nauts

& Pregnancy Bed Rest

What NASA is teaching us about inactivity...
Question: What do astronauts and pregnant women on bed rest have in common? Answer: A lot, particularly the same symptoms.

Does the body change when it's in a "weightless" state such as space or on bed rest? Are these changes temporary or longer lasting? How does weightlessness affect a person's mental health? Can exercise mitigate these changes? In the early 1940s, NASA and other aerospace scientists believed that the long-term effects of space flight would be similar to those seen during and after bed rest. Acting on that hunch, they began to put people on bed rest in order to study the potential effects of weightlessness in space. After decades of research, they found that bed rest causes numerous changes that occur in every system in the body (Fortney, Schneider, & Greenleaf, 1996; Rubin, 1988; Sandler & Vernikos, 1986). Their work began influencing health care starting in the 1950s, and the science that subsequently developed became the rationale for encouraging patients to get out of bed and walk around, particularly after events such as surgery.

Effects of Bed Rest

When a person spends a prolonged period of time in bed, the body begins to adapt to this new horizontal state and the changes occur rapidly (see Table 1). Body fluids shift from the feet toward the head much in the same way fluids shift in a bottle when it's turned on its side (Rubin, 1988). As a result,

- Diuresis occurs within the first 24 hours in an attempt to rid the body of excess fluids in the chest and head
- Baroreceptors in the chest that help regulate blood pressure due to alterations in posture are no longer stimulated, resulting in orthostatic hypotension when the person changes from a supine to an upright position
- Decreased pressure on the muscles and bones results in muscle weakness, atrophy and bone loss, especially in the weight-bearing muscles of the legs and back, beginning within 24 to 48 hours
- The body's loss in postural cues also stimulates changes in circadian rhythms. This results in abnormal sleep patterns during immobility, which leads to fatigue even though the person appears to be "resting."

Aerospace researchers have observed many of these changes in astronauts. During both space flight and long periods of bed rest, a person's entire musculoskeletal and cardiovascular system becomes deconditioned (Fortney et al., 1996; Rubin, 1988). Lack of weight bearing and inactivity make muscles weak. Dizziness, difficulty regulating blood pressure, and fainting are common. For example, one astronaut promptly passed out when he stood up for the first time upon returning to Earth after a two-week flight. His blood pressure was unable to quickly adapt to the change in position.

Aerospace researchers, working with both people on bed rest and astronauts, have experimented to prevent muscle atrophy. Exercise is believed to maintain muscle mass and prevent atrophy. However, astronaut Shannon Lucid exercised on a bicycle or treadmill for several hours each day while on the space station Mir for several months yet she still exhibited signs of muscle weakness and atrophy upon return to Earth. NASA still doesn't know whether exercise will prevent the effects of being in space or on bed rest on muscle and bone (Fortney et al., 1996; Sandler & Vernikos, 1986).

Aerospace scientists have also found that both bed rest and space flight can alter a person's psychological state (Fortney

Table 1.

<table>
<thead>
<tr>
<th>Side Effects of Antepartum Bed Rest and Postpartum Recovery</th>
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<tr>
<td><strong>During Bed Rest</strong></td>
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<tr>
<td>Muscle loss</td>
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<tr>
<td>Aching muscles, especially back</td>
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<td>Weight loss</td>
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<td>Dizziness</td>
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<td>Indigestion</td>
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<td>Loss of appetite</td>
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<td>Physical deconditioning</td>
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<td>Shortness of breath on exertion</td>
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<td>Difficulty concentrating</td>
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<td>Increased stress</td>
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<td>Depression</td>
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<td>Sleep changes</td>
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<tr>
<td>Boredom</td>
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<tr>
<td>Worry about other children</td>
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<tr>
<td>Stress from family separation</td>
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<tr>
<td>Fatigue</td>
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<tr>
<td>Increased family stress</td>
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<tr>
<td><strong>During Recovery</strong></td>
</tr>
<tr>
<td>Muscle weakness</td>
</tr>
<tr>
<td>Backache</td>
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<tr>
<td>Deep muscle soreness</td>
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<tr>
<td>Shortness of breath</td>
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<tr>
<td>Dizziness</td>
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<tr>
<td>Decreased stamina</td>
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<tr>
<td>Delay in resuming usual activities</td>
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<tr>
<td>Difficulty concentrating</td>
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<tr>
<td>Feeling overwhelmed</td>
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<tr>
<td>Swollen or sore feet</td>
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<tr>
<td>Feelings of loss</td>
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<tr>
<td>Fatigue</td>
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<tr>
<td>Loneliness</td>
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Box 1.

