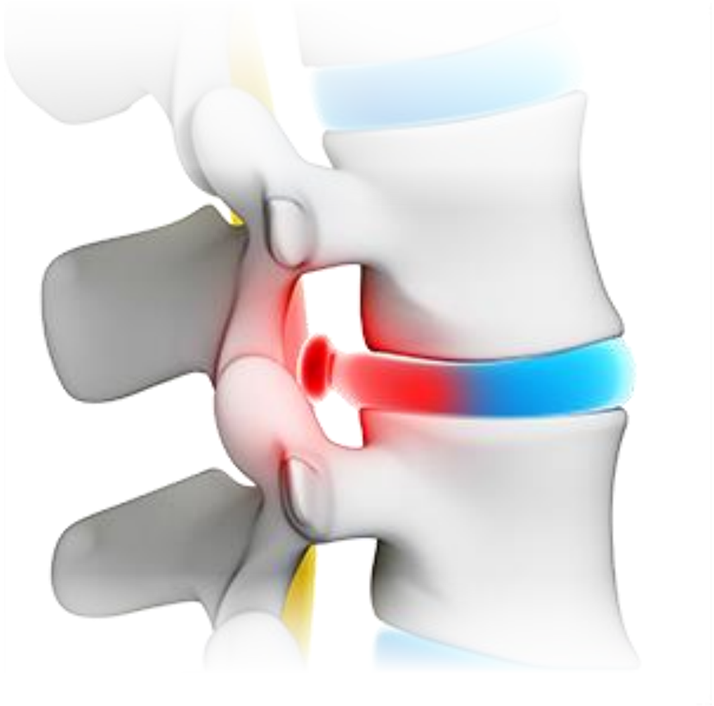
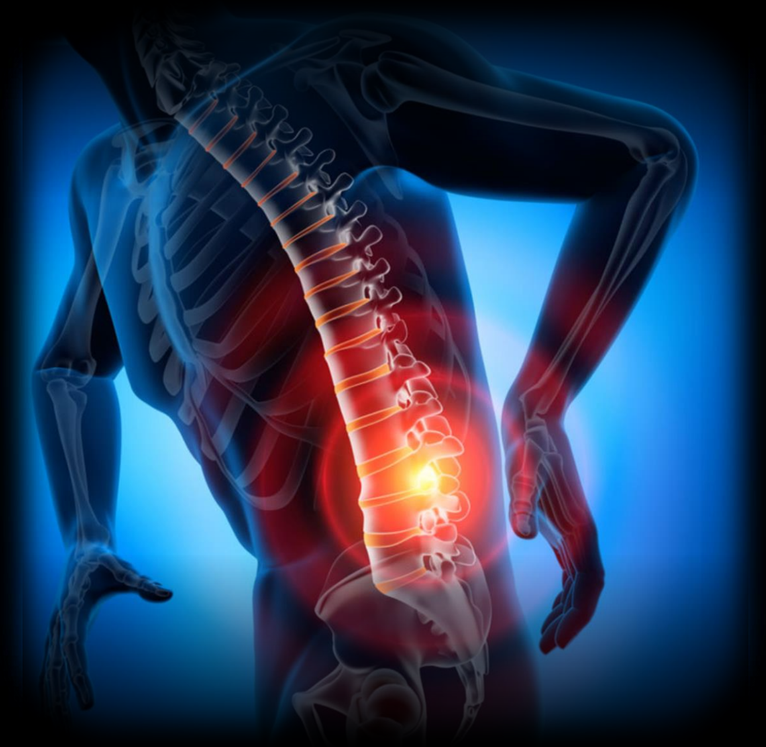
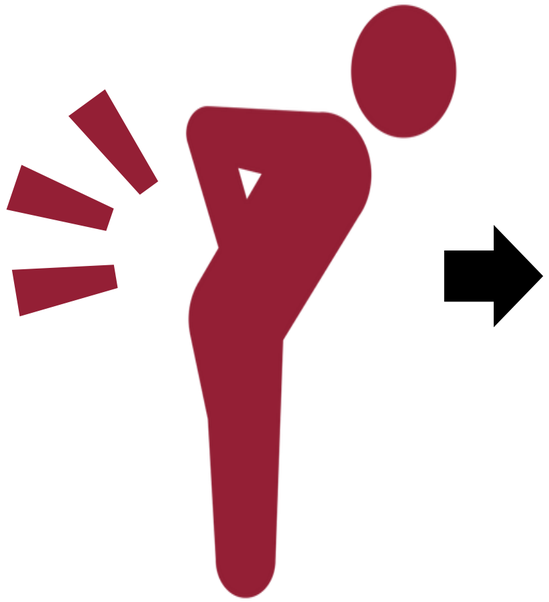
Spine By Design

