

*State of the Science Conference - 2006*

Telehealth Technologies for Monitoring  
Adherence and Performance of  
Home Exercise Programs for  
Persons with Spinal Cord Injury:  
*Tele-Exercise*

*Jenny Kiratli, PhD*

*SCI Center, Palo Alto VA Health Care System*



# Context - Clinical Setting



# Physical Activity Continuum



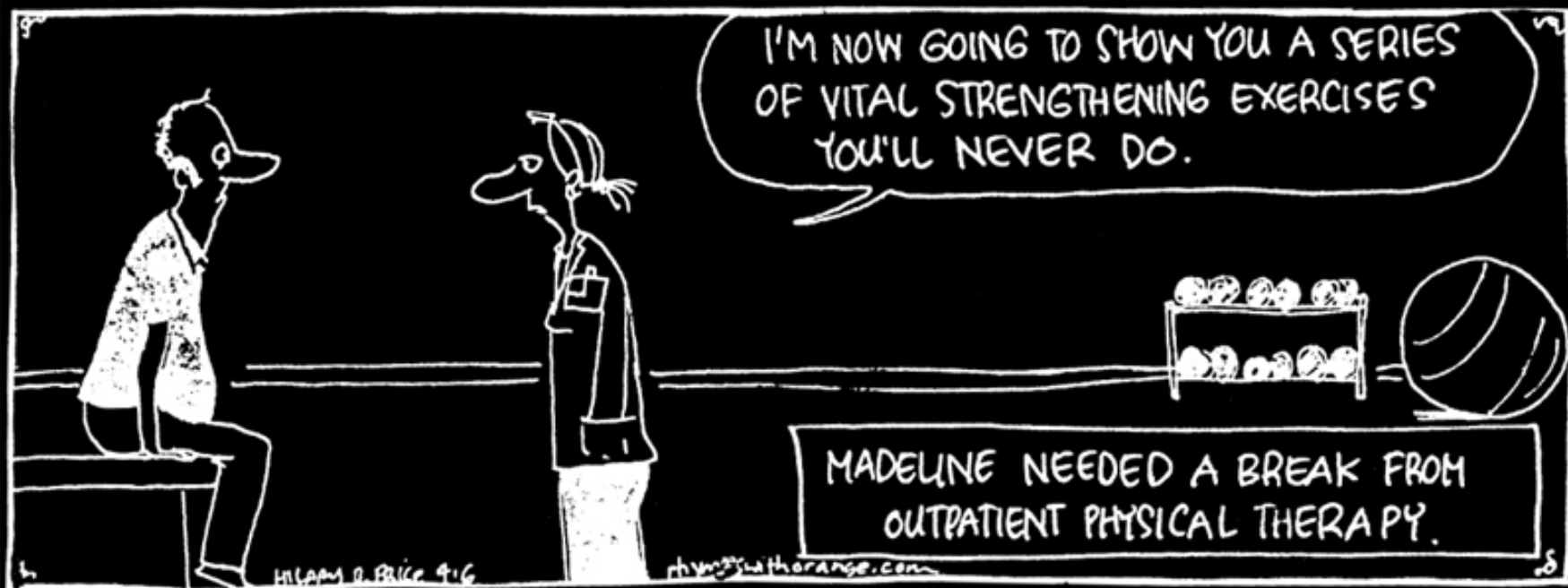
## ***RecTech Mission - Develop Technology to:***

- Reduce Barriers & Increase Access
- Improve Availability of Resources
- Increase Motivation and Adherence



# Physical Therapy Prescription of Home Exercise Programs

The Workout - *Hillary Price*



# Background

## Adherence to Home-Based Therapy:

- Non-adherence to *inpatient* physical and occupational therapy treatment ranges from 20 to 80% with an average of 50% across studies (Kyngis et al., 2000; Schunk, 1989).
- *Home exercise programs* are prescribed by therapists to complete a rehabilitation program and prevent recurrence of an impairment to dysfunction.
- Overall, *adherence* to home therapy is substantially lower, compromising the effectiveness of independent home exercise treatment plans. That is, poor adherence translates into non-optimal functional gains.



