

Future of spine surgery

Aron Lazary









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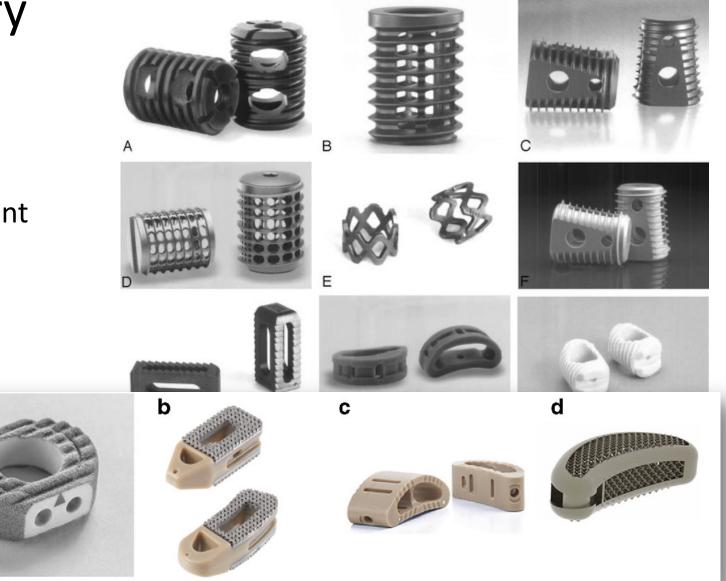


History of spine surgery

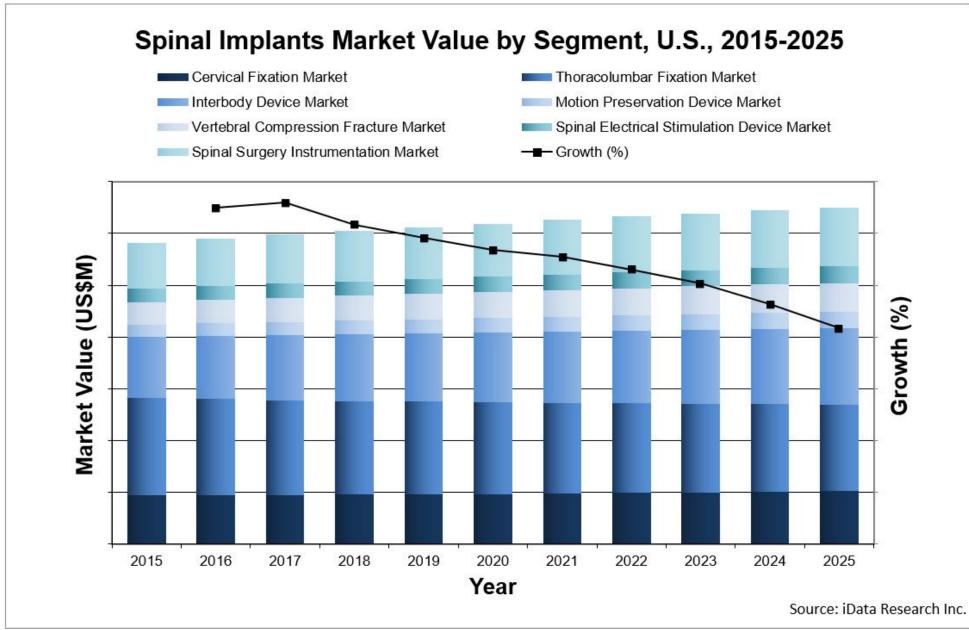
- Patients' need
- Population's need
- Technological development

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- Diagnostics
- Surgical methods
- Implants
- Devices
- Business
- Fashion