Objective data to support **spinal surgery** choices.

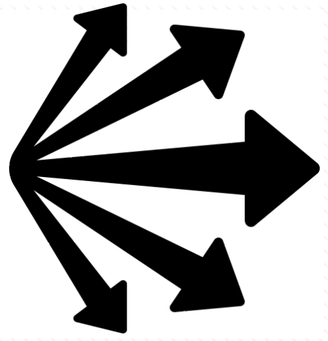
Herniated discs & Back pain

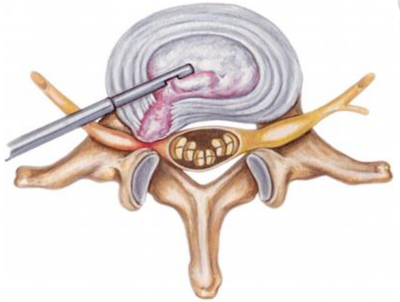






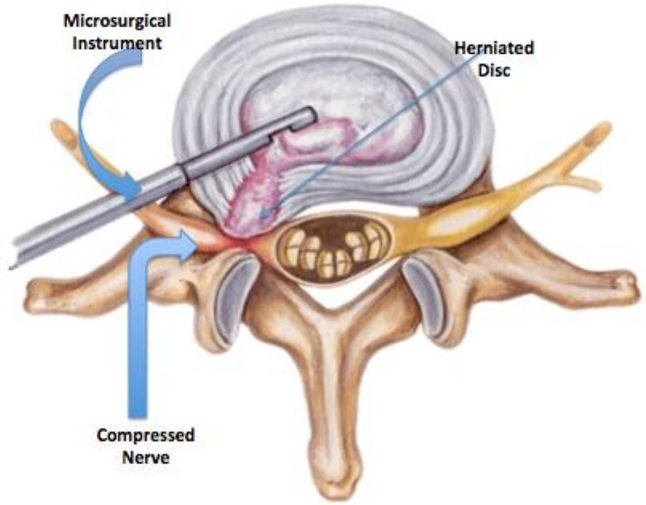

Vantage Orian
Canon





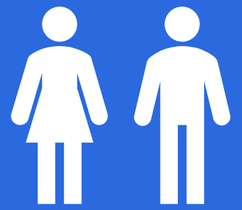
Disc Reherniation After Surgery

Surgical Complications



- In the US alone, more than **1.2 million spinal surgeries** are performed each year, including **spinal fusion** and decompression, or **discectomy** surgery, according to the National Center for Health Statistics.[1]
- Roughly **25%** of these are **microdiscectomies** (~300,000), costing between **4.5** and **15 billion** a year.[2]
- **5-10%** of microdiscectomies **reherniate** leading to additional surgery costs, longer recovery times and lost productivity. [3]