# 5 year RERC Project Objectives

- Objective 1:** Identify limitations to adherence to exercise programming in the SCI/D population with a focus on those with shoulder pain and dysfunction.
- Objective 2:** Develop a model utilizing telehealth for home exercise
- Objective 3:** Evaluate whether tele-exercise can be an effective approach for improving adherence to prescribed home exercise programs
- Objective 4:** Assess the physiological and psychosocial outcomes of home exercise with and without telehealth reinforcement



# Barriers to Home Exercise Compliance



# Survey Overview

- Survey questions were targeted toward patterns of adherence, perceived barriers, expected outcomes and identification of strategies for improving success with home exercise programs.
- **Primary purpose** was to identify realms to target with tele-exercise.
- **Secondary purpose** was to identify similarities and differences in perceptions of patients with spinal cord injury and VA therapists who issue Home Exercise Programs



# Survey Response

## 2 Groups of Subjects Surveyed:

**Patients** with SCI/D and documentation that they had been given a home exercise program between 8/01 and 8/03.

- 206 surveys sent.
- 122 (59%) valid surveys returned

**Therapists** (OT, PT, KT) who regularly treat patients with SCI/D and prescribe home exercise programs. 19 of the 22 VA SCI Centers agreed to participate.

- 165 surveys sent.
- 105 (64%) valid surveys returned



# Survey Results

## ***Current Adherence to Home Exercise***

### **Therapist Responses**

- 64% of the therapists surveyed responded that they believed their patients were performing 50-75% of their prescribed HEP routinely

### **Patient Responses**

- Nearly half (46%) of the patients who responded stated that they did not adhere to their HEP for the length of time prescribed.
- *27% of patients responded that they had not been given a home exercise program (HEP)*



# Survey Results

## *Satisfaction vs. Frustration with HEPs*

### Therapists

- 76% of therapist believed that their patients felt the prescribed HEP would enhance their lives.

### Patients

- 48% of patients reported to be moderately to severely frustrated with their HEP.
- However only 4% reported “no real benefit” from doing a HEP.



# Survey Results

## Therapists' Opinions - Top barriers to adherence

- Motivation (96%)
- HEP is low on priority list (70%)
- Unable to obtain needed assistance (54%)
- Pain prohibits participation (51%)
- Lack of patience, Lack of time (41%)

## Patients' Opinions - Top barriers to adherence

- Need motivation (38%)
- Hard to fit into daily routine (33%)
- Lack of Energy (29%)
- "I'm too lazy to exercise" (23%)
- Lack of time, Doing own activity is enough, Lack of interest (17%)



# Survey Results

*Do therapists spend enough time with their patients?*

## Patients

- 32% of patients reported that therapists didn't spend enough time with them.

## Therapists

- Only 1% of therapists believed therapist's time limitations to be a barrier to HEP adherence.



# Survey Results

Approximately one-half of therapists (57%) and patients (45%) agree that greater contact would increase adherence to HEPs

Further, *patients* would like family and friend involvement in their HEP:

- In the form of a work-out partner (54%)
- As well as encouragement for their participation (48%).



# Conclusions from Survey

## From patients' perspective:

- Primary barriers include lack of motivation, lack of interest, and time constraints.
- Some even don't know they'd been prescribed a home exercise program.
- Would like more time from therapists in providing plan and in follow-up.
- Would like more involvement with and encouragement from others.

*Many of these issues can be addressed  
by telehealth technology*



**Development of  
Tele-Exercise  
Monitoring Program  
for  
Patients with Spinal Cord Injury**



# Telemedicine / Telehealth



The logo for rectech, featuring a stylized orange and black figure resembling a person or a signal, followed by the word "rectech" in a bold, black, sans-serif font.

# Telehealth Device - Health Buddy

- In Home Messaging Device
- Health Hero Corp (local co.)
- Simple, compact, easy to use
- Uses plain old telephone service (POTS)
- Daily monitoring, education, and feedback
- Specific content tailored for our clinical & research objectives



# Health Buddy Clinical Monitoring - Overview

- During each daily session, participant is asked a series of 6-10 questions about *behavior, health, symptoms, and vital signs*.
- *Interactive* program uses branching algorithms - participant is presented with relevant questions that elicit further information and/or education based on participant response.
- Responses are downloaded daily and *trends* in adherence, retention of education, improvements in functional ability, and ability to appropriately self-monitor and self-progress home exercise program are available for analysis.
- Results are displayed by *risk stratification*, providing opportunity for intervention.
- Secure, internet web-based patient management software allows for viewing and reporting of trends by individual or population.



