Analysis Questions and Answers for Task 1

* Explain the Big O time complexity for addPatient, removePatient and findPatient.

1.) Time complexity = O(1) for addPatient(Patient person) -> A patient is added at the end of the list because the list keeps a tail pointer. Because the method attaches the new node to the tail without going through the entire list. This is a constant time operation.

2.) Time complexity = O(n) for removePatient(int id) -> Because the algorithm must perform a linear search beginning at the head to find the matching node in order to remove the given id.

3.) Time complexity = O(n) for findPatient(int id) -> Because a linear traversal is necessary to locate the wanted patient. The method must check each node in turn until the id is found because there is no index based acces.

* Compare the performance of LinkedList vs ArrayList of these operations.

-) Memory Overhead: Two additional references (next and prev) are stored in the PatientNode. Compared to an ArrayList, which stores only the object referances in a contiguous block, this greatly increases the memory footprint in a system with thousands of patients.

-) Cache Locality: Because the elements are kept in a contiguous manner ArrayLists are more “cache friendly”. Nodes in linked lists may be dispersed throughout the heap due to “pointer chasing”, which could result in more cache misses and slower real world performance even though some operations have the same BigO.

-) Structural Flexibility: Since the LinkedList eliminates the element shifting cost associated with ArrayList, it is better if the application calls for frequent insertions or deletions at the beginning or at the middle (assuming you have the iterator).

Output of The Test Scenario

Added: John Doe
Added: Lorem Ipsum
Added: Sponge Bob
Added: Patrick Star

*** Current Patient List ***
* Patient's ID: 101, Name: John Doe, Severity: 5, Age: 25 *
* Patient's ID: 102, Name: Lorem Ipsum, Severity: 10, Age: 30 *
* Patient's ID: 103, Name: Sponge Bob, Severity: 6, Age: 20 *

* Patient's ID: 104, Name: Patrick Star, Severity: 9, Age: 21 *
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