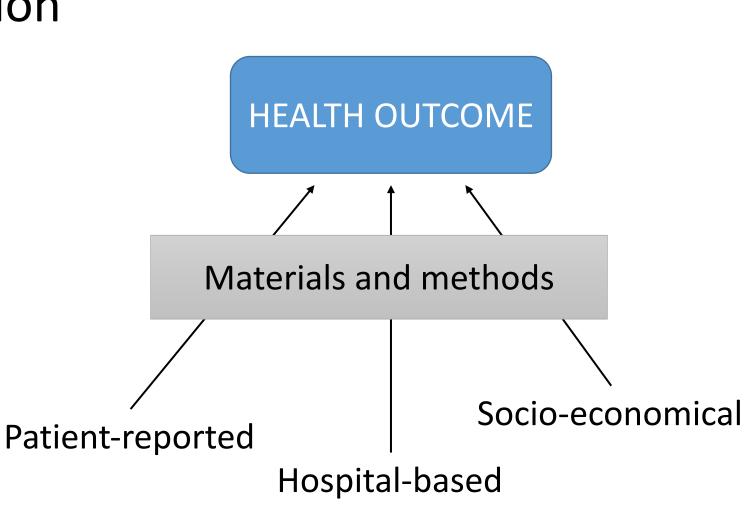




Global health care vision

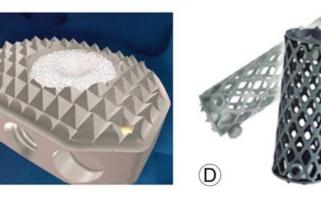
- Evidence-based spine care
- General approaches
- Individual solutions
- Bio-psycho-social model
- Value-based health care

"providers, including hospitals and physicians, are paid based on patient health outcomes"













Final Event, NWE6





Sheath

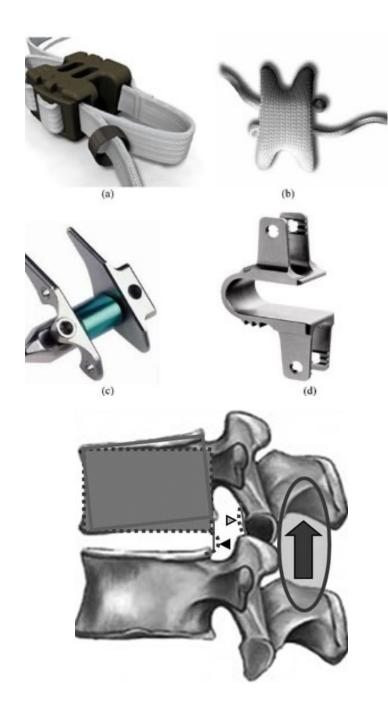
Artificial Nucleus Artificial Annulus

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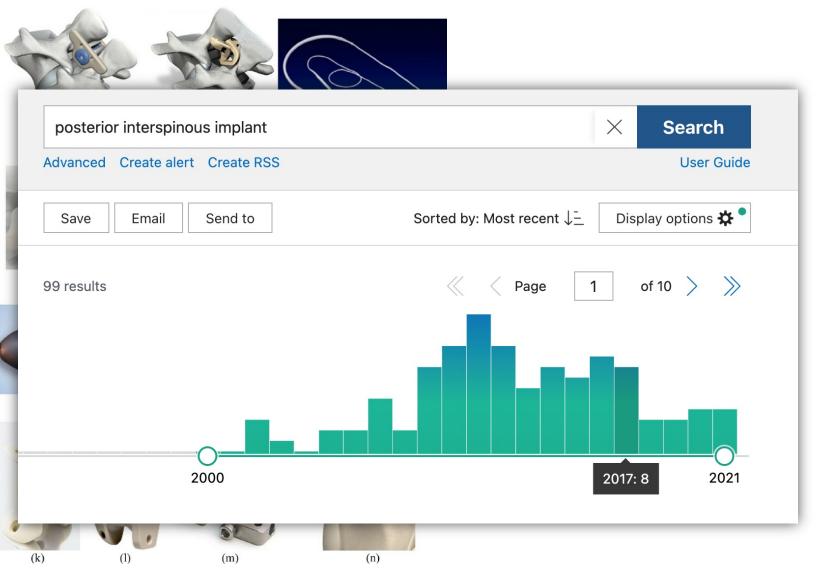




OR time	90'	75'	60-120'
Patient satisfaction	90%	91% (??)	92% (???)
"Cool" factor	1	10	100
Price	1000 EUR	2000 EUR	10000 EUR 6



