Shoulder Injury Recovery Tracking System

Jishnu Nair

MCA Student, Sree Narayana Guru Institute of Science and Technology, Kerala, India

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ABSTRACT: The system would have a simple approach which makes sure that the patients track their own health progress and input related data into each survey. The doctors can access the data and analyze it for their future betterment. It would enhance the quality of human-computer interaction and also would improve the doctor-patient relationship. The rehabilitation application is for those who are suffering from shoulder dislocation. The goal of the survey is to accurately determine the best possible way for rehabilitation. There are several techniques which are implemented for the recovery and ailment.

Keywords— Healthcare, Data sharing, Shoulder injury, Rehabilitation, Authentication

I. INTRODUCTION

A **shoulder dislocation** occurs when the ball of your upper arm bone is forced fully out of its normal position on the shoulder socket. A shoulder dislocation is usually gives extreme pain and an inability to move your arm until it is relocated back properly. Your shoulder is the most flexible joint in your body. It has great range of motion. The shoulder allows you to lift your arm overhead, out to the side, rotate it behind your head and your back and reach in multiple directions. Thus, this huge range of motion comes at the cost of its stability.

As the population of senescent patients who suffer from severe shoulder injuries, there are an amount of demands for advanced health management systems. In order for patients to restore their health as soon as possible after the treatments or operations performed in hospitals, they sometimes need to conduct complementary self treatments at home.

However, in everyday life, it is very difficult to get a proper guideline from remote medical staff as well as follow the guideline for a long period. For a doctor, there is no felicitous base for evaluating whether the patients completed the home tasks that he gave out.

In this paper, I introduce a simple interface for users to share their recovery status with medical staff regarding the shoulder-joint rehabilitation. Patient can easily keep managing their health with them while constantly getting prescription from their medical attendants through online network. This system includes functions that collect the data of patients and share them with the doctor through the server in it. We also developed the platform to share the shoulder movement exercises and videos from the application itself. Patients can efficiently and safely share the training data with the doctor. The main objective of this research is to know whether the shoulder dislocated patients would recover better with the video guidance or the theoretical data provided to them through the web application.

II. IMPLEMENTATION

In this study, I have applied the above discussed approach to a web application for shoulder-joint rehabilitation. For patients with shoulder-joint disorders, constant rehabilitation training is extremely important after an initial treatment. Our homecare system would maximize the efficacy of the treatment by enabling the medical staff to monitor the patient's training outcomes in real-time.

- **Application architecture**

a) Registration procedure

A patient is required to create an account and attends the survey. Every time he/she accomplishes his training exercises, training result data will be stored in the server. The doctor can visit the site and analyze the results.

b) Perform recovery exercises

The patient is supposed to follow all the instructions given to them for a particular period of time. The exercises and the details about the injury are to learnt and performed with due attention and seriousness.

c) Attend survey programme

After performing the rehabilitation techniques, the patient is supposed to attend the survey programme time-to-time. It would help the medical team to track the recovery of the patient efficiently.

d) Survey tracking process

The medical staffs can keep a track on the survey programme. They can imply several rehabilitation methods or techniques on every particular group of patients. The survey programme patterns can be controlled and adjusted from the admin side.

By following such a process the medical team could acquire a lot of tested data and related information regarding the shoulder injury rehabilitation process. The time required for a particular patient to fully recover from a severe shoulder injury could be predicted and

planned well from the information and statistics collected in the survey programme.

- **User Module**

The user module deals with the patient's data and records the recovery status. The user (Patient) will be guided through the application initially. The user is supposed to attend the survey which is being carried out at a specific period of time. It tracks the recovery and performance of the user individually.

