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# Prosthetic Rib Wound Complication Risk Stratification

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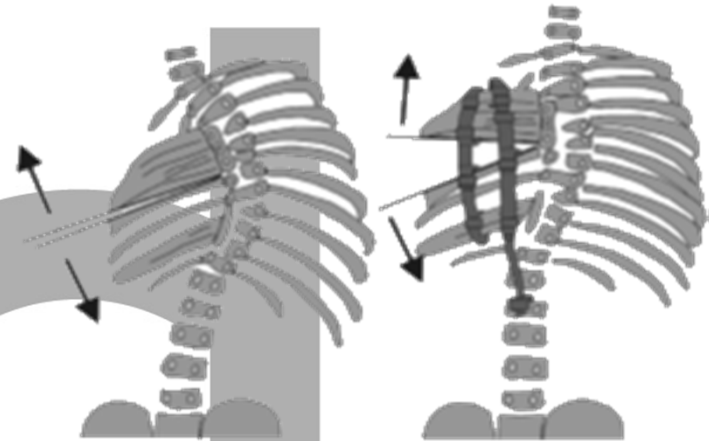
# Prosthetic Rib

## Mechanism:

- Devices are attached vertically to proximal and distal ribs.
  - Sometimes with pelvis or spinal fixation
- Devices are expanded every 6-9 months until skeletal maturity.
- Device removal and spine fusion once skeletal maturity is reached

## Effects:

- Separates ribs
- Straightens the spine via torque applied through ribs.
- Increases thoracic volume



# Prosthetic Rib Implant Wound

## Complications

- Prosthetic Rib treatment has a significant wound complication rate, on average 22% per patient, and 3% per surgery.
  - Growing Rod Construct infection rate: 18.4% per patient
- Prosthetic Rib implantation have a higher infection rate per operation than other Prosthetic Rib procedures.



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# Effects of Wound Complications

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- **Increased reoperations**
- **Longer hospitalization**
  - **Physiological effects: Due to re-hospitalization and operations.**
- **Increased costs: \$12,500+ per spine surgery complications.**



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# Study Design

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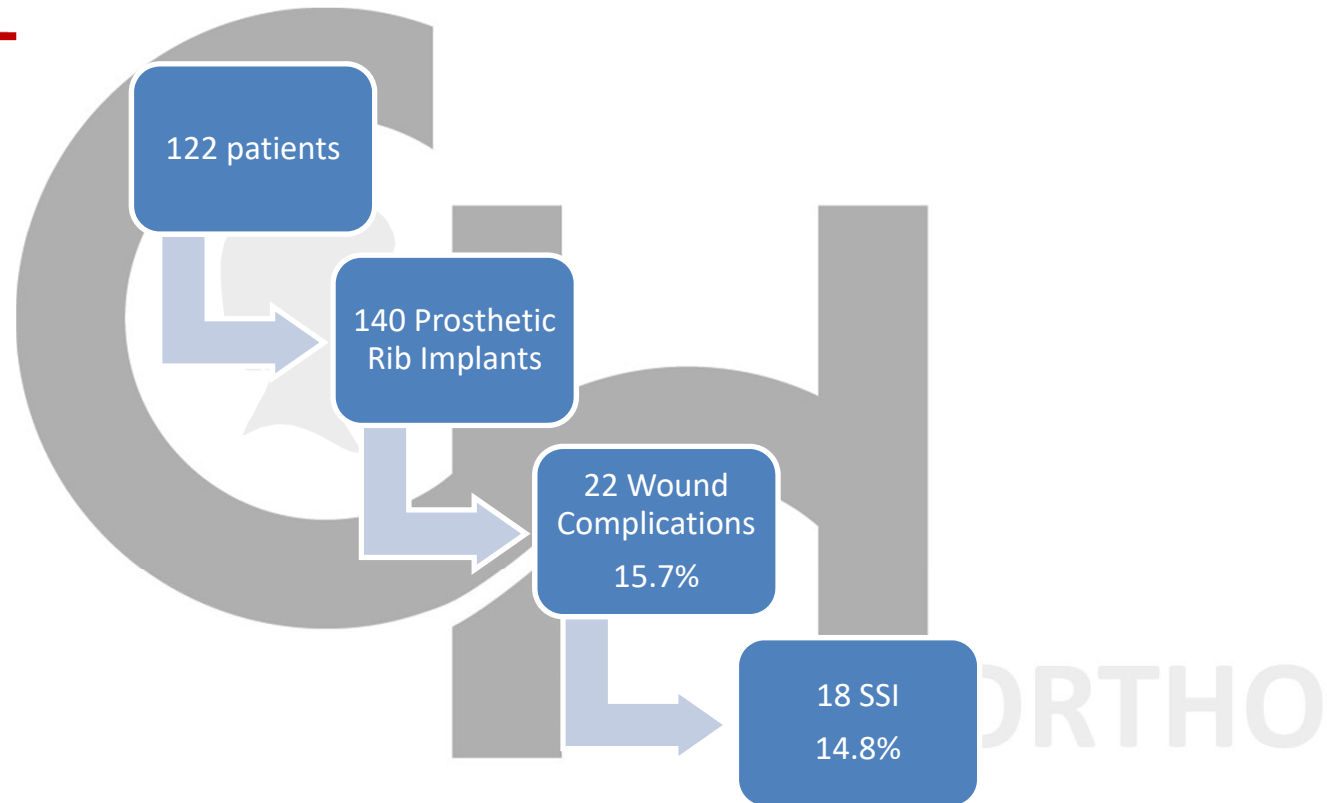
- **Single-center retrospective analysis of prospective institutional safety registry queried from Jan. 2011 to Sept. 2015**
- **Restricted to only Prosthetic Rib implant procedures.**
- **Outcome variable: wound complications resulting in re-operation.**
- **Inclusion in multivariate analysis dependent on significance ( $p < 0.1$ ) in univariate analysis.**