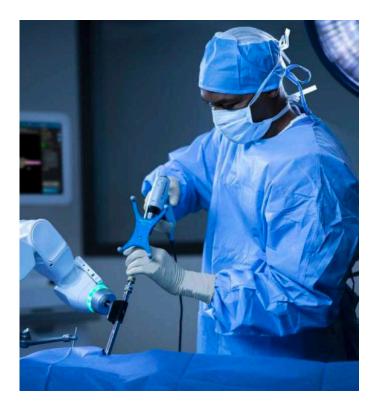


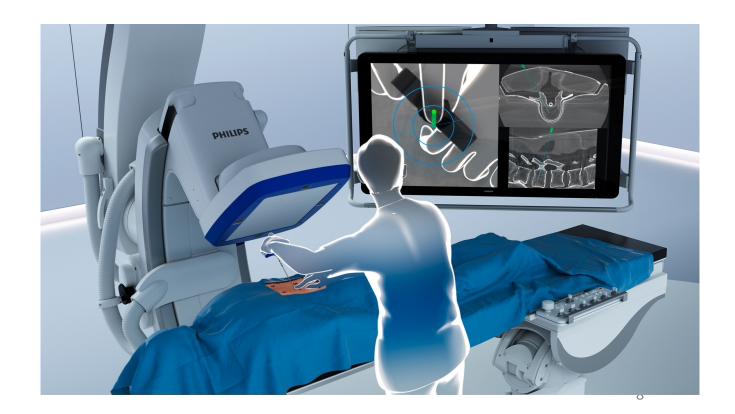




Future developments in spine surgery

ROBOTICS, NAVIGATION







VIRTUAL REALITY, SIMULATORS





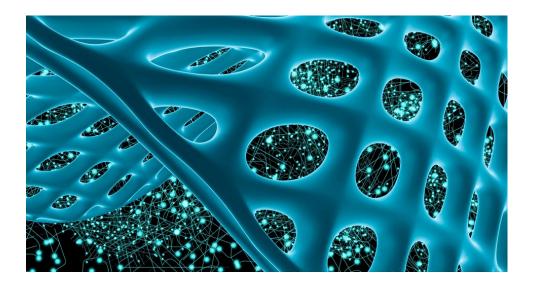


LESS INVASIVE SURGERY





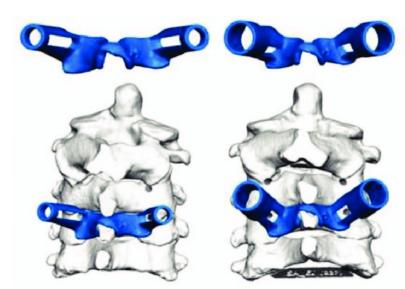
BIOMATERIALS





3D PRINTING





Drill Guide Template

Screw Guide Template







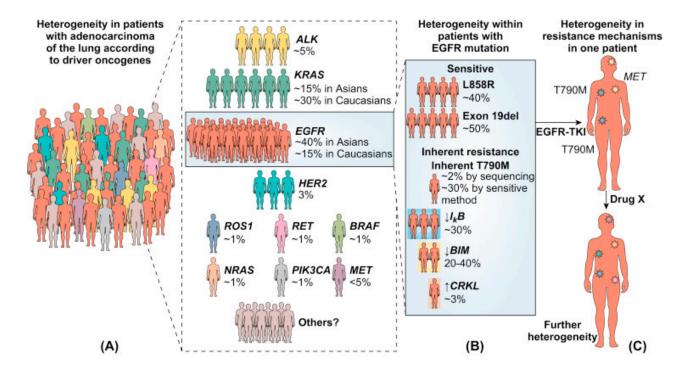
Robot: 1M Navigation: 1M Microscope: 0,5M Endoscope: 0,5M

3M EUR

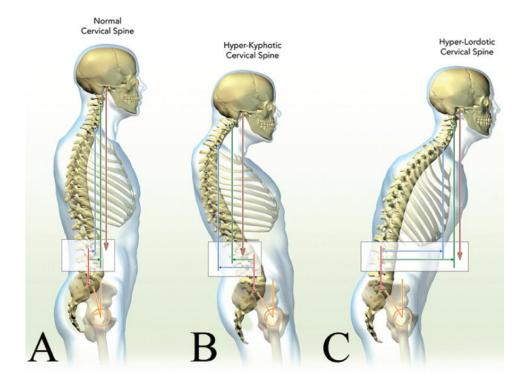
<u>One—level fusion:</u> 4000 EUR (HUN) – 750 pts 20000 EUR (US) – 150 pts



