Lifestyle Medicine: Exercise, Diet, & Stress Management in the Transplant Setting

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Lifestyle Medicine and Transplant

- Incidence of transplant
- What is medicine?
- What is Lifestyle Medicine?
- Nutrition
- Exercise
- Sleep
- Stress
- Spirituality
- Motivation and purpose
Based on Organ Procurement and Transplantation Network (OPTN) / United Network for Organ Sharing (UNOS) data as of January 9, 2017. Data subject to change based on future data submission or correction.
What is Medicine?

The science or the practice of the diagnosis, treatment, or prevention of disease.

- Pharmaceutical and procedural
- Lifestyle
  - Nutrition
  - Exercise
  - Mindfulness
    - Meditation
    - Spirituality
  - Sleep
Why Lifestyle Medicine?

- “Today, 7 in 10 deaths in the U.S. are related to preventable diseases such as obesity, diabetes, high blood pressure, heart disease and cancer.”
- “Another striking fact is that 75% of our health care dollars are spent treating such diseases.”
- “However, only 3% of our health care dollars go toward prevention.” - American Public Health Association

Current “Health Care System” in the U.S. = “Disease Care System”
What is Lifestyle Medicine?

Lifestyle Medicine (LM) is the use of lifestyle interventions in the treatment and management of disease.

Interventions:

- nutrition
- exercise
- stress management
- smoking cessation
- a variety of other non-drug modalities
Nutrition

Healthy Food
Diet After a Transplant

- Some of the drugs you will be taking after your transplant affect the way the body processes food. This may cause patients to eat more, causing weight gain.
- Excessive weight gain increases the risk of heart disease, diabetes and high blood pressure.
- Eat a balanced diet with plenty of fruits and vegetables.
- Eat a minimum amount of salt, processed foods and snacks.
- Use herbs and spices to add flavor, instead of salt.
Watch food intake and drink plenty of water (unless advised to limit fluids).

Try to eat high-fiber foods, such as raw vegetables and fruits, which increase satiety.

Add calcium to your diet by eating calcium-rich foods, such as low-fat dairy products and green, leafy vegetables or calcium supplements.

Eat as little fat and oil as possible.

Read food labels so that you can be smart when food shopping.

Become more aware of serving sizes that are listed on food labels.
Because protein helps build muscle and tissue, which will help heal after surgery, foods high in protein, such as meat, poultry (i.e. chicken), fish, eggs, nuts (without salt) and beans are beneficial.

Select healthier condiments, such as mustard, and low-fat mayonnaise and salad dressings.

Choose healthy cooking methods. Instead of frying, try baking, grilling, broiling or steaming foods. And instead of oil, use nonstick, fat-free spray or sauces.

When dining out, try smaller portions and avoid high-fat entrees.

Don't drink alcohol or use any drugs that aren't prescribed by your physician, as these may harm your new organ. If you have a problem with drugs or alcohol, talk with your social worker, who can help arrange for counseling and other support services.
Some anti-rejection medicines are known to cause high blood sugar.

Although it is typically a temporary condition after transplantation, it is more common in patients who have a family history of diabetes and patients who are over weight.

It can be controlled by reducing the dose of a patient's anti-rejection medicines or changing medications all together.
Diabetes Mellitus after Kidney Transplantation in the United States

Nutrition

Glycemic Load (GL)

Glycemic Load Effect

Blood Sugar Levels

- High glycemic load meal
- Low glycemic load meal
- Fasting blood sugar level
- Cortisol

Hours After Meal

Glycemic Index Foundation: http://www.gisymbol.com/about/general-health/
Donut vs. Orange:
It is not necessary to avoid fruit!

- 200 calories
- 10 grams sugar
- 0 grams fiber
- 0 phytonutrients
- Glycemic load = 15

- 62 calories
- 12 grams sugar
- 3 grams fiber
- 170 phytonutrients
- Glycemic load = 4
# Nutritarian vs. Standard Diet

<table>
<thead>
<tr>
<th>Nutritarian Diet</th>
<th>Standard Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Vegetable-based</td>
<td>• Grain based</td>
</tr>
<tr>
<td>• Lots of fruit, beans, seeds, nuts</td>
<td>• Lots of dairy and meat</td>
</tr>
<tr>
<td>• Oil used sparingly</td>
<td>• Oils supply a major caloric load</td>
</tr>
<tr>
<td>• Animal products 0-3 times a week</td>
<td>• Animal products 2-4 times a day</td>
</tr>
<tr>
<td>• Focused on nutrient-dense calories</td>
<td>• Focused on nutrient-poor calories</td>
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</tbody>
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### Diabetes Research Study Summary