# Health Buddy Education & Monitoring Content for SCI Tele-Exercise Program

10 Health & Behavioral Domains included in Program:

- *General health*
- *Strengthening*
- *Stretching*
- *Cardiopulmonary*
- *Posture & positioning*
- *Exercise progression & self assessment*
- *Safety & contraindications*
- *Skin*
- *Nutrition*
- *ADLs*



# Health Buddy Education & Monitoring Approach

- Multiple choice *behavior* questions with dynamic branching.
- *Numeric-symptom* questions with numeric ranges and follow-ups which are prompt questions.
- *Escalation* questions that starts with a multiple choice symptom question that branches to a second multiple choice-symptom question. The escalation is on the second YES response.
- *Knowledge* questions and information provided and tested in subsequent sessions.
- Each session closes with *trivia*, fun fact, or affirmation.



# Health Buddy Content - Example

Have you noticed any changes in your ability to put on/take off your shirt over the past week? *[Any changes?: Symptoms / ADLs]*

## Easier

That's great! Your shoulder must be getting stronger and more flexible. Hopefully, you are no longer straining it with this activity! Keep up the good work you are on your way to recovery. *[Confirm: Knowledge / ADLs]*

## More difficult

Is this due to shoulder pain? *[Shoulder pain?: Symptoms / ADLs]*



# Health Buddy Content - Example *continued*

**Is this due to shoulder pain?** *[Shoulder pain?: Symptoms / ADLs]*

**Yes**

**If the pain is greater than 6 (0=no pain & 10=worst pain), take a break from the resistance exercises and focus on light stretching today.** *[Instruct: Knowledge / ADLs]*

**Key muscles to stretch for this activity would be your Pectorals, Latissimus Dorsi, and Triceps.** *[Instruct cont.: Knowledge / ADLs]*

**If the pain persists for greater than 2 hours: Ice your shoulder for 15-20 minutes, take your prescribed medications and focus on light stretching.** *[Instruct cont. 2: Knowledge / ADLs]*

**If it continues to worsen tomorrow please contact your PT.**  
*[Instruct cont. 3: Symptoms / ADLs]*



# Health Buddy Content - Example *continued*

Is this due to shoulder pain? [*Shoulder pain?: Symptoms / ADLs*]

## No

Spend a little more time on your Pectorals, Latissimus Dorsi and Triceps stretches. Increasing your shoulder flexibility may be the key. [*Confirm: Symptoms / ADLs*]

## About the same

Keep up with your stretches and strengthening. It can take up to 6 weeks to see significant strength changes and 2-3 weeks to see changes in flexibility. [*Instruct: Knowledge / ADLs*]

The key stretches to help with this activity would be stretching your Pectoralis, Latissimus Dorsi and Triceps muscles. [*Instruct cont.: Knowledge / ADLs*]



## Health Buddy Content – Risk Stratification

**Overall, how would you say your ability to do things you want to do such as work, recreation, ADLs, has changed over the past week?**

1) Better than last week → **LOW RISK**

Response 1: Excellent! Keep up the good work!

2) About the same as last week → **LOW RISK**

Response 2: Have you been doing your home program consistently for >2 months?

2a) No → **MED RISK**

Response 2a: Don't get discouraged; often it takes a good 6-8 weeks of consistent participation in a home exercise program before you start to see results.

2b) Yes → **LOW RISK**

Response 2b: You may have reached a plateau. If this persists for more than 1 week contact <PT, phone #>

3) Worse than last week → **HIGH RISK**

Response 3: If this persists for more than 3 days contact <name, #>



**Evaluation of tele-exercise as an effective approach for improving adherence to prescribed home exercise programs**



# Tele-exercise Intervention Research Design

- Select patients with SCI and shoulder pain or dysfunction who have been given home exercise programs
- Randomized assignment to *experimental* (teleexercise with Health Buddy) and *control* (home exercise without Health Buddy)
- Expect to enroll 30 participants
- 12-month home exercise program, cross-over design at 6 months
- Assess physiological and psychosocial outcomes
- Each participant will serve as his or her own baseline control and longitudinal data will allow us to investigate retention of effects and time trends



## Participant exercising with NCPAD DVD



# Daily Health Buddy Session



# Remote Monitoring of Health Buddy Input

Case management is done by health professional remotely for all participants by logging onto secure website and monitoring individual daily responses and individual and group trends. Daily adherence is tracked



and problems noted in a timely manner. Follow-up can be initiated easily.