# Patient Descriptive

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- **122 Patients**
- **Mean age: 5 years, 2 months**
- **54.3% Males 45.7% Female**
- **60.7% Caucasian, 15.7% African American, 3.6% Asian, 20% Other**
  - 15% Hispanic
- **62.9% Neuromuscular/Syndromic etiology**

# Results



# Statistical Analysis

## Univariate Analysis

1. Male gender
2. Diapered patient with lower back incision
3. Bilateral procedure
4. More than 3 incisions
5. Left iliac incision
6. Right iliac incision
7. Patient age  $\leq 4$
8. Operative time  $> 150$  mins
9. Hospital length of stay

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## Multivariate Analysis

1. Patient age  $\leq 4$ , OR= 4.9 (1.5-15.4); p value 0.007
2. Male gender, OR= 3.0 (1.0-9.1); p = 0.05
3. Lower Back Incision & Diapers, OR= 2.9 (.76-11.64); p value 0.11
4. Bilateral procedure, OR= 8.5 (2.0-36.3); p = 0.004



# Parameters Investigated

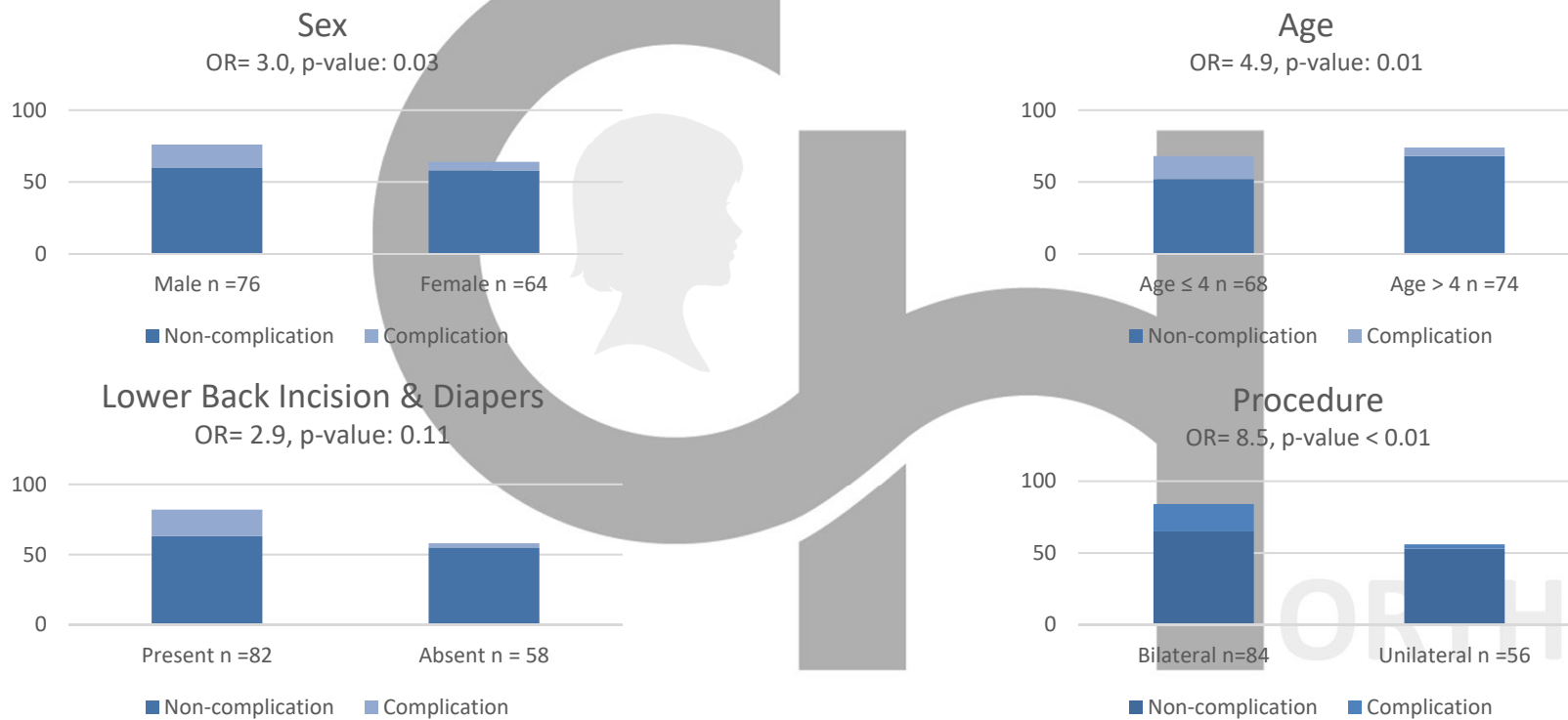
## Significant

1. Patient age
2. Male gender
3. Iliac incision with diaper use
4. Bilateral procedure

## Non-significant

- |   |   |
|---|---|
| 1. Race                                   | 20. BMI < 15                              |
| 2. Ethnicity                              | 21. BMI < 15 and non-ambulatory status    |
| 3. International Patient                  | 22. BMI > 30                              |
| 4. Non-English speaking parents           | 23. ASA Classification                    |
| 5. Neuromuscular or Syndromic Etiology    | 24. Low Weight (<5 percentile for age)    |
| 6. Cobb Angle                             | 25. Failure to Thrive Diagnosis           |
| 7. Developmental Delay                    | 26. Neuromuscular etiology and Low Weight |
| 8. Developmental Delay and Non-ambulatory | 27. G-Tube feeding                        |
| 9. Developmental Delay with diaper use    | 28. G-tube and Tracheostomy present       |