All the users who get registered to the application would be allotted to a particular group. One group would be provided the video guidance for the exercises based on their recovery stage. On the other hand, the other would be provided with detailed content about their injury and rehabilitation practices.
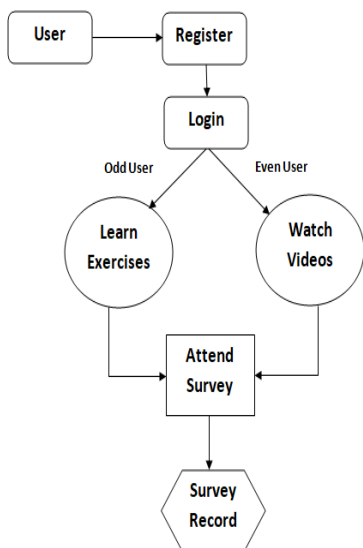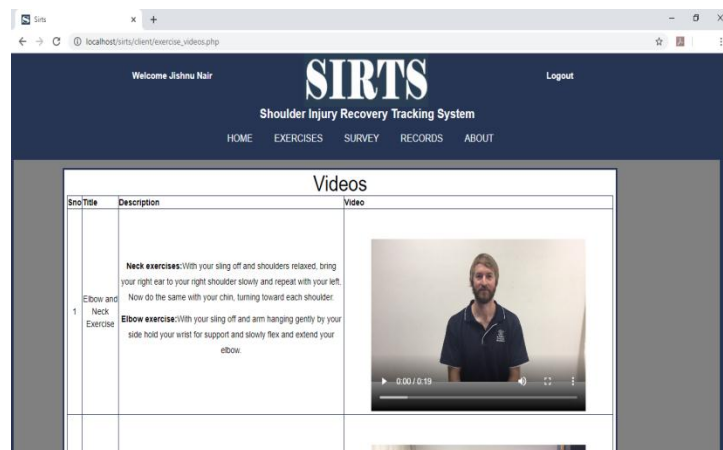

Fig 1: User module work flow

The recovery programme is designed into multiple phases which are:
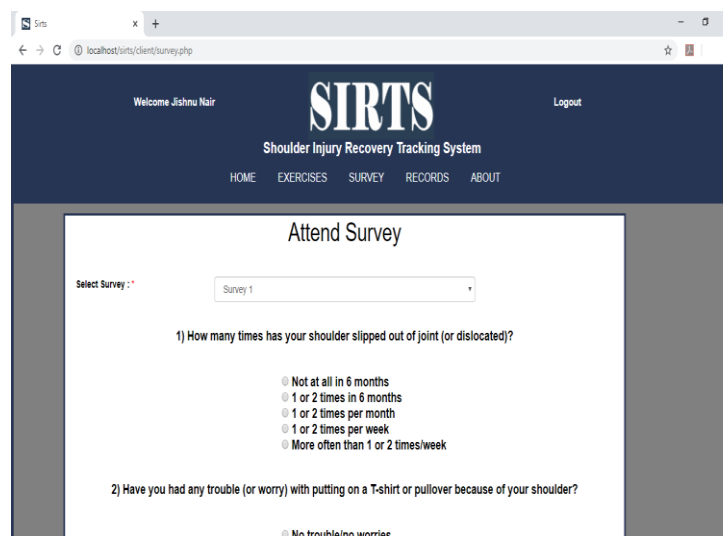
Phase 1 (up to 4 weeks): Goal is to maintain anterior-inferior stability.

Phase 2 (4-12 weeks): Goal is to restore adequate motion.

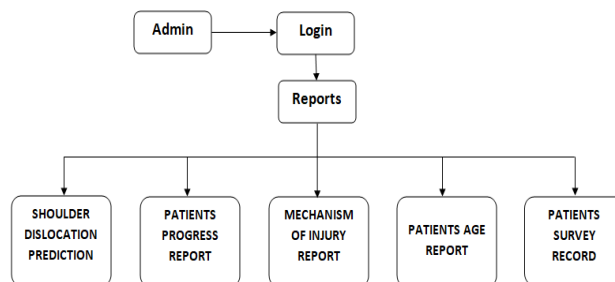**Phase 3** (12-24 weeks): Successfully returning to sports or physical activities.

Fig 2: Exercise Videos

Fig 3: Survey Form

- **Admin Module**

The admin module is for the medical staff to track the recovery and guide the patients. Here, they would get all the survey data which have been submitted by the users (patients).