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>HND diet</th>
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</thead>
<tbody>
<tr>
<td>Participants taking Diabetes medication</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>BMI</td>
<td>34.4</td>
<td>26.8</td>
</tr>
<tr>
<td>HbA1C</td>
<td>8.15%</td>
<td>5.80%</td>
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<tr>
<td>Systolic blood pressure (mmHg)</td>
<td>148</td>
<td>121</td>
</tr>
<tr>
<td>Triglycerides (mg/dl)</td>
<td>170.6</td>
<td>103.4</td>
</tr>
<tr>
<td>TC:HDL ratio</td>
<td>4.67</td>
<td>3.62</td>
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Cancer and Transplant

- Cancer is more common in transplant patients than the general population.
- Research has shown that it is likely for patients who live for at least 10 years after a transplant to develop some type of cancer, including skin cancer.
- Transplant recipients have an increased risk of developing new cancers in general (one to two percent per year) and a 15-20 percent higher incidence of certain types of cancer.

The content on this page was originally created on August 15, 2003 by UNOS and last modified on October 10, 2003.
Cancer Deaths (%) Linked to Diet

Diet
35%

Larynx, Bladder, Mouth, Pharynx, Esophagus
20%

Endometrial cancer
50%

Lung cancer
20%

Breast cancer
50%

Colorectal cancer
70%

Gastric cancers
35%

Pancreatic cancer
50%

Other cancers
10%

Prostate cancer
75%

Gall bladder cancer
50%

Exercise:
What do you want it to do for you?
Exercise After a Transplant

- Most people are weak after any surgery. Transplant recipients must recover from surgery, as well as the illness that caused the need for a transplant. As a result, exercise and muscle strain should be limited when you return home.

- As you start to feel better, regular exercise will help you regain your strength. Because you may feel tired at first, you should take rest breaks during exercise.

- Gradually increase the amount and type of physical activity you enjoy.

The content on this page was originally created on August 15, 2003 by UNOS and last modified on October 10, 2003.
Effect of CRF on Mortality
Attributable Fractions (%) for All-Cause Deaths

40,842 men & 12,943 women from the Aerobic Cooper Longitudinal Study

Exercise and Disease

- Can reduce mortality and the risk of recurrent breast cancer by approximately 50%.¹
- Can lower the risk of colon cancer by over 60%.²
- Can reduce the risk of developing Alzheimer’s disease by approximately 40%.³
- Reduces the incidence of high blood pressure and heart disease by approximately 40%.⁴⁻⁵

¹ Physical activity and survival after breast cancer diagnosis. Holmes MD et al. JAMA 2005; 293:2479
³ Exercise is associated with reduced risk for incident dementia among persons 65 years of age and older. Larsen EB et al. Annals of Internal Medicine 2006; 144:73-81.
⁴ Cardiorespiratory fitness is an independent predictor of hypertension incidence among initially normotensive healthy women. Barlow CE et al. Am J Epidemiol 2006; 163:142-50
Exercise and Disease

- Lowers the risk of stroke by 27%.  
- Reduces the incidence of diabetes by approximately 50%.  
- Can decrease depression as effectively as Prozac or behavioral therapy.  
- Muscle strength decreases mortality risk.

The Beneficial Effects of Increasing Physical Activity: It's About Overload, Progression, and Specificity

- **Overload** is the physical stress placed on the body when physical activity is greater in amount or intensity than usual.
  - Aerobic
  - Muscle Strength
  - Balance

- **Progression** is closely tied to overload. Once a person reaches a certain fitness level, he or she progresses to higher levels of physical activity by continued overload and adaptation.
  - Small, progressive changes in overload help the body adapt to the additional stresses while minimizing the risk of injury.

- **Specificity** means that the benefits of physical activity are specific to the body systems that are doing the work.