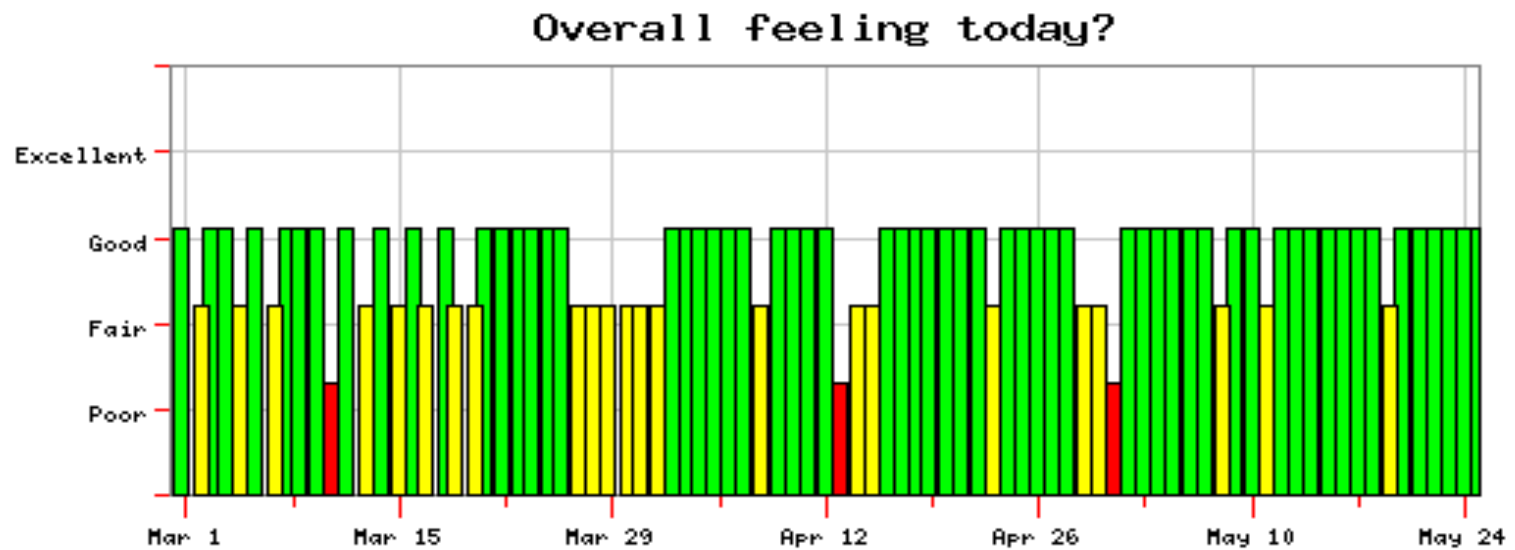
# Health Buddy “iCare Desktop” Display - Risk Stratification

- Case Management can be done based on risk level of answers
- Contact can be initiated in response to risk level as displayed by color
- Trends in responses can be graphed for individuals and for group

Patient	Response Time	Symptoms	Behavior	Knowledge	General
● <a href="#">Patel, Krishna</a>	<a href="#">02:58 PM PDT</a>	High	High	High	None
● <a href="#">Chamura, Mark</a>	<a href="#">09:38 AM PDT</a>	High	High	Medium	None
● <a href="#">Lake, John F.</a>	<a href="#">03:07 PM PDT</a>	High	Medium	Medium	None
● <a href="#">McAllister, Troy</a>	<a href="#">01:09 PM PDT</a>	High	Medium	High	None
● <a href="#">Romeo, Julie R.</a>	<a href="#">10:43 AM PDT</a>	High	Medium	Medium	None
● <a href="#">Zimman, Mary M.</a>	<a href="#">05:14 AM PDT</a>	High	Medium	Medium	None
◐ <a href="#">Schmidt, Anna</a>	<a href="#">02:17 AM PDT</a>	Low	High	Medium	None
◐ <a href="#">Fish, John F.</a>	<a href="#">11:46 PM PDT</a>	Medium	Medium	Low	None
● <a href="#">Flock, Kimberly</a>	<a href="#">06:19 PM PDT</a>	Medium	Low	Medium	None
◐ <a href="#">Garden, Herb E.</a>	<a href="#">03:20 AM PDT</a>	Medium	Low	Medium	None
○ <a href="#">Kawehara, Aolani</a>	<a href="#">12:55 AM PDT</a>	Medium	Low	Medium	None