On the Sidelines

Women on bed rest often feel as though they’ve been “sidelined.” A national support group, Sidelines, is available to provide resources and support, including a helpful bedside checklist that can be used to discuss the range of activities a woman on bed rest may be able to participate in or what must be excluded. They have a helpful magazine called *Left Sidelines*. Contact:

Sidelines
2805 Park Place
Laguna Beach, CA 92651
(949) 491-2265
www.sidelines.org

et al., 1996; Rubin, 1988; Sandler & Vernikos, 1986). Working in space, astronauts are busy at a variety of tasks; however, their environment is very different from everyday life on Earth. There’s an estrangement from all that is familiar, separation from friends, family & society at large, and even though astronauts typically are working side-by-side with colleagues, reports of feeling confined and isolated are common (Sandler & Vernikos, 1986). There’s also a hunger for the types of typical stimuli we take for granted on Earth: they can’t go outside, feel the sun, the wind or the cold or hear the usual sounds of everyday life. As a result, these individuals may experience a type of sensory deprivation and symptoms of depression. It has been hypothesized that being on pregnancy bed rest may be similar in many ways to being in space.

Bed Rest vs. Space

Approximately 700,000 women per year in the U.S. are prescribed pregnancy bed rest (Goldenberg et al., 1994). Pregnancy brings on a new physiological state, so it was natural to question whether pregnant women on bed rest would experience the same side effects of inactivity identified in aerospace research. Nurses have conducted studies on the side effects of pregnancy bed rest (Gupton, Heaman, & Ashcroft, 1997; Heaman, 1992; Maloni et al., 1993; Schroeder, 1996), and their work is creating an evidence base for state-of-the-science information to guide perinatal nursing care. Nursing researchers found that pregnant women on bed rest have effects that are very similar to those experienced by astronauts when in space. Pregnant women on bed rest experience

- loss of muscle strength, particularly in the legs and back (Maloni et al., 1993)
- dizziness when they first get out of bed
- weight loss or slow weight gain, headache (even when not on tocolytics), indigestion, depression and boredom (Heaman, 1992; Maloni et al., 1993)
- increased stress and a sense of isolation (Gupton et al., 1997; Schroeder, 1996)
- major stress due to separation from their family in the home, particularly any children (Maloni, 1993; Maloni & Kutl, 2000)

Postpartum recovery is both longer and different from women who had not been on bed rest (Maloni et al., 1993; Maloni & Schneider, 2002). The more time a person spends in bed, the longer it takes to recover (Fortney et al., 1996; Maloni et al., 1993). Symptoms commonly reported by postpartum women include,

- leg and back muscle weakness
- difficulty negotiating stairs, stepping off curbs, getting out of a chair or leaning over a changing table or crib

These symptoms, along with backache and deep muscle soreness, are due to muscle weakness and delayed recovery from atrophy. Other symptoms include shortness of breath and dizziness upon exertion, a lingering depression and difficulty concentrating.

Supporting Women at Rest

Nurses have a variety of options for helping women on bed rest (Maloni, 1998). If the woman is on bed rest in a hospital setting, nurses can provide weekly opportunities for women to interact with others in the same situation (Maloni & Kutl, 2000). Also, women can be referred to Sidelines, a national high-risk pregnancy support group that provides information and telephone support for women on bed rest (see Box 1).

Other sources of information include the various pregnancy bed rest Web sites where women can read about bed rest, various diagnoses and common treatments and suggestions for things to do while on bed rest. There are also some excellent books on pregnancy bed rest, most of which are paperback, that can help women learn how to help themselves (Table 2). One of the most comprehensive books available is from Amy Tracy, a woman who was actually on bed rest. Another useful book is Eakin’s consumer’s guide to obstetric care, which provides summaries regarding research in pregnancy, pregnancy complications and the common treatments that a pregnant woman might receive (see Bookshef). Women then can make quality decisions regarding their health care based on the most current information and data. Nurses can create hospital lending libraries to provide these books to women.

Lying in bed for long periods of time creates muscle and joint pains and reinforces dependency. Nurses can help women create a “mission control on an eggcrate” (Maloni, 1998).
which consists of creating a fingertip environment that allows a woman to have everything she needs to keep her comfortable or entertained within her reach. This means having lots of tables or stacking drawers around the bed for reachable storage. Not having to ask for things will help women on bed rest feel less dependent and more in control. An egg crate mattress can keep a woman more comfortable as joint and muscle pains develop.

