The overall purpose of the research is to replace conventional metrology (e.g. BASMI) measuring spinal movement. The project is part of an ongoing clinical evaluation being undertaken in Derry, Londonderry, N.Ireland to engage and retain patients to perform regular monitoring of their condition, Spondylitis using IMU sensor technology. iSpondylitis uses gamification in its design.

**PHASE 1 STUDIES**

Examining the accuracy of sensors in measuring movement in axSpA in a home or work environment.

Examining the performance of standardised functional tests while wearing the IMU sensor (e.g. sit to stand).

Comparing sensor outputs to data obtained from optical motion capture (UCOTrack).

**CLINICAL DEMONSTRATIONS**

**CONCEPT / OBJECTIVES**

iSpondylitis is an application design for remote monitoring of Ankylosing Spondylitis using IMU sensor technology. iSpondylitis uses gamification in its design to engage and retain patients to perform regular monitoring of their condition, process treatment and offer remote feedback regarding their spinal mobility.

The project is part on the on-going clinical evaluation being undertaken in Derry, Londonderry, N.Ireland and Cordoba, Spain to examine the accuracy of sensors in measuring spinal movement.

The overall purpose of the research is to replace conventional metrology (e.g. BASMI) measuring spinal movement.

**PROBLEM**

Spinal mobility is assessed in patients with AS/saxSpA using the BASMI to provide baseline measurement and monitor change over time. The BASMI test is usually undertaken on a yearly basis with varying degrees of regular monitoring.

1. Can wearable sensors and mobile technology be used to replace the BASMI test and construct an accurate picture of the patient’s condition during regular monitoring?

2. Can we leverage technology to engage and motivate the patient to perform condition monitoring remotely?

**METHODOLOGY**

1. **1: USABILITY FEEDBACK**

The application is tested with user groups and qualitative feedback is gathered via surveys and questionnaires.

2. **2: APP / DATA ANALYTICS**

Analysis is used to gain insight in user retention cycles and sticky factor.

**CONSISTENT DESIGN**

Navigating from screen to screen is performed via dynamic buttons on the interface. Profile & Success indicators are assessed on the header section.

**GAMIFICATION**

Gamification techniques are utilized in the application’s design to engage in play.

**MINI-GAMES / PLAY**

Casual mini-games and sensor exercises are built into the application to add a layer of fun to the condition monitoring.

**COMMUNITY**

Clinicians can be alerted by the patient or through an automated process. They can directly access patient’s data and thus support their analysis and improve patient care.

**DATA PROCESSING**

Relevant sensor data is saved in the cloud to allow for further analysis.

**PATIENT VIEW**

Monitoring:

- Patients regularly input information and condition status through questionnaires and a slider. Patients are encouraged to document how they feel each time they use the app or during condition flare ups to create a detailed picture of their progress over longer periods of time.

- The app assists in sensor setup and guides patients through movement routines while recording the relevant data for feedback and analysis.

Feedback:

- Patients are presented with simplified meaningful feedback. Traffic lighting is used to quickly inform the patient of their condition status.

- Links to relevant exercises and information based on their current status is available to view in the app.

**OUTCOMES**

Over the course of the project we will develop a set of gamification principles to use within the application design.

The app development will support the clinical demonstrations for the IMU sensors to test the remote monitoring and practical application of patients using the hardware in a home or work environment.

**KEY OUTCOMES**

1. We can engage users within the app environment to perform regular monitoring and measure their engagement in the process using data analytics.

2. We can gain positive patient feedback in regards to the gamification and community focused design of the application compared to traditional monitoring using intermittent BASMI tests.

3. We can determine a correlation in improvement to patient condition and regular use of the sensors and application.

**FRAMEWORK / DESIGN**

Visualisation & Play:

- Sensor input is visualised using 3D kinematics, charts and graphs. Interactive exercises and casual mini games are built into the app to add a layer of fun to the monitoring process.

Profile & Progression:

- Condition monitoring is presented as a journey with a sense of progression at the core of the experience. Achievements, milestones and streaks are used to encourage long term engagement with the app.

Community:

- App users are part of a wider community to share information and build a support network.

**CLINICIAN VIEW**

Profile:

- Clinicians are setup with an ID to monitor groups of patients and provide individual monitoring and management.

Visualisation:

- The application provides access to detailed data visualisation and patient monitoring history to support their analysis and improve patient care.

Feedback:

- Clinicians can be alerted by the patient or through an automated process. They can recommend exercises and link relevant information on an individual patient basis.

**CONCEPT / OBJECTIVES**

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