Spinal Surgical Decision Support Software



Methods: Predictive Software

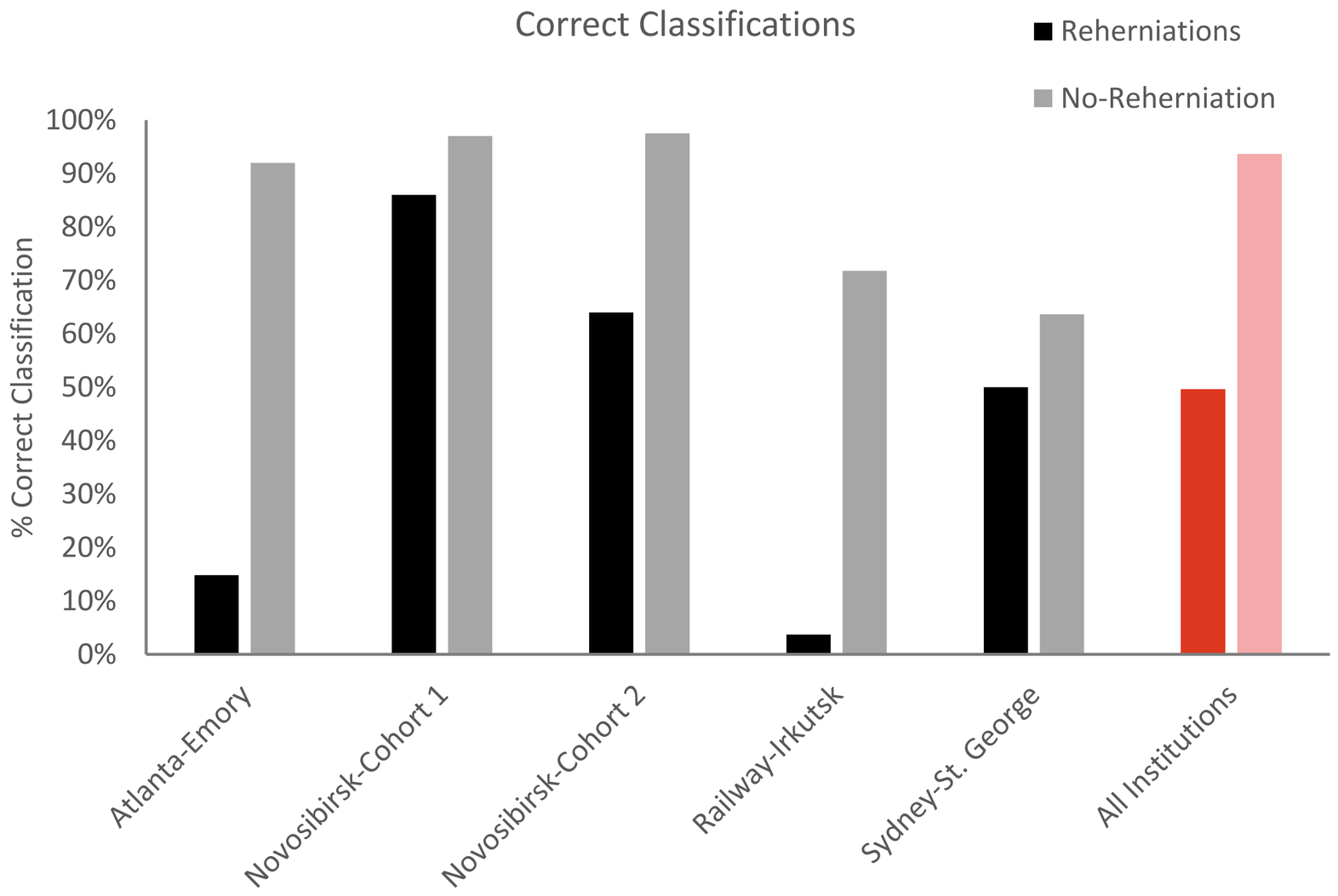
Probability Calculator for Lumbar Disc Herniation Recurrence After Microdiscectomy