| 10. Hospital Length of Stay               | 29. Number of incisions                   |
| 11. PICU stay and length                  | 30. Left iliac incision                   |
| 12. Instrument Uncover to incision time   | 31. Right iliac incision                  |
| 13. Instrument Uncover to closure time    | 32. Midline Spine Incision                |
| 14. Tracheostomy present                  | 33. Operative Time                        |
| 15. Tracheostomy with upper back incision | 34. Current MRSA colonization             |
| 16. Neurogenic Bladder                    | 35. MRSA colonization and Low weight      |
| 17. Diapered Patient                      | 36. MRSA History                          |
| 18. Non-ambulatory Status                 | 37. Previous SSI                          |
| 19. Non-ambulatory with Diaper use        | 38. Previous SSI within a year            |

# Predictive Risk Factors



# Potential Implications:

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- **Patient age has been demonstrated as a risk factor for increased complications in multiple Prosthetic Rib specific studies.**
  - Special precautions should be taken with infants.
- **Similarly, pelvic fixation and incontinence have both independently been associated with spine surgery complications.**
  - Wound monitoring in diapered patients with incisions over the iliac region should be increased.
- **The use of more aggressive prophylactic treatment may be warranted in patients with multiple risk factors.**

# Conclusion

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- We present a wound complication risk stratification model for Prosthetic Rib implant surgery.
- Multiple pre- and intra-operative factors were found to be predictive of postsurgical wound complication.
- This tool can improve patient counseling and assist in identifying high risk patients in need of additional prophylaxis and post-op monitoring.

# References

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