1. Low volume, moderate intensity
   • walking 40-55% VO₂ for 12 miles/wk (walking ~45 min., 4 days/wk)

2. Low volume, high intensity
   • jogging 60-85% VO₂ for 12 miles/wk (jogging ~25 min., 4 days/wk)

3. High volume, high intensity
   • jogging 60-85% VO₂ for 20 miles/wk (jogging ~45 min., 4 days/wk)
Time Watching TV and 2 Hour Glucose Levels

The Nature and Prevalence of Injury During CrossFit Training

RESULTS

- 132 responses
- 70.5% = male and 29.5% female
- Mean age = 32.3 years
- Mean total period of training CrossFit = 18.6 months
- Mean weekly training = 5.3 hours per week
- 73.5% participants had sustained an injury that had prevented them from working, training or competing
- Injury rate was 3.1 injuries per 1000 hours trained.

In conclusion, in this population of relatively untrained but healthy young adults, our results suggest no particular advantage for very high intensity training models, such as that which has been widely adapted from the results of Tabata et al. (1996).

The observation that the Tabata protocol was less enjoyable is not surprising. The progressive loss of enjoyment across all the protocols suggests that perhaps variety in the type of exercise is as important as the type of exercise per se.

Particularly considering that the health benefits of exercise have to be viewed in the context of the likelihood that exercise is continued for several years, not just the weeks of a controlled study.

Perhaps, in our quest to find the ‘perfect exercise’ we have missed the more important issue of how to make exercise enjoyable enough to be continued long term.
As intensity increases carbohydrate use increases, fat use decreases
As duration increases, fat use increases, carbohydrate use decreases

Rate of Fat Metabolism at Different Exercise Intensities

~70% = anaerobic threshold

Oxidation of fat (Kcal/hr)

Exercise intensity (% \( \dot{V}O_2 \text{ max} \))

- 20
- 50
- 80
- 100
Exercise Intensity: Heart Rate

**Exercise Intensity: Heart Rate**

**Results**

The standard error of estimate (SEE) of predicted $HR_{\text{max}}$ was 12.4 and 11.4 bpm for the Fox and Tanaka formulas, respectively, indicating a wide-spread of measured-$HR_{\text{max}}$ values are compared to their age-predicted values.

**Conclusion**

Our findings show that based on the SEE, the prevailing age-based estimated $HR_{\text{max}}$ equations do not precisely predict an individual’s measured-$HR_{\text{max}}$. 

Exercise Intensity: “Talk test”

- On a scale of 0 to 10
  - 0 = sitting
  - 10 = maximal effort
  - 5 or 6 = moderate-intensity activity
  - increases in breathing rate and heart rate.
Sleep
The Function and Promise of Sleep

Top 10 List

10. **RESTORE**: Cool brain and body
9. **RESET**: Regulate ion channels
8. **REPAIR**: Optimize physiological growth
7. **ANTI-INFLAMMATORY**: Reduce inflammatory markers
6. **IMPROVE MOOD**: Soothe emotions & mental fatigue
5. **HEART HEALTH**: Actively cardio-protective
4. **BRAIN HEALTH**: Enhances neuro-plasticity
3. **MEMORY**: Improve memory formation & consolidation
2. **JOY**: Connect us physically, mentally & emotionally
1. **ENERGY**: Replete energy stores
Optimal Sleep

Quantity **AND** Quality are needed!
Optimal Sleep: Goal = 7-9 hrs

Debate: All at once or naps?

All at night: Gold standard

Naps: Good option to reach 7-9 hrs
  Best if part of a routine
  Option: 10-30 minutes (need to be personalized)
  Avoid naps that are too long or too close to bed time
DISORDERED SLEEP

MECHANISM
- Inflammation
- Metabolic
- Vascular
- Hormonal

RISK FACTORS
- Hypertension
- Obesity
- Diabetes
- Hyperlipidemia

OUTCOMES
- Heart Disease
- Stroke
- Dementia
- Early Death
Consequences of Poor Sleep:

**Increased PAIN!**

- Fibromyalgia
- Worsening Arthritis
- All pain conditions worse

Poor Sleep ↔ Pain
Preparing Yourself Emotionally

▶ Anxiety and Depression

▶ Patients and their families face a new lifestyle after transplantation that may cause them to feel nervous, stressed or depressed.

▶ Because emotional and psychological support is a continuing process, ask your social worker about counseling services that can help you and your family deal with these changes.

