Project Idea: Empowering Patients Through Eye-Tracking Communication

An innovative solution to address critical communication challenges for patients with limited mobility, speech disabilities, or post-surgery pain in hospitals. This application leverages **eye-tracking technology** to provide a seamless way for patients to communicate their needs, reducing patient vulnerability and improving nurse response efficiency.

Problem Statement

In hospitals, two pressing issues complicate patient care:

1. **Misplaced Nurse Call Devices:** Patients, especially those with limited mobility, often cannot reach these devices when needed.
2. **Staff Shortages:** Overburdened nurses struggle to perform frequent rounds, leaving patients without timely care.

This gap in communication disproportionately affects patients with conditions like **aphasia, apraxia of speech, dysarthria**, and **cognitive-communication disabilities**. These patients face heightened risks of adverse events, including falls, due to their inability to express urgent needs.

Proposed Solution

An **iPad/Android tablet application** that:

1. Uses **eye-tracking technology** to enable non-verbal, mobility-restricted patients to communicate effortlessly.
2. Sends **real-time notifications** to nurses' mobile devices, specifying patient needs (e.g., "I need water," "I need assistance to the bathroom").
3. Reduces unnecessary nurse rounds and ensures faster, targeted responses, improving patient safety and satisfaction.

Key Features

1. **Eye-Tracking Interface**: Patients interact with the app using their gaze to select predefined options or customizable requests.
2. **Real-Time Notifications**: Nurses receive immediate alerts with the patient's location and specific need, directly on their mobile devices.

3. **Customizable Templates**: Hospitals can tailor communication options based on the unique needs of their patients.
4. **Multilingual Support**: Ensures accessibility for diverse patient populations.
5. **Analytics Dashboard**: Tracks response times and request patterns to optimize resource allocation and improve care.

Actionable Steps to Build the Project

1. Research & Design

- **Patient and Nurse Interviews**: Understand common needs, pain points, and priorities for both users.
- **Competitive Analysis**: Study existing healthcare communication tools to identify gaps.
- **Wireframes & UX Design**: Design a patient-friendly interface with large, intuitive buttons and minimal visual clutter.

2. Technology Stack

- **Frontend**: Flutter or React Native for cross-platform compatibility.
- **Backend**: Node.js (or Python) with Firebase/Firestore for real-time notifications.
- **Eye-Tracking Technology**: Integrate libraries like **OpenCV** or **Tobii SDK** for gaze-based interactions.
- **Mobile Notifications**: Use **Firebase Cloud Messaging (FCM)** or **APNs** for real-time alerts.
- **Analytics**: Implement **Google Analytics** or **Mixpanel** to monitor app usage and nurse response times.

3. Development Process

- **Phase 1: Eye-Tracking Integration**
    - Implement basic eye-tracking to detect gaze position.
    - Calibrate the system for accurate selection of interface elements.
- **Phase 2: Communication Module**
    - Build a menu with predefined options (e.g., "I need water").
    - Enable customizable request templates.
- **Phase 3: Nurse Notification System**
    - Connect the patient's app to a nurse's mobile device.
    - Display real-time patient requests with location details.
- **Phase 4: Feedback Mechanism**
    - Allow nurses to confirm or respond to requests within the app.
    - Add patient acknowledgment to ensure seamless communication.

Impact

This project addresses critical healthcare gaps by ensuring:

- **Timely Patient Care**: Patients receive assistance promptly, minimizing accidents.
- **Nurse Efficiency**: Nurses can focus on urgent needs without excessive rounds.
- **Improved Patient Experience**: Enhances dignity and autonomy for patients with communication or mobility challenges.