Fig 4: Admin module work flow

From the admin side the application can be fully controlled as per the requirements. The admin can make changes to the rehabilitation techniques for the patients and also make adjustments to the survey programme.

The report section on the admin side is the most crucial for the medical team. Various reports would be generated on the basis of the patient's personal information data and also according the survey responses which is being delivered time-to-time by the patients.

Fig 5: Survey Reports

III. RESULT EVALUATION AND DISCUSSION

The results obtained from the survey techniques are derived in various statistical and graphical formats. The survey data obtained from the patients under go several complex and logical calculations. Here, the most important aspect is to study the patient's recovery pattern and accordingly make changes to the rehabilitation techniques.

3.1 SHOULDER DISLOCATION PREDICTION

The shoulder dislocation prediction allows the medical team to study the data easily and perform their duties as required. According to the patient's age, activity and dislocation history the prediction is done whether the dislocation would happen again or not. The dislocation probability is classified into 3 types, which are HIGH, MEDIUM and LOW. If the patient is having high probability of shoulder dislocation then extra care and guidance can be provided to them.

Shoulder Disslocation Report

SNO	NAME	ACTIVITY	AGE	PREVIOUS DISSLOCATION	DISSLOCATION PROBABILITY
1	Danial	Assault	24	No	LOW
2	Adam	Sports	5	Yes	HIGH
3	Mary	Sports	34	No	MEDIUM
4	John	Fall from a bike	70	No	MEDIUM
5	Anuj	Fall from height	25	No	LOW
6	Jishnu	Simple fall	23	Yes	MEDIUM
7	Bhavin	Car accident	10	Yes	HIGH
8	Shalini	Swimming	10	No	LOW
9	Pulkit	Pulling some object	10	Yes	HIGH
10	Andrew	Fall from a bike	70	No	MEDIUM

Table 1: Shoulder Dislocation Prediction

3.2 ANALYSIS OF AGE REPORT

The analysis of age report provides the data regarding the patient's in various age groups. It helps in studying the pattern and cause of shoulder injury. The most prominent age group facing the injury can be identified from the whole lot of data with this report.

The table specifying the various age groups with the number of patients is derived. From the table the higher percentage of age group can be identified. Thus, more care is to be provided to those age groups.
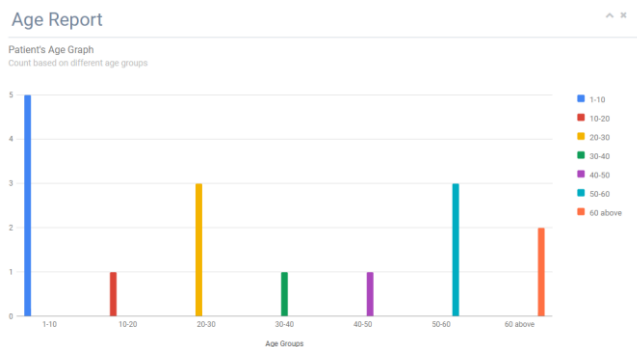

Fig 6: Age report

Sno	Age	Pateints(count)	Percentage
1	1-10	4	25.00%
2	10-20	1	6.25%
3	20-30	4	25.00%
4	30-40	1	6.25%
5	40-50	1	6.25%
6	50-60	3	18.75%
7	60 above	2	12.50%
		Total 16	100.00%

Table 2: Age Table

3.3   MECHANISM OF INJURY REPORT

The mechanism of injury report provides a clear view about the various ways of getting shoulder injury. The medical team can quickly know the most prominent mechanism or activity which causes the shoulder injury. By studying the pie graph here we can derive that the activities like sports, falling from a bike and assault are much likely to cause shoulder dislocation.