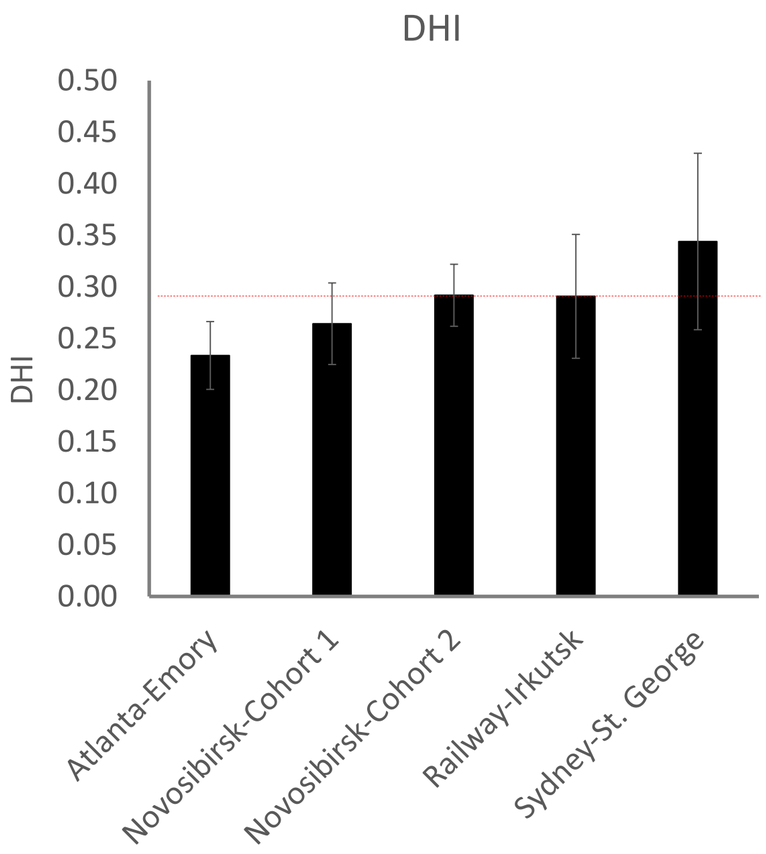
DHI	
BMI (kg/m²)	
sROM (degrees)	
Lumbar lordosis angle (degrees)	
Phirrmann grade (1-5)	
Herniation type (protrusion = p, extrusion = e)	
Smoking (no = 0, yes = 1)	
Recurrence probability (highest = 1, lowest = 0)	0.00

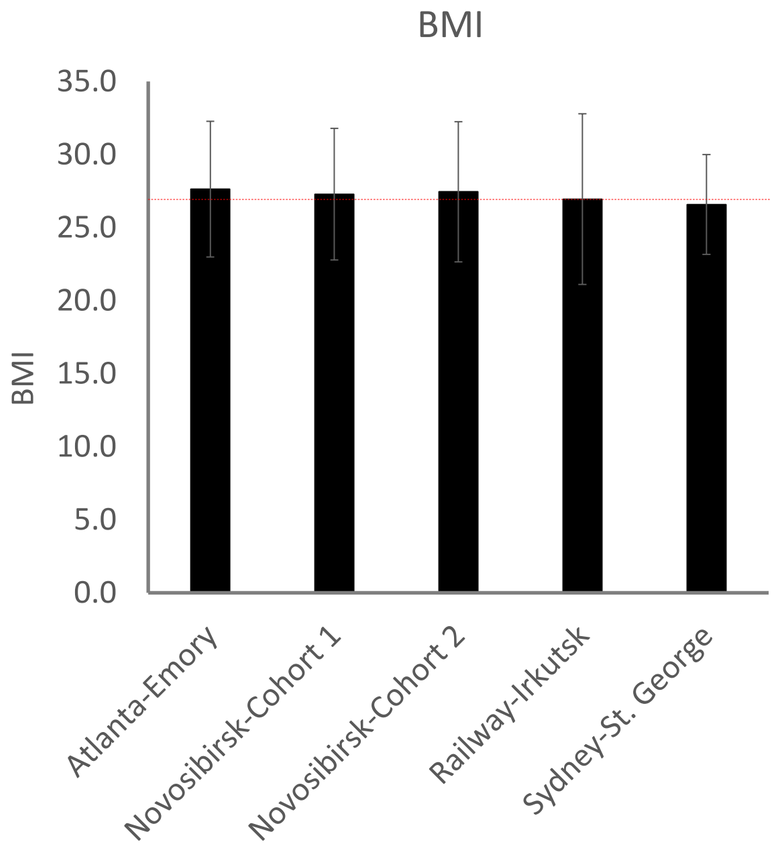
A nonlinear, multivariate, **logistic regression** model:

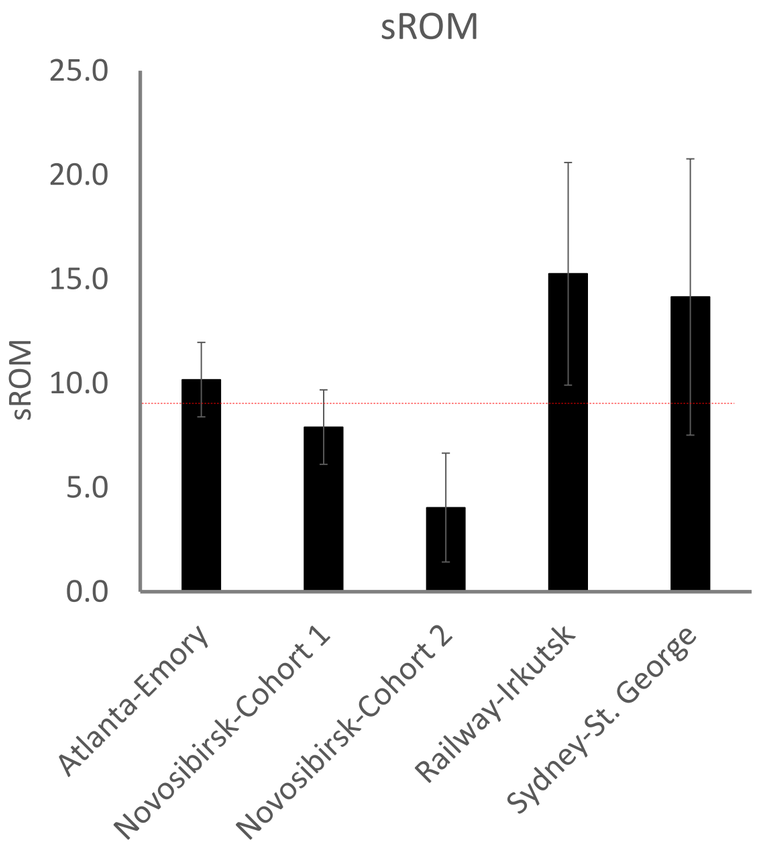
- **Machine learning** software for spinal image processing
- **Neural networking algorithm** for prediction of surgical complications

$$p = \frac{\exp\left(\beta_0 + \sum_{j=1}^{N} \beta_j x_j\right)}{\exp\left(\beta_0 + \sum_{j=1}^{N} \beta_j x_j\right) + 1}$$


Correct Classifications
Reherniations
No-Reherniation
% Correct Classification
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Atlanta-Emory
Novosibirsk-Cohort 1
Novosibirsk-Cohort 2
Railway-Irkutsk
Sydney-St. George
All Institutions


DHI
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
DHI
Atlanta-Emory
Novosibirsk-Cohort 1
Novosibirsk-Cohort 2
Railway-Irkutsk
Sydney-St. George


BMI
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
BMI
Atlanta-Emory
Novosibirsk-Cohort 1
Novosibirsk-Cohort 2
Railway-Irkutsk
Sydney-St. George


