


# ROBOTIC SPINE SURGERY

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# ROBOTIC SPINE SURGERY

- No Disclosures - Hopefully in the future I will




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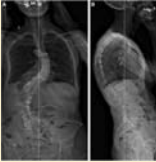

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# SPINE SURGERY CHALLENGES

- Patient Expectations
  - Safe
  - Successful
  - Definitive
- Human Factor
  - Misplaced Screws
  - 0.8 to 2% chance of nerve damage
- Clinical Challenges
  - Anatomical challenges (deformities, revisions)
  - Minimally Invasive - Field of View
- Occupational Risk
  - Increased risk of cancer
  - Increased incidence of cancer - orthopedic surgeons vs non radiation exposed surgeons


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# REVOLUTIONIZED SPINE SURGERY



- Navigation
  - improve patient care
- Enhance Surgeon Capabilities
  - precision
- Overcome Clinical Challenges
  - Anatomical Variants
  - Increase Occupational Variants
  - Less Radiation




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# ROBOTIC SPINE SURGERY




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# ROBOTIC SPINE SURGERY



- Open
- MIS
- Percutaneous
- Instrumentation
  - Pedicle screws
  - Translaminar facet screws
  - Transfacet Screws
  - Sacroiliac Screws
- Oncology
  - Biopsies
  - Tumor Resection
- Cement Augmentation
  - Kyphoplasties
  - Vertebroplasty
- Revision Surgery




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## POTENTIAL BENEFITS - ROBOTICS

- Planning of Pedicle Screws
- Preoperative Planning vs Intraoperative planning
- Eliminating Human Error
- Learning Curve
  - Faster learning curve than navigation alone
- Less Radiation
- Surgeon, Patient, OR Staff


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## ROBOTIC SPINE SURGERY

- Mazor X - previous renaissance/Spine Assist - spine only
- TransEnterix - SurgiBot and ALF-X - laparoscopic procedures and spine
- Globus Excelsius GPS
  - KB Medical - AQRate Robotic Assisted Spinal Surgery - (not approved in the US) - Spine only
- Medtech ROSA - spine and neurosurgical procedures
- Intuitive Surgical - da Vinci robotics - laparoscopic and spine




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## ROBOTIC SPINE SURGERY

Mazor X - Mazor



Excelsius GPS - Globus



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## MAZOR - RENAISSANCE



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## ROBOTIC SPINE SURGERY -

- Robotic guidance - (Mazor)
  - Navigational assistance (if used with the O arm)
- Robotic and Navigational Guidance - (Globus)

Planning

- Preoperative CT
  - CT to Fluoro
- Intraoperative CT
  - Scan and Plan
- Open and Closed system



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# WORKFLOW

- Preoperative CT scan
- Preoperative Planning
- Mazor X Align Planning Software
- Drill/Tap/Screws
- Facetectomies/Decompressions
- PCO's
- +/- TLIFs
- Corrective Procedures




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# PLANNING - ROBOTIC SPINE

Preoperative Plan with CT scan -  
"CT to Fluoro"



Intraoperative CT scan  
O ARM  
"Scan and Plan"




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# PLANNING -

## Preoperative

- CT to Fluoro
- Higher quality CT scan
- Deformity Cases
- Shorter OR time
- Less anesthesia

## Intraoperative

- Scan and Plan
- shorter cases
  - 1 or 2 level cases
- Trauma setting
- Disadvantages
  - unable to plan at once, if longer construct
  - longer anesthesia in deformity cases
  - unable to see global alignment
  - lesser quality ct scan




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# MAZOR X ALIGN SOFTWARE

- Scoliosis Film
- Preoperative CT scan 1mm Cuts
- Flexibility Index
- Prediction of Correction - Interbody grafts/osteotomies, etc.
- Global alignment



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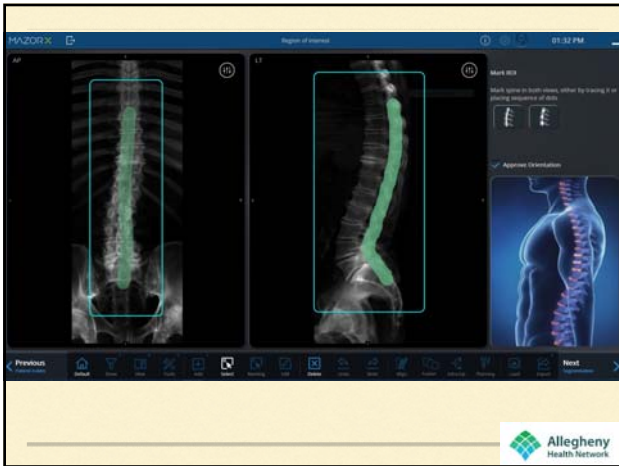
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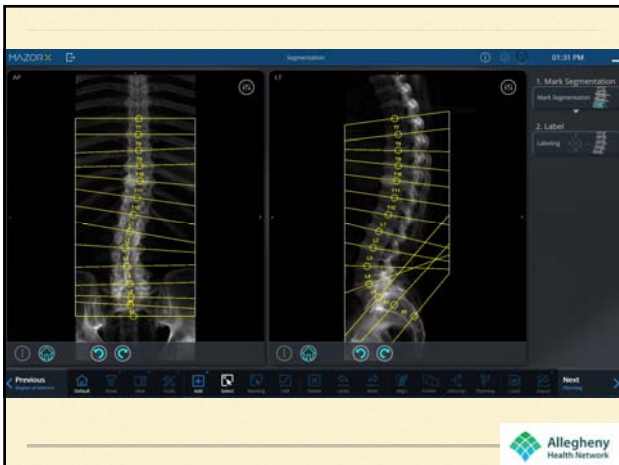
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## POINTS OF ATTACHMENT