Here, along with the pie graph a table is also included. It provided accurate data and percentage of patients doing various activities and getting their shoulder injured.
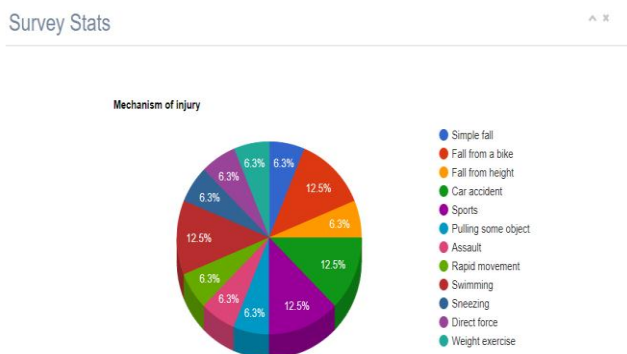

Fig 7: Mechanism of Injury chart

Sno	Mechanism of Injury	Pateints (count)	Percentage
1	Simple fall	1	6.25%
2	Fall from a bike	2	12.50%
3	Fall from height	1	6.25%
4	Car accident	2	12.50%
5	Sports	2	12.50%
6	Pulling some object	1	6.25%
7	Assault	1	6.25%
8	Rapid movement	1	6.25%
9	Swimming	2	12.50%
10	Sneezing	1	6.25%
11	Direct force	1	6.25%
12	Weight exercise	1	6.25%
		Total 16	100%

Table 3: Mechanism of Injury Table

3.4   PATIENTS PROGRESS REPORT

The patient's progress report describes the weekly improvement of the patient. This would help the medical staff to make slight changes to the rehabilitation techniques being carried out. Individual survey data of each patient can be analyzed and accordingly the further schedule of exercises can be planned. Rehabilitation process will progress based on the patient's symptoms and change in the range of motion, reduction of muscle

spasms and relief of pain. Though, the main objective is to allow the shoulder capsule to heal.

Table 4: Rehabilitation Techniques

Sno	Users	Survey Status	Video watching	Theory data
1	Danial	Improvement		✓
2	Adam	No improvement	✓	
3	Mary	Improvement		✓
4	John	No improvement	✓	
5	Anuj	Improvement		✓
6	Jishnu	Improvement	✓	
7	Bhavin	Improvement		✓
8	Shalini	No improvement	✓	
9	Pulkit	Improvement		✓
10	Andrew	No improvement	✓	

The incidence of recurrent dislocation ranges from 80-90% for the patients between the ages of 15-20 years old. Therefore, the rehabilitation program should progress cautiously in young individuals. Some factors considered while designing Shoulder Instability Rehabilitation system are:

- Mechanism of Shoulder Instability

- Pre-injury Activity Level

- Neuromuscular Control

- Direction of Shoulder Instability

- Concomitant Pathology

- Degree of Shoulder Instability

Sno	Age	Dislocations	
		YES	NO
1	1-10	3	1
2	10-20	1	0
3	20-30	1	3
4	30-40	0	1
5	40-50	0	1
6	50-60	3	0
7	60 above	0	2

Table 5: Comparative Age Analysis of Total Patients

As the table shows that the children below the age group of 10 and having relatively high activity are more likely to face the shoulder dislocation. Also people above the age of 50 and having previous dislocation are found to be more prominent to get the dislocation again.

Table 6: Patients Rehabilitation Status

The table above describes that the rehabilitation can be tracked for each user separately on the basis of the survey being carried out time to time. The survey stats would show if the individual is improving or not with the rehabilitation techniques being carried for him.

IV. CONCLUSION AND FUTURE SCOPE

4.1 Conclusion

In this research paper, I propose a simple approach for healthcare data sharing devised on a web-based application for rehabilitation. A patient can share his/her healthcare data with the medical team. The proposed process is very simple that any person with basic technology knowledge can make the best use of this application. The developed web application gives patients the specific guide for rehabilitation exercises. The doctor can check the condition of patient's health status in real-time. In addition, the proposed method could be applied to various healthcare systems.

The research shows that the video guidance provided to the patients is helping them more to recover from the shoulder dislocation. This survey would help the doctor's to know the patient's recovery pattern. Also they can introduce various new techniques for the patients to help them in their recovery.

4.2 Future scope

■ The method of performing surveys in order to get the rehabilitation information from the patients can be applied on several other body related injuries and diseases.

■ Online guidance and feedback can be provided to the patients, which could help them to have a speedy recovery.

V. REFERENCES

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