sROM
25.0
20.0
15.0
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5.0
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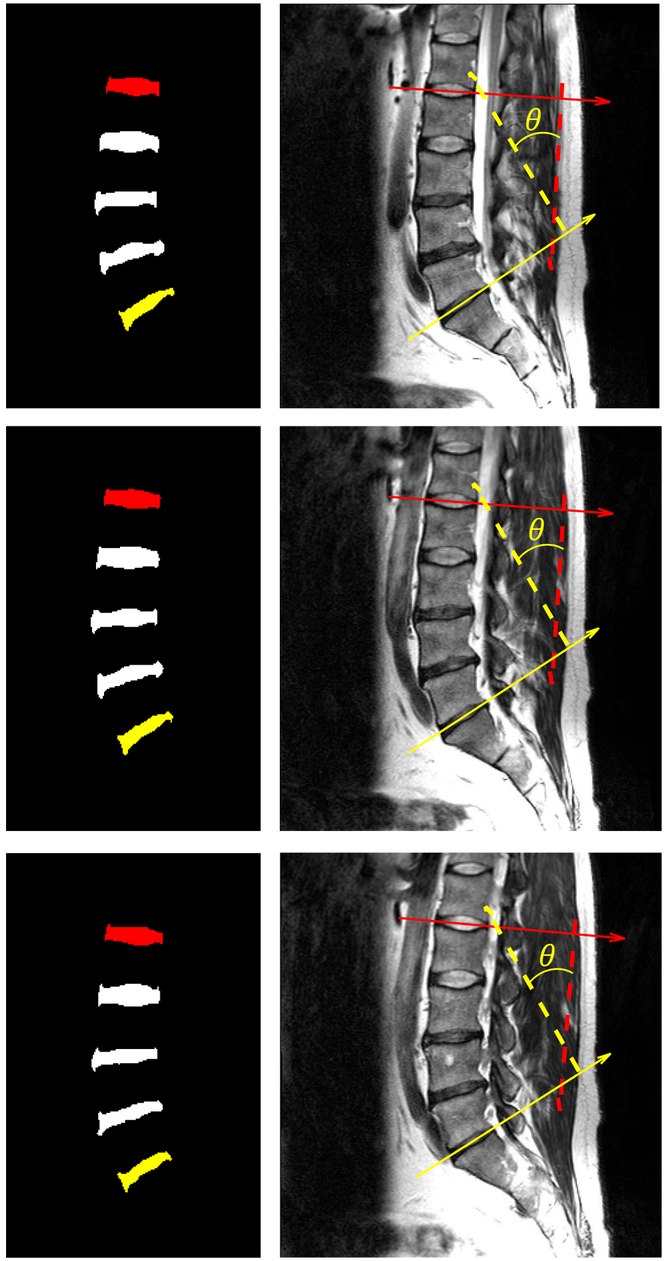
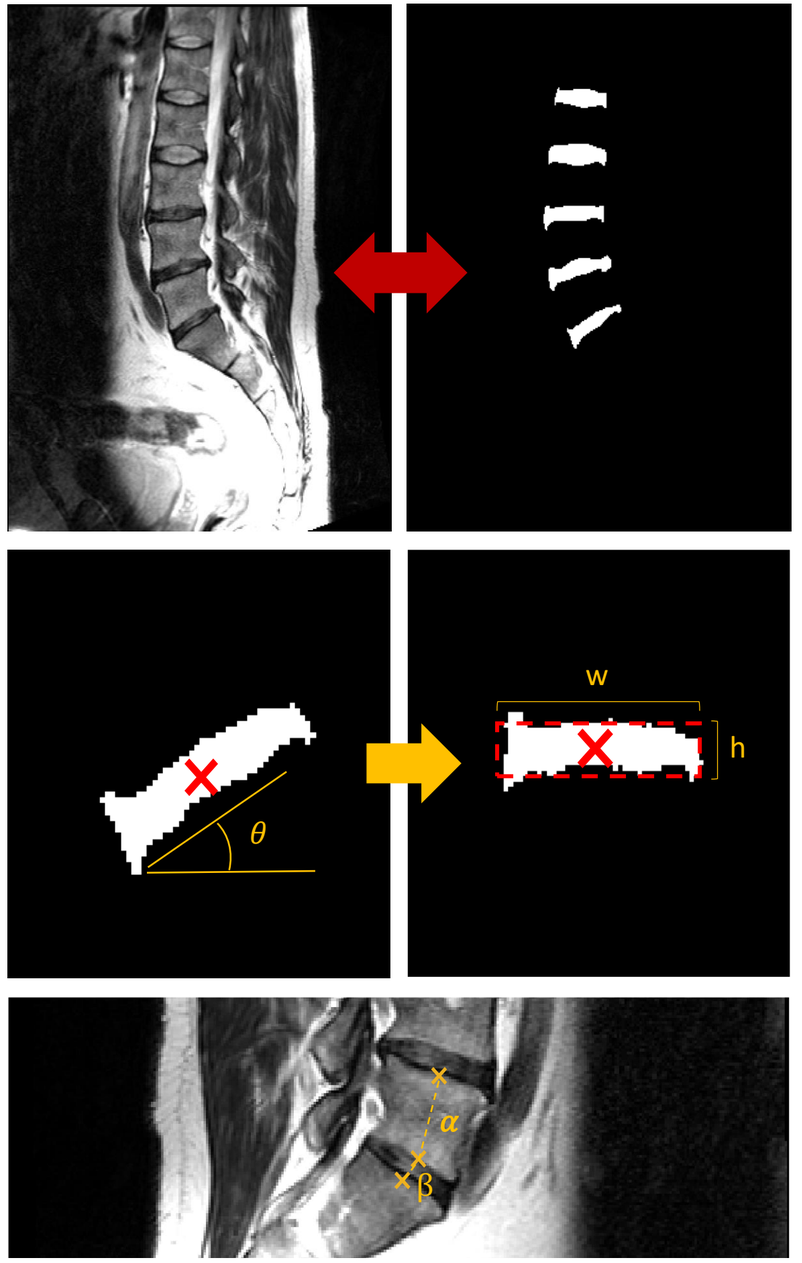
sROM
Atlanta-Emory
Novosibirsk-Cohort 1
Novosibirsk-Cohort 2
Railway-Irkutsk
Sydney-St. George

