Master 3.6 Answer Key (Sample)

The Liver and Liver Transplants: Checking for Understanding

Check Facts

1. What does your liver do? List at least four different functions.
   Stores vitamins, sugar, and iron to help give the body energy.
   Controls the removal and production of cholesterol.
   Clears the blood of waste products, drugs, and other toxins.
   Makes clotting factors to stop bleeding after cuts or injuries.
   Releases bile that helps digest food and absorb important nutrients.

2. Describe two causes of liver failure in adults.
   Liver failure can be caused by cirrhosis, which can be caused by viruses, alcohol, buildup of fat in the liver, and inherited disease; cancer; benign tumors; and inherited disease.

3. Identify an action that you can take to help keep your liver healthy.
   Stay away from excessive alcohol intake.

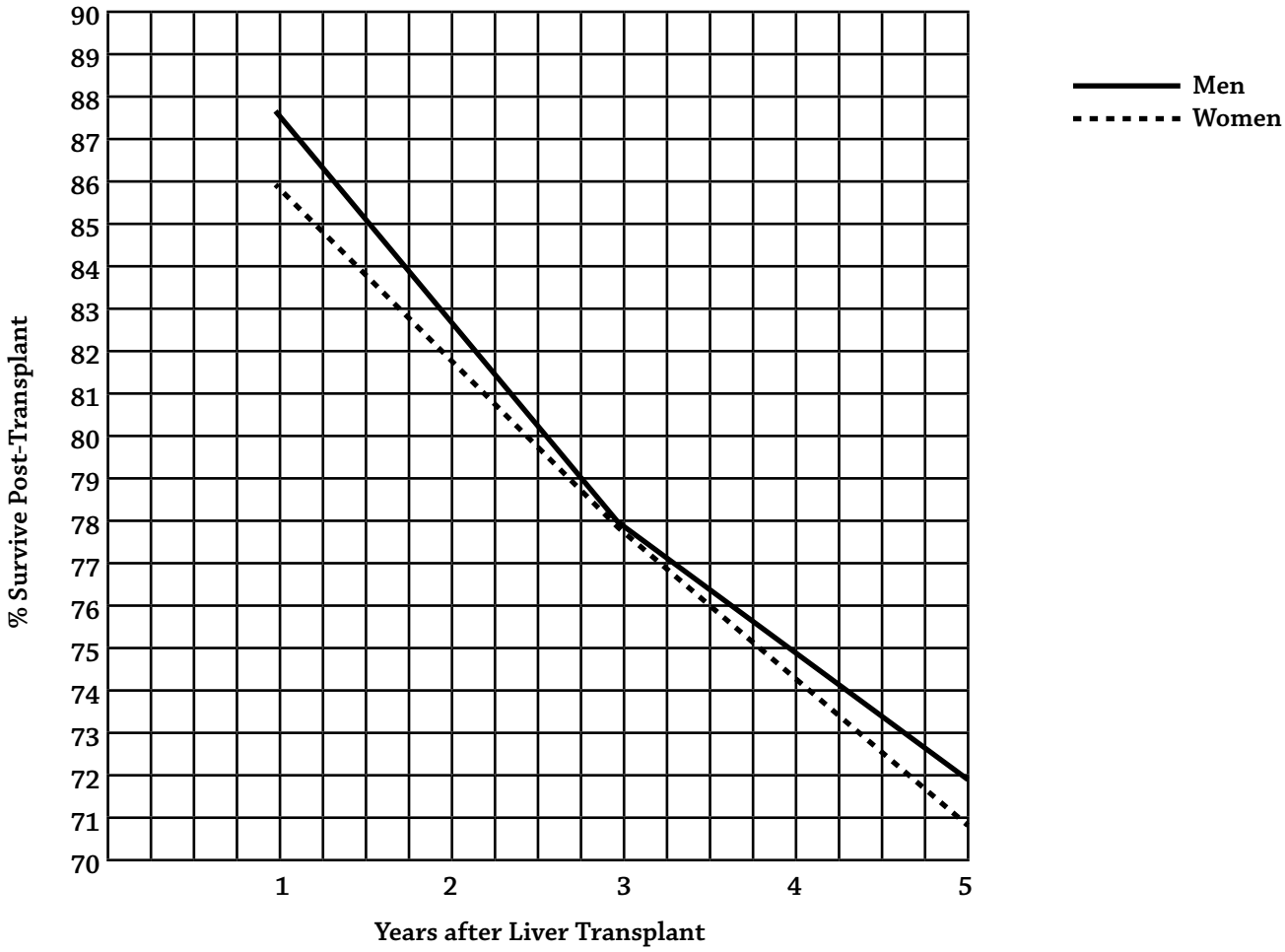
4. After a transplant, a patient must take medication.
   a) What are some of the side effects of the medications one must take after a liver transplant?
      Immune suppression, risk of infections.
   b) Why are these medications necessary, despite the side effects?
      You must partially suppress the patient's immune system so it doesn't reject the organ.

