Bed Rest

*Truth and Consequences*

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Johns Hopkins University
no relevant disclosures
MICU Admission Orders

• Admit to MICU
• Diagnosis: _______
• Condition: Critical
• Allergies: _______
• Activity: Bed rest
• ....
Bed Rest

“In every movement of the body, whenever one begins to endure pain, it will be relieved by rest.”

Hippocrates
460-377 BC
Sleep

- Refreshes, renews, regenerates
- Essential for health, life
- Bed rest
Beneficial Effects of Bed Rest?

- Conserve energy for healing and recovery
- Conserve oxygen for vital organs
- Reduce minute ventilation ($\downarrow$VILI)
- Reduce FiO$_2$ ($\downarrow$O$_2$-toxicity)
- Improve CNS blood flow
- Reduce cardiac stress, ischemia
- Reduce pain
- Prevent tubes from coming out
- Prevent falls
Indications for Bed Rest?

- Preeclampsia
- Multiple pregnancy
- Myocardial infarction
- Rheumatoid arthritis
- Acute low back pain
- Lumbar puncture/spinal anesthesia
- Dilated cardiomyopathy

- Threatened abortion
- Pulmonary tuberculosis
- Common cold
- Strep pharyngitis
- Ascites
- Gout
- Chronic venous insufficiency
- Diphtheria
## Trials of “Early Mobilization” After Uncomplicated Myocardial Infarction

<table>
<thead>
<tr>
<th>Journal</th>
<th>Publication Date</th>
<th>Early</th>
<th>Late</th>
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<tbody>
<tr>
<td>BMJ</td>
<td>1973</td>
<td>10</td>
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<td>Lancet</td>
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<td>7</td>
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<td>NEJM</td>
<td>1975</td>
<td>6</td>
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<td>BHJ</td>
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RCT of Bed Rest for Rheumatoid Arthritis

<table>
<thead>
<tr>
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<th>Bed Rest vs Activity</th>
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<tbody>
<tr>
<td>Swollen joints</td>
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</tr>
<tr>
<td>Tender joints</td>
<td>No difference</td>
</tr>
<tr>
<td>Grip strength</td>
<td>No difference</td>
</tr>
<tr>
<td>Walking time</td>
<td>No difference</td>
</tr>
<tr>
<td>Range of motion</td>
<td>No difference</td>
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<tr>
<td>ESR</td>
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</table>

Bed Rest for Acute Low Back Pain

RCT – 186 patients (no sciatica)

3 Study Groups

- Bed rest (2 days)
- Back exercises
- Activity as tolerated

Bed Rest Therapy for Tuberculosis

Sanitarium Treatment

- Fresh air
- Nutrition
- Bed rest
Effects of Bed Rest in Tuberculosis

RCT Bed Rest vs Ad Lib Activity

- OR for cavity closure: 0.70 (0.25 - 1.9)
- OR for sputum clearance: 0.36 (0 - 1.4)
- Time to return to work: 180%

Wynn-Williams et al. Tubercle 1960; 41:353-7
Indications for Bed Rest?

- Preeclampsia
- Multiple pregnancy
- Myocardial infarction
- Rheumatoid arthritis
- Acute low back pain
- Lumbar puncture/spinal anesthesia
- Dilated cardiomyopathy
- Threatened abortion
- Pulmonary tuberculosis
- Common cold
- Strep pharyngitis
- Ascites
- Gout
- Chronic venous insufficiency
- Diphtheria

Allen et al. Lancet 1999; 354: 1229-33
Effects of Bed Rest on Lean Muscle Mass

Fernando et al. Curr Opin Clin Nutr Metab Care 2006; 9:410-415
Effects of Bed Rest and Cortisol on Lean Muscle Mass

Fernando et al. Curr Opin Clin Nutr Metab Care 2006; 9:410-415
Complications of Bed Rest

04Jan09

05Jan09
Bed Rest Causes Insulin Resistance


**Glucose Load**

![Graph showing changes in insulin and glucose levels with and without bed rest](image)
Bed Rest - Consequences

- Atrophy, weakness
- Oxidative stress
- Insulin resistance ... hyperglycemia, catabolism
- Muscle-derived IL-6 ... inflammation
- Regulation of microcirculation
- Contractures
- Thromboembolic disease
- Atelectasis
- Pressure ulcers
MICU Admission Orders

