CS10C SI Activity: Heaps and Sorting

Question 1 (Heaps) *This is awkward. There is a new virus that affects the younger population the worst. A hospital that is distributing a vaccine with a 100% efficacy rate has lost its list of people to give the vaccine to. The hospital does, however, have a scrambled list of names with the patient's full name and age. Your team of 1-5 people is tasked with creating a program that will provide a new list that will have have the order of who will get the vaccine first given their ages. Remember, the vaccine is worse with younger people, so they should get the vaccine first.*

Here's the specs:

1. Create a program that will ask the hospital staff to input a patient's full name, then the patient's age.
2. If the staff enters "done", the program will stop asking for names (sorry people named "done", you won't be getting a vaccine)
3. The program will then output the order of people to get the vaccine onto a file labeled *hospital_vac_list.txt*
4. The program will also be outputting the order onto the terminal before exiting

Patient structure in file should be:

First Last age

Note 1: Use a heap. The heap should ordering itself as the user inputs the names. When outputting, it will use heapsort
Note 2: The program will only work on one computer. I know, it's inefficient, but for this question, we will have it at that.

Extra (You can skip this if you want):

1. The program should be able to read in a file as well. This allows for use across computers
   (a) Iff the file matches the output file from earlier, it will read it and ask the staff if they wish to input more patients (if yes, then do above, otherwise don't).
   (b) If the file does not match output file name, it will read it and order it and do the same final outputs.

Question 2 (Sorting) *Your team came and decided to work for this hospital. But little did you know, this hospital is located on an entirely different country! This country is mysterious and is not charted on the map. Everything the inhabitants do will have two options to choose from. Regardless if one choice is better than the other, they'll have to give and choose between one of two choices. This hospital wants you to organize their list in some way. As their culture suggests, they have given you two options that they want you to organize their list. You can either:*

1. *Organize the list by alphabetical order by First Name in reverse order.*
2. *Organize the list by age sections: Child, Teenager, Adult. The culture likes to classify children as 0-10, teenagers as 10-30, and adults as 30+.*

Here's the specs:

1. Organize the existing list (from qustion 1) in your team's choice. Note that the algorithm will need to be fast (Max: $O(n^2)$)

2. Store the new organized list in a new file labeled *hospital_sorted.txt*.

   (a) If you organize by names, the fill output won't have any additional parsing information.

   (b) If you organize by groups, the file output will need to clearly organize the groups.

Note: You don't have to use a heap for this. You can use a custom ADT, or, if you want, you can use std::map