PATIENT STARTIFICATION



RISK PREDICTION





Future developments in spine surgery

- Regulatory issues
- Socio-economy
- Psycho-social issues



100

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WC influences positively WC influences negatively

International Journal of Environmental Research and Public Health

MDPI

Review Does Workers' Compensation Status Affect Outcomes after Lumbar Spine Surgery? A Systematic Review and Meta-Analysis

Fabrizio Russo ^{1,*}^(D), Sergio De Salvatore ¹^(D), Luca Ambrosio ¹^(D), Gianluca Vadalà ¹^(D), Luca Fon Rocco Papalia ¹, Jorma Rantanen ³, Sergio Iavicoli ² and Vincenzo Denaro ¹

	wo		NW	5		Risk Ratio	Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI	M–H, Random, 95% Cl
1.1.1 VAS and NRS							
Asch 2002	25	78	23	134	19.6%	1.87 [1.14, 3.06]	
Atlas 2000	36	56	39	120	27.7%	1.98 [1.43, 2.73]	
Carreon 2010	45	58	34	58	31.4%	1.32 [1.02, 1.71]	-
Gum 2013	12	37	8	37	11.2%	1.50 [0.69, 3.24]	
Klekamp 1998	19	27	5	27	10.1%	3.80 [1.66, 8.70]	
Rouben 2011 Subtotal (95% CI)	0	14 270	0	155 531	100.0%	Not estimable 1.79 [1.32, 2.42]	•
Total events	137		109				
Heterogeneity: Tau ² :	= 0.06; Ch	1 ² = 8.4	83. df =	4 (P =	0.07); I ² =	55%	
Test for overall effect	: Z = 3.74	(P = 0)	.0002)				
Total (95% CI)		270		531	100.0%	1.79 [1.32, 2.42]	•
Total events Heterogeneity: Tau ² :	137 = 0.06; Cl	ni² = 8.1	109 83. df =	4 (P =	0.07); l ² =	55%	0.02 0.1 1 10 50
Test for overall effect	: Z = 3.74	(P = 0)	.0002)				WC influences positively WC influences negatively
Test for subgroup dif	ferences:	Not app	plicable				the initiatives positively we initiatives negatively

	wo		NW	C		Risk Ratio	Risk Ratio
tudy or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI	M-H, Random, 95% Cl
.2.1 ODI							
sch 2002	23	63	15	111	5.4%	2.70 [1.52, 4.79]	
arreon 2010	53	58	39	58	12.3%	1.36 [1.12, 1.65]	
eutsch 2006	1	4	2	16	0.6%	2.00 [0.24, 16.93]	
um 2013	27	37	12	37	6.3%	2.25 [1.36, 3.73]	
fadan 2003	5	9	2	26	1.2%	7.22 [1.69, 30.92]	0.000
fadan 2003	6	12	2	27	1.2%	6.75 [1.59, 28.74]	
han 2017	7	24	27	90	4.1%	0.97 [0.48, 1.96]	
ouben 2011 ubtotal (95% CI)	0	14 221	0	155 520	31.1%	Not estimable 2.11 [1.31, 3.39]	-
tal events	122		99				
terogeneity: Tau ²	= 0.22; Cl	$hi^2 = 20$	0.38, df :	= 6 (P =	0.002);	l ² = 71%	
est for overall effect	t: Z = 3.0	9 (P = 0)	0.002)				