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- Activity: Bed rest As tolerated
- ....
MICU Admission Orders

- Admit to MICU
- Diagnosis: _______
- Condition: Critical
- Allergies: _______
- Activity: Bed rest As tolerated
- Sedation
Reducing Consequences of Bed Rest
Physical Medicine

- Passive stretching
- Roll
- Shift weight
- Lift arms
- Resistance exercise
- Edge of bed, sit
- Out of bed, lift legs, sit in chair
- Walk
Thank You
Bed Rest

- noun

- a prolonged rest in bed, as in the treatment of an illness
Insulin Resistance Hyperglycemia
Muscle Atrophy
Altered Microcirculation
Inflammation
Atelectasis
Thromboembolic Disease
Anti-inflammatory Effects of Exercise

Peterson and Pederson, J App Phys, 2005
Bed Rest Impairs Microcirculation Responses

Hamburg et al
Arteriosclerosis, Thrombosis, and Vascular Biology. 2007;27:2650
"WE HAVE MET THE ENEMY AND HE IS US."

...Pogo
Insulin Resistance
Hyperglycemia
Disuse Atrophy
Altered Microcirculation
Inflammation
Atelectasis
Thromboembolic Disease
ICU-Acquired Weakness
Bed Rest with Head of Bed Elevated Increases Pressure on the Low Back

The heel is the healthiest part of a loaf of bread.
Ethyl carbamate (carcinogen)
3-8 fold higher concentration in the heel

Contractures (herridge re most common c/o ambulation)
Effects of Modest Levels of Exercise

- Griffiths passive stretching of muscle in critically ill !!!
- Bamman JAP resistance exercise reduces skeletal muscle sarcopenia and myosin isoform distribution
- Malkoc chest physiotherapy reduced los
- Trappe JAP modest exercise for muscle testing prevented …
Lower Lobe Atelectasis in Supine Position
# Bed Rest for Acute Low Back Pain

## 12 Week Follow-up

<table>
<thead>
<tr>
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<th>Bed Rest</th>
<th>Exercises</th>
<th>Ad Lib</th>
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<tbody>
<tr>
<td>No. sick days</td>
<td>9.2</td>
<td>7.2</td>
<td>4.7</td>
</tr>
<tr>
<td>Intensity of pain</td>
<td>2.1</td>
<td>1.8</td>
<td>1.3</td>
</tr>
<tr>
<td>Pain radiating (%)</td>
<td>14</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Can walk (%)</td>
<td>88</td>
<td>89</td>
<td>90</td>
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<tr>
<td>Health QOL Index</td>
<td>0.93</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>Health costs</td>
<td>234</td>
<td>397</td>
<td>168</td>
</tr>
</tbody>
</table>

Lower Lobe Atelectasis

Hypoxemia
VILI
Difficult Weaning
RCT of Bed Rest for Rheumatoid Arthritis


Figure 1. Changes in Range-of-Motion Scores during the Study.
Acute Low Back Pain
Bed rest: a potentially harmful treatment needing more careful evaluation

Allen et al. Lancet
1999; 354: 1229-33
Anti-inflammatory Effects of Exercise

“Hindlimb unloading increases oxidative stress and disrupts antioxidant capacity in skeletal muscle”

Lawler. Free Radical Biology and Medicine 2003; 35:9-16
“Hindlimb unloading increases oxidative stress and disrupts antioxidant capacity in skeletal muscle”

Lawler. Free Radical Biology and Medicine 2003; 35:9-16
Immobilization and Inflammation
Synergistic Effects on Skeletal Muscle

Fink  Crit Care Med 2008; 36:910-916
Bed Rest and Muscle Strength

Belgian Centre for Comic Strip Art
Anti-inflammatory Effects of Exercise

Peterson and Pederson, J App Phys, 2005
Anti-inflammatory Effects of Exercise

Peterson and Pederson, J App Phys, 2005
Bed Rest Causes Atrophy and Weakness

Immobilization Causes Anabolic Resistance

Consequences of Bed Rest

- Rationale for bed rest
- Clinical studies of bed rest
- Complications of bed rest