Apply Your New Knowledge

5. Why is geography important to consider? In other words, why might a hospital give a liver to a patient closer to the hospital, even if this patient has been waiting for less time or is not as sick as another patient who lives farther away?
   A liver has the best chance of success when there is very little time between removing the organ from the deceased donor and transplanting the liver into the recipient. Usually, no more than 12 hours can pass.

6. Out of all of the people waiting for a liver in 2005, what percentage died while waiting for a liver transplant?
   (2,000/17,000) x 100 = about 12%

7. Suppose that you are giving a presentation to compare percentage survival in males vs. females one year, three years, and five years after a liver transplant from a deceased donor. Using the area below, prepare a line graph in which you show the relevant data.
   a) Consider which variable (number of years or percentage survival) you will place on the X (independent) axis and which variable you will place on the Y (dependent) axis. Label each axis, and decide on an appropriate scale.
   b) Make two lines, one for females and one for males. Color-code your lines (or make one dashed and one solid).
   c) Provide a descriptive title.



8. On the basis of your graph above, do you think that the patient's sex (male vs. female) makes a small, medium, or large difference in terms of percentage survival over five years?
   Small difference

Master 3.9 Answer Key (Sample)

Identifying Allocation Criteria and the Relevant Facts

Your teacher will ask you to fill in the top row of this chart with the criteria your class came up with—one criterion in each shaded box. In the column on the left are different facts that may or may not be relevant to the criteria. With your teacher, you will fill out the first column by placing check marks in the boxes next to the facts you would need to know to evaluate whether someone met the first criterion. Then, as homework, you will fill out the rest of the chart by looking at each criterion in the top row and checking off the facts that you think are relevant to that criterion. Be prepared to share your completed chart during class.

Note to teachers: *The criteria in the table below are just examples; the actual criteria will vary from class to class. Students should write the criteria their class came up with—the ones you recorded during the Activity 5 discussion—in the empty top row of Master 3.9.*

	Criteria relevant to allocating livers						
Potentially Relevant Facts	Will likely live the longest post-transplant	Is the sickest	Is the youngest	Is most valuable or socially useful to society	Is the least responsible for the liver disease	Wins a random lottery*	Waited the longest for a liver
Patient's age	✓		✓		✓		
Patient's sex	✓†						
Cause of liver failure					✓		
Patient's other medical conditions	✓	✓					
Cold ischemic time	✓						
Compliance with medical requirements after the transplant	✓						
Access to health care	✓						
When the patient will die without a transplant		✓					
Patient's career				✓			
Patient's impact on dependents				✓			
Patient's support system at home	✓						
Time on the waiting list							✓

*To win the lottery, the only relevant facts are whether the person's name was placed in the lottery and whether his or her name was selected.

† Patient's sex has a small impact on their post-transplant life expectancy.

Reflection Question: Which of these criteria (listed in the top row in the shaded cells) do you think are the most important? Explain your answer on the back of this page.
Students' answers will vary. The most important part of this activity is that students have supported their answers well.

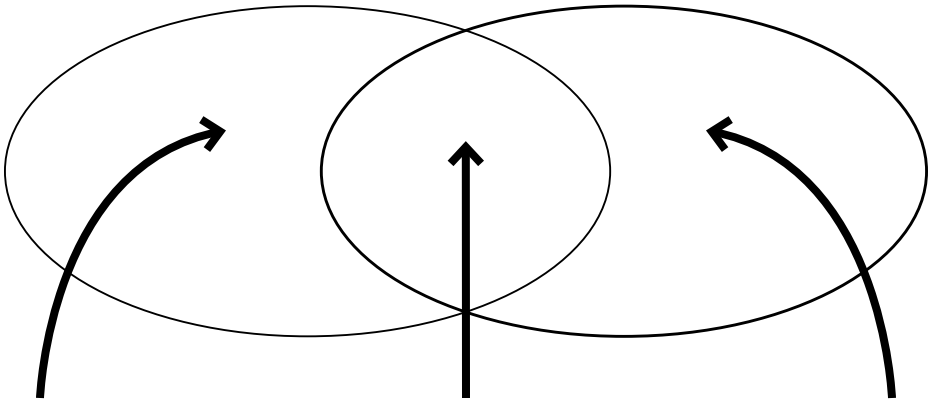
Master 3.11 Answer Key (Sample)