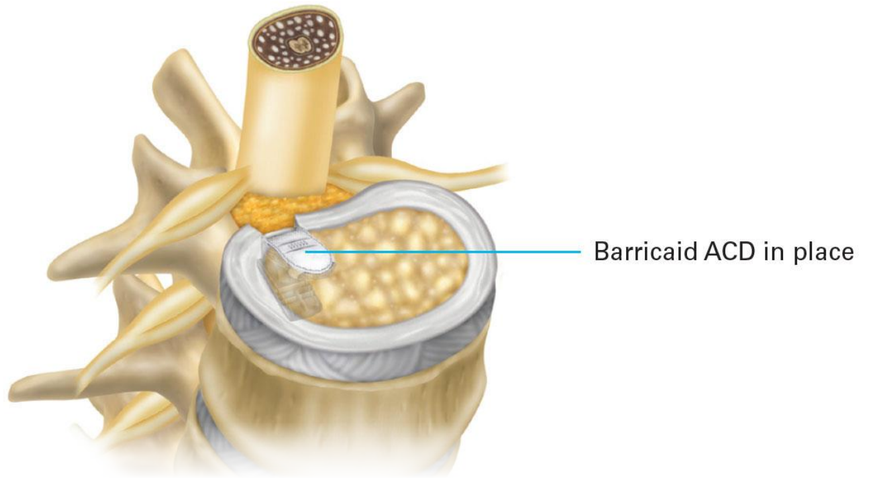
Methods: Automated Image Processing





Market Landscape

Clinical Decision Support



- Current competition for this software is the **surgeon's "best guess"** as to which surgery will be most successful based on risk factors for reherniation. [4-6]
- Market is embracing the use of **surgical planning software** – most major spine device companies are currently pursing addition of software to their product portfolio. [8-10]
- **Annular Closure Devices** are sometimes used if reherniations are suspected. [7]

Patients

Better weigh risks & reduce likelihood of costly (and painful) complications.

Hospitals

Reduce risk of surgical re-admittance & associated costs.

Insurance Companies

Provide additional validation of patient treatment plan efficacy.

Surgeons

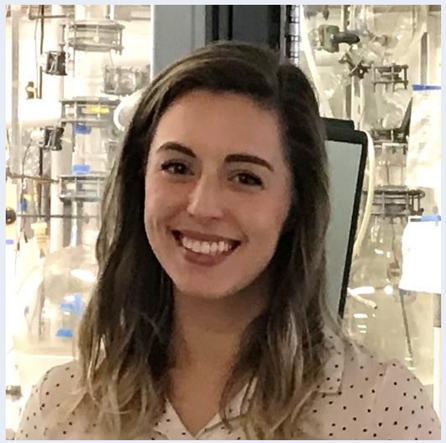
Increase likelihood of successful outcomes for their patients.

Informed Surgical Choice

The Team-
Biomedical Engineers

Morgan Giers
CTO

Charla Triplett
CEO



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