Hospital Emergency Queue System

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PROBLEM STATEMENT

A hospital needs to manage patients in the ER efficiently. Critical patients must be treated immediately, while others wait. Using a **Doubly Linked List**, each patient is stored as a node with:

- patientID
- prev pointer
- next pointer

Supported operations:

1. Insert at beginning – critical patients
2. Insert at end – normal patients
3. Insert at specific position – based on priority
4. Delete from beginning – patient leaves after treatment

PROPOSED SOLUTION

Use a **Doubly Linked List** for dynamic queue management.

Efficiently update head, tail, prev, and next pointers.

Handle edge cases like empty list, single node, and invalid positions.

CONCLUSION

The project shows how a **Doubly Linked List** can manage an ER queue effectively, ensuring critical patients are treated first and the list updates dynamically.

WORKING METHODOLOGY

1. **Initialize the ER Queue:**
   - Start with an empty doubly linked list where head and tail are nullptr.
- **Insert Patients Based on Priority:**
   - **Critical patient:** Use insertAtBeginning() to ensure they are treated first.
   - **Normal patient:** Use insertAtEnd() to add them at the end of the queue.
   - **Specific priority:** Use insertAtPosition() to place a patient exactly where the nurse decides.
- **Update Pointers Dynamically:**
   - After every insertion or deletion, update the prev and next pointers of neighboring nodes.
   - Adjust head and tail if the first or last node changes.
- **Delete Treated Patients:**
   - Use deleteFromBeginning() when a patient is treated and leaves the ER.
   - Handle edge cases like deleting from a single-node list.
- **Maintain Queue Order:**
   - Ensure the list always reflects the correct patient order in real-time.
   - Forward traversal represents treatment order; backward traversal can verify links.
- **Visual Representation:**
   - Optionally, after each operation, display or draw the list showing patientID and the prev/next connections for clarity.