	WC		NWG	с		Risk Ratio	Risk Ratio
or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% Cl	M-H, Fixed, 95% CI
	44	76	37	130	24.4%	2.03 [1.46, 2.84]	
	17	80	99	459	26.2%	0.99 [0.62, 1.56]	
006	2		0		1. 1997.2008	kint antinedile	-
gh 1994		<u>م / د</u>	_ +	.		- ulu) 1 CO	
01		((r	etur	rnτ	0 W 0	ork)=1.68	
2011		`					
1997	0	0	27	32		Not estimable	
000	57	73	26	60	25.5%	1.80 [1.32, 2.47]	
1997	13	13	10	11	10.1%	1.10 [0.87, 1.40]	
95% CI)		355		915	100.0%	1.68 [1.41, 1.99]	•
events	182		216				2016
geneity: Chi2 -		f = 6 (F		001); I ²	= 82%	E.	
or overall effect						0	0.01 0.1 1 10 WC influences positively WC influences negatively
	wo		NW	c		(A) Risk Ratio	Risk Ratio
y or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% CI	M-H, Fixed, 95% Cl
999	18	34	6	37	3.5%	3.26 [1.47, 7.25]	
002	28	76	22	133	9.7%	2.23 [1.38, 3.61]	
000	32	56	35	120	13.6%	1.96 [1.37, 2.81]	
ough 1994	27	85	8	40	6.6%	1.59 [0.79, 3.18]	
ugh 1998	24	56	18	59	10.7%	1.40 [0.86, 2.29]	
	27	89	12	186	4 7%	6 44 [3 54 11,74]	
001		89	12	186	4 7%	6 44 [3 54 11,74]	
001 ny 1995		89	12	186	4 7%	=2.10 ^{.43]}	
001 y 1995 2000	RF	*• R (S	atis	fac	tion	(+44 [3 54 11,74] (+43] (+43] (+43] (+43] (+43] (+43] (+13)(
001 y 1995 2000 r 1996	RF	89 R (S 10	atis [.] 9	186 fac 13	4 7% tion	=2.10 .82] 1.30 [0.86, 1.97]	
001 y 1995 2000 1996 1997	RF	89 R (S 10 61	atis [.]	186 fac 13 42	4 7% tion 4.8% 3.6%	+ 44 [3 54 11,74] + 2.10 .43] -2.10 .43] .21] .82] 1.30 [0.86, 1.97] 1.38 [0.51, 3.74]	
001 y 1995 2000 1996 1997 e 1997	P 9	89 X (S 10 61 20	atis ⁻¹²	186 fac 13 42 32	4 7% tion 4.8% 3.6% 0.9%	=2.10 .30 [0.86, 1.97] 1.38 [0.51, 3.74] 8.00 [1.95, 32.82]	
0001 ay 1995 5 2000 r 1996 1997 r 2000	P 9 10 10 32	89 R (S 10 61 20 73	atis 9 5 2 21	186 fac 13 42 32 60	4.7% tion 4.8% 3.6% 0.9% 14.0%	(1.30 [0.86, 1.97] 1.38 [0.51, 3.74] 8.00 [1.95, 32.82] 1.25 [0.81, 1.93]	
n 1996 (1) 001 av 1995 s 2000 r 1996 1997 r 2000 r 2000 r 2000	P 9 10 10 32 20	89 R (S 10 61 20 73 47	12 atis 9 5 2 21 54	186 fac 13 42 32 60 185	4.8% 4.8% 3.6% 0.9% 14.0% 13.3%	(1.30 [0.86, 1.97] 1.38 [0.51, 3.74] 8.00 [1.95, 32.82] 1.25 [0.81, 1.93] 1.46 [0.98, 2.18]	
001 ay 1995 2000 r 1996 1997 e 1997 2000	P 9 10 10 32	89 R (S 10 61 20 73	atis 9 5 2 21	186 fac 13 42 32 60	4.7% tion 4.8% 3.6% 0.9% 14.0%	(1.30 [0.86, 1.97] 1.38 [0.51, 3.74] 8.00 [1.95, 32.82] 1.25 [0.81, 1.93]	
1 1995 000 996 97 1997 000 000	P 9 10 10 32 20	89 R (S 10 61 20 73 47	12 atis 9 5 2 21 54	186 fac 13 42 32 60 185 11	4.8% 4.8% 3.6% 0.9% 14.0% 13.3%	(1.30 [0.86, 1.97] 1.38 [0.51, 3.74] 8.00 [1.95, 32.82] 1.25 [0.81, 1.93] 1.46 [0.98, 2.18]	

0.01

(B)

0.1



Future developments in spine surgery

- Regulatory issues
- Socio-economy
- Psycho-social issues

SMART R & D

- Reflects on real needs
- Focusing on multidimensional outcome
- Modern R & D technologies
- Collaboration between S & E



bridging medicine and engineering to enhance innovation



SBI