.05	
Psychoth.	3.9	0.95	
Massage	3.4	0.52	
Acupuncture	3.2	-0.1	
Loc. inj.	6.1	0.93	
Laser intrad.	3.5	-4.6	
Perc. Nucl.	4.3	-4.4	
Chemonucl.	3.9	-4.5	
Back school	5.1	3.5	
Discectomy	7.2	-3.4	
Fusion	6.3	-6.9	

Fig.3 The risk-value score for therapeutic procedures in spine

Discography and *myelography* are typical examples of techniques which rated a low risk-value score in general because of their levels of invasiveness and risk compared to CT and MRI. They should have a value multiplier for special indications, such as discography to identify symptomatic discs before fusion or myelography combined with CT for spinal stenosis.

Radiculography had some “don't know” responses. It is invasive but gives us important information for identifying painful exiting nerve roots in the lumbar spine. Radiculography is another example of where a value multiplier is appropriate in special indications.

Ultrasound has a good reputation in orthopedics for congenital dislocation of the hip and shoulder diagnostics – but so far not for the spine. Invasiveness, risk, and cost are low, but effectivity was also rated very low in all questionnaires. We use ultrasound for a guided facet infiltration instead of X-rays. We have a research program using ultrasound to investigate scar development after laminectomy with a wide or limited approach. In general, how-

ever, ultrasound is not routinely used for spine diagnostics.

In the *therapeutic* part of our questionnaire, manual medicine, physiotherapy, and back school had the best and fusion the worst reputation.

Therapeutic *manual medicine* has a good risk-value score in its field, i.e. if it is indicated. However, there is some risk.

Physiotherapy (Krankengymnastik) has a very good reputation in Germany among doctors, with a high effectiveness rating of 6.0. This questionnaire will help us in the discussions with our Department of Health, which wants to cut the payment for physiotherapy.

TENS had some “don't know” responses. Its general reputation is not very high because of its questionable effectiveness. A recent placebo controlled study by Jarzem and co-workers presented at the AAOS meeting showed that TENS is no better than a placebo [1].

Local injections like epidural injections or nerve root blocks for the cervical and lumbar spine have a high effectiveness. They are very popular in Germany. The techniques have improved and are innovative as, for instance, the new epidural-perineural injection for lumbar radicular syndromes. The oblique approach to the anterior epidural space with a 29-G needle inserted by a special double needle technique allows the application of only small amounts of steroid and local anesthetic. It is less risky and invasive and has a high effectiveness, as the results of our controlled studies have shown.

Intradiscal laser and *percutaneous discectomy* have a decreasing reputation, with an overall risk-value score of -4.5, rated the same by orthopedic surgeons and non-surgeons. The outcome of both had already been predicted by professional spine specialists when these methods were introduced. Two controlled European studies – the Revel study for percutaneous nucleotomy [3] and the Steffen study for intradiscal laser [4] – have shown that the success rates for both methods are at the level of placebos. Both were compared to chemonucleolysis, which had the predicted and well-known success rate from other studies of 60–70%.

Chemonucleolysis in our country is, therefore, still state of the art for intradiscal therapy. Low effectiveness ratings and the low risk-value score are, however, not very promising. The reputation of chemonucleolysis is not very high, because of its side effects, with postinjectional back spasm in 40% of cases.

It is a challenge for a Spine Society in Europe to find better procedures of intradiscal therapy. We need new agents and better techniques to approach the disc bulge without damaging the nerve root. Since there are no restrictions in Europe like those applied by the US Food and Drug Administration (FDA) and there is not as yet any major legal obstacle, realisation of innovation should be easier in Europe than in the United States.

The reputation score for spine surgery – mainly open discectomy and fusion – was the worst because of its high invasiveness, risk, and cost, with a questionable effectiveness. Non-surgeons and orthopedic surgeons were of the same opinion. Mostly it is inappropriate patient selection that is responsible for poor outcome in spine surgery. This could mean in the Hippocratic sense “do not cut”; however, this doesn't mean that we should not operate at all. Open discectomy had the highest effectiveness rate, at 7.2, but an overall risk-value score of -3.4. That means discectomy is a very effective operation, but has a high risk. There are and always will be clear indications for open disc surgery, such as cauda syndrome, acute footdrop, and intolerable pain.

There are also clear indications for fusion, like spondylolisthesis with progressive neurological symptoms. There is no doubt about the value for decompression and fusion – nowadays anterior and posterior fusion after realignment and decompression. In these cases surgery is very effective and should have a value multiplier that turns the individual risk-value score positive.

Open disc surgery and fusion should not automatically mean a poor prognosis. Hippocrates says “I will not cut into patients in whom the disease is manifest, I will leave this operation to be performed by specialists in this art”. Leave it to specialists who are well trained and do that kind of surgery every day. Most procedures, like microdiscectomy or insertion of screws into the pedicle, require special training and routine. This is a challenge for a European Spine Surgeon education and evaluation program. Our instructional courses could be a beginning, but they are not enough. We need a training program with a longer hospitalization in special spine centers – programs that are being developed by our educational committee.

The main challenge is to give guidelines for (1) patient selection, (2) surgical technique, and (3) postoperative treatment.

In conclusion, with the LIRCE questionnaire we identified some of our challenges and can propose ways of approaching them. The questionnaire should be evaluated at a European level.

Some diagnostic and therapeutic methods for spine diseases which in our opinion are well recommended and

Table 1 Conclusions from the LIRCE questionnaire: challenges for the European Spine Society

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Support and evaluation of

- Manual medicine
- Physiotherapy
- Local injections

Make MRI more available

Improve reputation of spine surgery

Better communication

Consider risk-value score

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which we use every day need more support and evaluation by the Spine Society of Europe, in order to gain recognition by our Departments of Health. From our questionnaire this appears especially to be the case for manual medicine, physiotherapy, and local injection therapy.

MRI needs official regulation and should be available to everyone who needs it. The cost of MRI has to be reduced or subsidized by the government.

Spine surgery has a bad reputation not only with the doctors involved but also with our patients. A Spine So-

ciety of Europe has to improve this reputation by more evaluation research and training programs in spine centers.

Communication is the key for Europe, not only for spine problems. We need better and faster information concerning new methods – whether they are good or bad – before our own patients tell us.

Finally, if we have the information, a reasonable risk-value relation according to the LIRCE principle should be considered for anything we do to our patients.

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