Comparing the Past and Current Unos Policies

Compare the past and current UNOS policies by completing each of the three areas in the Venn diagram below. Include information about what is included in the policies, as well as what is not included. For example, you could write a phrase such as "prioritizes whoever is sickest" as well as a phrase like "doesn't mention worth to society." Characteristics unique to the past policy belong in the far left region; characteristics unique to the current policy belong in the far right region; and characteristics shared by both policies belong in the middle region.

Note to teachers: *The completed diagram below provides one example of how a student might communicate his or her understanding of the past and current UNOS liver allocation policies. Students' responses will vary, but look for the basic concepts shown below in their completed diagrams.*

Before 1998 (past policy) **Both** **Since 1998 (current policy)**



- *Used four medical-urgency-status categories to prioritize patients*
- *Prioritized patients within each local OPO area, even if they weren't sickest*
- *Prioritized those who were on waiting lists longest, even if they weren't sickest*
- *Patients' doctors' subjective opinions were used*
- *Healthier patients could get livers before very sick patients*

- *Severity of patients' illness important*
- *Waiting list used*
- *No mention of worth to society*
- *No use of a lottery system*
- *Youngest patients not prioritized*
- *Those who will likely live longest not prioritized*
- *First-come, first-served not used*
- *Those responsible for disease not penalized*

- *Prioritizes Status 1 patients that will die within a week without a new liver*
- *Prioritizes all others using a MELD score—based on objective blood tests—that predicts their risk of death over the next three months*
- *Patients with the highest scores (highest risk of dying) receive next highest priority*
- *Ensures that sickest patients—Status 1 and those with highest MELD scores—receive livers first, whether or not they live in a local OPO area or region*
- *Objective medical data and medical tests—not doctors' opinions—guide decision making*

Pros and Cons of Prioritizing a Single Criterion

Criterion Being Prioritized	Pro	Con
Likely to live the longest after the transplant	• Maximizes the number of years when valuable projects, plans, and relationships are pursued. • Ensures the greatest number of extra years of life across the total population.	• It is impossible to be 100% certain how long a person will live after a transplant. • Ignores other relevant considerations.
The sickest	• Aids those who are suffering right now.	• Ignores needs of those who will become sick. • Leads to people receiving interventions only after their health deteriorates. • Likely to lead to fewer extra years of life across the total population. • Ignores other relevant considerations.
The youngest	• Benefits those who otherwise would have had the shortest life.	• Favors infants over adolescents, yet adolescents already have life plans and projects, as well as developed relationships, all of which will be lost without a transplant. • Ignores other relevant considerations.
Considered the most valuable or socially useful	• Maximizes the overall benefit—the benefit not only to the recipient of the resource but to all the people the recipient will in turn help or benefit.	• Fails to treat people as moral equals. • May result in systematic but unconscious discrimination or bias toward unpopular or vulnerable groups. • Ignores other relevant considerations.
Not personally responsible for their disease	• Ensures that those who are sick through no fault of their own do not die as a result of bad luck.	• Creates the opportunity for people to possibly misjudge—and penalize—those who are responsible for their disease. May attribute more responsibility for the disease to the person than he or she really had, given the available resources, family experiences, and educational opportunities. • Ignores other relevant considerations.
Wins a random lottery	• Hard to "game" or corrupt the system and so gain an unfair chance at getting the scarce resource. • Requires little information about recipients, so it is easy to implement.	• Ignores other relevant considerations.
Waited the longest for a liver	• Requires little information about recipients, so it is easy to implement.	• Ignores other relevant considerations.
Other: First-come, first-served system	• Protects existing doctor-patient relationships. • Requires little information about recipients, so it is easy to implement.	• Favors wealthy, powerful, and well-connected people since they are more likely to "get there first." • Ignores other relevant considerations.

Note: For a more detailed discussion of the pros and cons of these criteria, as well as pros and cons of policies that have a mixture of some of these criteria, please see Persad, G., Wertheimer, A., and Emanuel, E.J. 2009. Principles for allocation of scarce medical interventions. *Lancet 373*: 423–31. Retrieved February 2, 2009, from *http://bioethics.nih.gov/departmentpubs/Persad 2009 - Lancet.pdf*.