▶ Professionals can help you work through concerns about your self image; mood swings; job planning; rehabilitation; family stresses, such as parent-child conflicts, marital conflict or changes in sexual functioning; and financial concerns, such as questions about Medicare, disability or insurance.
Stress
Autonomic Nervous System

**Sympathetic Nervous System**

- "Fight or Flight" system
- Releases Stress hormones
  - Epinephrine, norepinephrine, and cortisol

**Parasympathetic Nervous System**

- "Rest and Repose" system
**Methods:** Meditation (mindfulness-based stress reduction-MBSR) and gentle hatha yoga for 8 weeks

**Results:** Significant improvement in:
- the quality and duration of sleep continued for 6 months
- self-report measures of anxiety and depression

**Conclusions:** Mindfulness-based stress reduction is an effective treatment in improving the quality and duration of sleep. Because sleep is highly correlated with positive mental health and overall well-being, these findings suggest that mindfulness-based stress reduction has the potential of being an effective, accessible and low-cost intervention that could significantly change transplant recipients' overall health and well-being.

Stress Hormones During Exercise and with Regular Exercise
Exercise Intensity and Stress Hormone Response

Exercise Training and Stress Hormone Response

Foods Associated With Reduced Stress

- Omega-3 fatty acids
- magnesium
- tryptophan
- folate and other B vitamins
- low glycemic foods (Healthy Diet)
- Dark Chocolate
- Alcohol (ie., red wine)
Preparing Yourself Spiritually

- Spiritual growth and challenges await many transplant candidates and recipients.
- Some find that life-threatening illness makes them question their faith; others find their faith strengthened through the transplant process.
- Your second chance at a healthy life may come with the knowledge that another life was lost. Receiving a donor organ may create a sense of spiritual rebirth. This may create a profound change in your beliefs, and spiritual guidance and counseling can help you deal with these issues.
- Just as every patient has different medical issues, spiritual needs vary as well. Talking to your pastor, your rabbi, or the hospital chaplain may help.
Lifestyle Medicine in Transplant Summary

**Nutrition**
- Consult a dietician if available
- Increase plant based whole foods
- If you have meat, very lean with less than 30% of calories from fat
- Limit any processed foods
- Focus on the quality of the foods, not the calories
- Lots of water, especially with meals

**Quick tips**
- If it goes bad in 3 days, it is probably good for you
- If no label, enjoy it!
- For processed plant based foods, look for a “smile” – high fiber, low sugar, high protein
- Don’t be perfect!
- Focus on “increasing the good to decrease the bad”!
Exercise: What do you want the exercise to do for you?

- Over 650 muscles in the human body
  - Any movement is beneficial
- Make sure you can do the talk test when doing any activity to keep it aerobic
- Do functional activities as well as aerobic
  - Chair rises and balance in doorway
- When finish exercise, you shouldn’t be exhausted
- Gradually add 10-15% every 1-2 weeks until max of 45 minutes
- Look for other activities besides just exercising
- Find things that you enjoy to do
- Listen to music
- Find someone to exercise with
Lifestyle Medicine in Transplant Summary

- **Sleep**
  - 7-9 hours is the goal
  - Practice sleep hygiene
  - Use naps if needed
  - Lack of sleep has significant impact on overall health and recovery

- **Stress (Mindfulness-Based Stress Reduction)**
  - “Push the other button”
  - Learn to meditate
  - Don’t give people your energy who don’t deserve it
  - Serenity Prayer
  - Don’t forget to breath!

- **Spirituality**
  - Embrace a patients belief in religion and spirituality

- **Purpose and hope!**
  - Find it!
You are there for your patient. Be present.

Understanding their lifestyle will help you deliver better medicine.

If you want your patients to be more compliant with your lifestyle advice, make it personal.

We are all consultants for our patients and the more control they feel they have, the better everyone will do.

And.........................
Lifestyle can be Medicine.
United Network for Organ Sharing (UNOS) is an organization that operates the Organ Procurement and Transplantation Network (OPTN) under contract with the federal government.
In the AHS-2, compared to similar, health-conscious nonvegetarians, risk of developing diabetes was:

- 62% lower among vegans
- 38% lower among LOV

Conclusion

- High-intensity exercise training is superior to moderate-intensity training in reversing risk factors of the metabolic syndrome.

Study Limitations

The number of patients in our study was small, and information on the safety and injury risk of this training protocol in the general population is not known.