- Multiple Attachments - Mazor
  - Spinous Process Clamp
  - Right PSIS docking for Robotic Arm
  - Posterior Superior Iliac Spine (Scan and Plan)
  - Docking point - Mazor Right PSIS
    - Medtronic Reference Frame into Left PSIS
  - Future: 1 docking station on the PSIS for the robotic arm and the Medtronic Reference frame
- Globus - floor mounted system, no attachments to the patient





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## PROCEDURE

- Begin Pedicle Screw Placement
- Select Level
- Robotic Arm Moves into position
- Small Incision - through fascial layer
- Dock the inserter on bone



A photograph showing a person in blue scrubs and a white cap operating a robotic arm. The person is holding a green and white instrument. The background shows a surgical room with a monitor and other equipment. The Allegheny Health Network logo is in the bottom right corner.

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# PROCEDURE

- Drill to 30 mm into the pedicle
- Place K wire into the pedicle
- Remove the dilator that is docked on the bone
- Repeat at all levels
- Screws placed over the K wire



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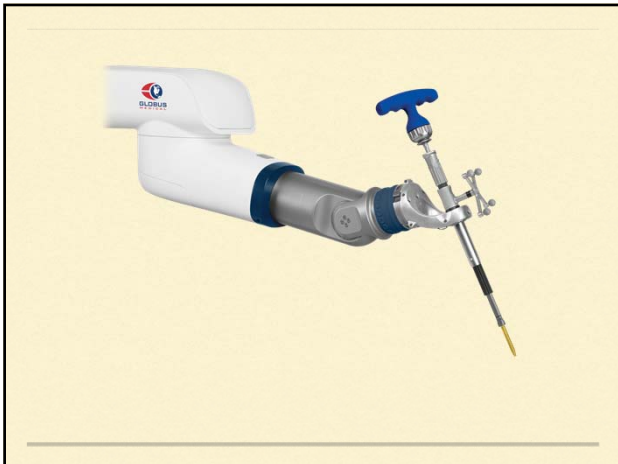
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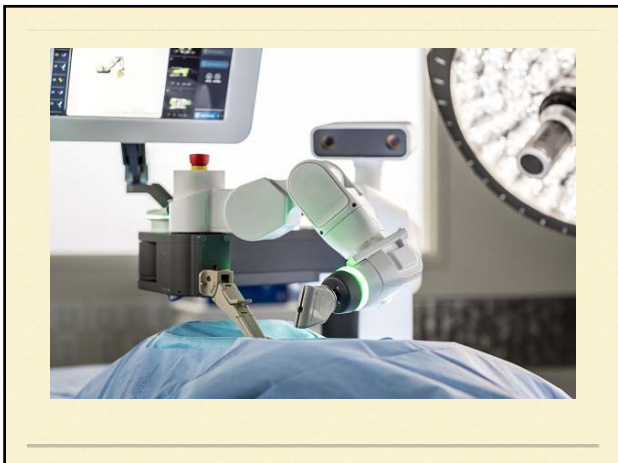
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# WHY NOT JUST USE NAVIGATION?

- Repeatability
  - Drill, Kwire, tap, screw
- Stability
- Navigation
  - Alignment alone
- Robotics
  - Mazor - Segmentatation



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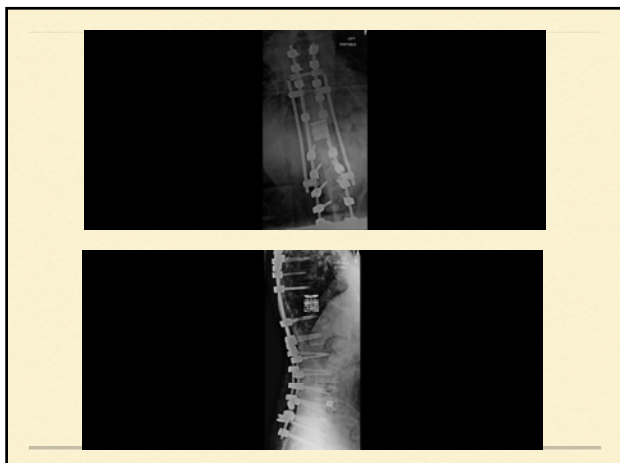
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## ROBOTIC SPINE SURGERY - WHATS NOW AND NEXT?

- Open and Closed systems
  - K wireless systems
- Premade Rods
- Navigation and Robotic - one system
- Preoperative Software
  - Prediction of Correction



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## NULLI SECUNDUS



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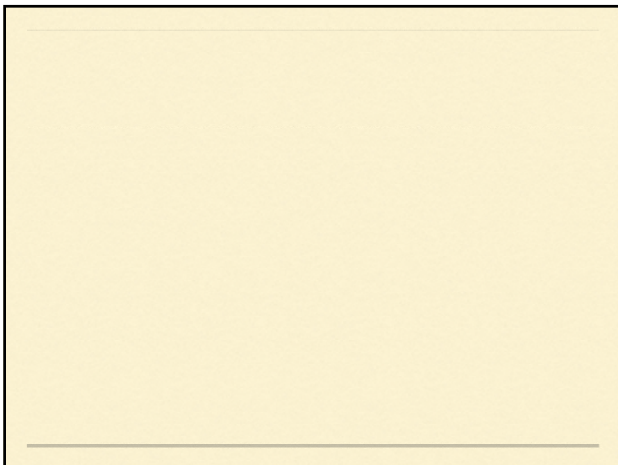
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