For women who are on bed rest at home, the place where they decide to be at rest needs to be near

- the bathroom
- a phone
- a television and other entertainment sources
- a window

Ironing boards and milk crates make great makeshift tables; a cooler can be placed near the bed or resting place for storing meals, snacks and cold drinks. It's also important to provide women with the following tips for coping with bed rest:

- If indigestion occurs, eat small frequent meals, use antacids approved by the doctor, and raise the head of the bed
- Become a telephone coordinator of helpers for the family's needs. A church or a local high school can be a source of help with babysitting, meals and completing odd jobs. Additional services for help during pregnancy and recovery may be available through state/county/city agencies and also covered by insurance. Women can contact such sources from the bedside
- Set up a daily schedule to offset boredom, such as get up at the same time of day, eat breakfast, watch TV, take a shower, read until lunch, and so on
- Fight depression with planned activity: get dressed, don't lie around in pajamas all the time, put on some makeup and fix your hair as you normally would

- Don't blame yourself if you find it hard to maintain motivation while on bed rest. Lethargy and lack of motivation are common side effects, and you may find that despite your good intentions, you do not get much done each day
- Limit daytime naps so you can sleep better at night

Recovery from bed rest doesn't occur rapidly. The more time a person spends in bed, the longer it will take to recover (Fortney et al., 1996; Sandler & Vernikos, 1996). Many women aren't fully recovered at six weeks postpartum (Maloni et al., 1993). Recovery depends on the length of bed rest and the severity of activity restriction. Thus, the woman who is allowed to spend part of her day being out of bed will recover more quickly than one who spends most of the day in bed. Ironically, it appears that the length of postpartum hospital stay is the same for women who were on antepartum bed rest as it is for women who had uncomplicated pregnancies. However, women who were previously on bed rest often receive little advice about recovery from bed rest. Unlike pregnant women who did not experience prolonged bed rest, women who were assigned to bed rest have to recover both from pregnancy and birthing and the effects of bed rest.

Providing good advice to postpartum women will help them set realistic expectations for recovery and may prevent further injury and muscle damage. Women need to resume activity somewhat slowly so that they do not fall or injure themselves or the baby. Women also need to be cautioned that they may not recover as quickly as other women. Women often think that because they have been in bed for a long time, they should feel rested. However, postpartum women are surprised to find that they are extremely fatigued and unable to quickly resume usual activities of daily living. Like astronauts, they need time to recover from the deconditioning effects of inactivity. Nurses can help women who have been on antepartum bed rest recover by:
Table 2.
Getting All the Facts

- Pregnancy Bed Rest: http://fpd.cwr.edu/Bedrest/
- Pregnancy Bed Rest: www.pregnancybedrest.com
- Sidelines: www.sidelines.org
- Moms on Bedrest: www.momsonbedrest.com
- The Triplet Connection: www.tripletconnection.org
- LaLeche League: www.lalechelagoue.org
- International Childbirth Education Association: www.icea.org
- March of Dimes: www.marchofdimes.org
- National Perinatal Association: www.nationalperinatal.org
- "Premie" Parent Support: www.preemieparentssupport.com
- Premie Parents reading room: www.preemieparents.com
- Mothers of Twins: www.montc.org

- Advising such women that they may feel overwhelmed at times and have severe fatigue but that this is normal
- Obtaining referrals for a physical therapy evaluation to identify muscles that are weak and that are in need of rehabilitation
- Advocating for a planned program of rehabilitation for musculoskeletal and cardiovascular deconditioning for women who have been on bed rest
- Suggesting that women obtain help with resuming usual activities of daily living such as childcare, cooking, laundry and house cleaning, especially during the first few weeks postpartum

Side effects of bed rest or inactivity are not limited to just astronauts and pregnant women; they occur in any individual who has to be inactive or immobile for any reason. The severity of the side effects will vary with the degree of immobility. So, for example, people who do not exercise and are “couch potatoes” find that they have mild deconditioning effects from the lack of exercise. People who experience more severe but limited immobility due to arthritis or a fracture may have only localized symptoms associated with muscle atrophy. Any person who has severely reduced activity because she or he is very ill, has been in intensive care, has been in a coma or who has paralysis will experience effects similar to those discussed.

Aerospace research on bed rest has helped health care providers to identify and treat these effects. The body adapts to immobility. NASA continues to conduct bed rest studies to determine whether various types of exercise will prevent muscle atrophy during inactivity. This information is important in determining the possible side effects of putting someone in space for a long time, for example, in a space station. NASA also needs to learn how to counteract these effects—so do health care providers. The answers emerge, the knowledge may be applicable to pregnant women who are prescribed bed rest and to other individuals with limited mobility.

References