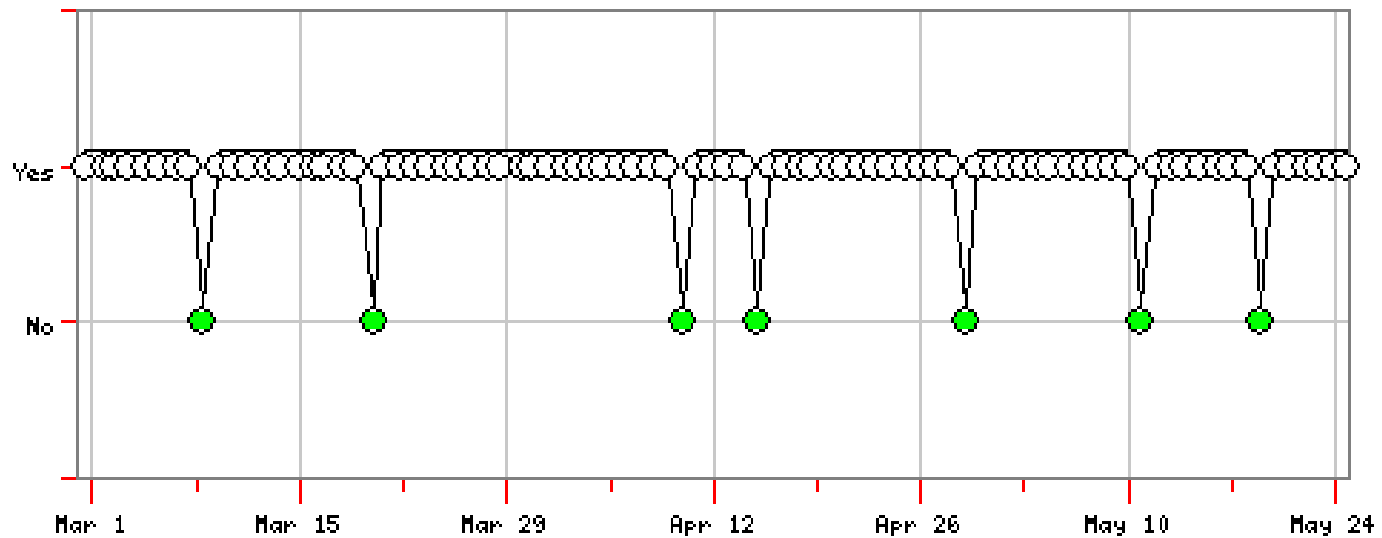


# How are you feeling today?



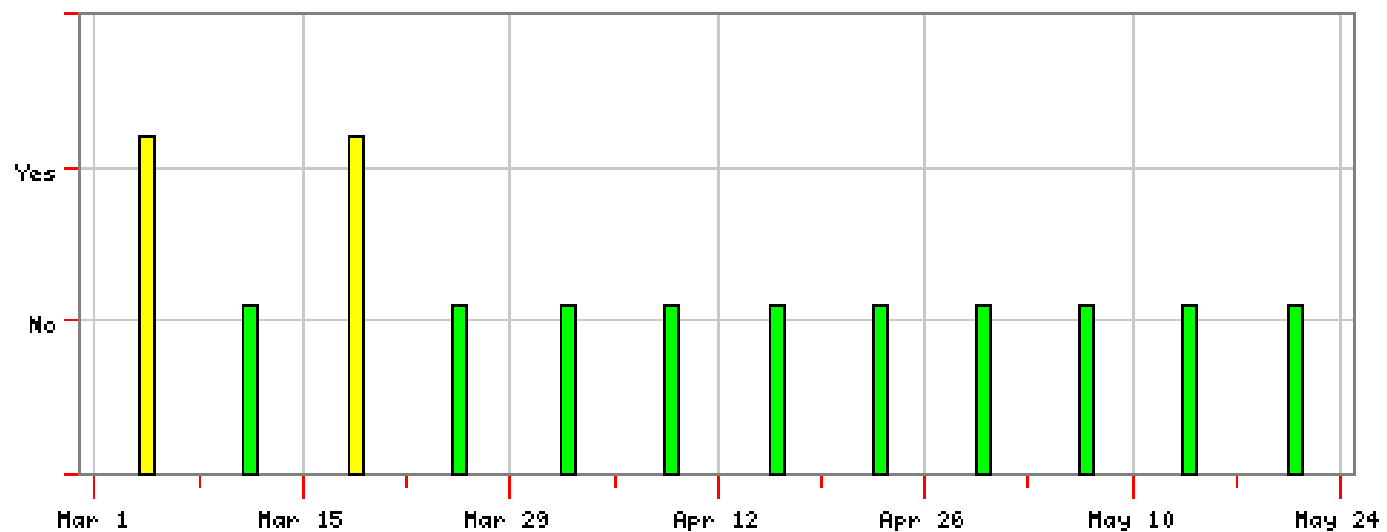
# Did you do your exercises yesterday?

Adherence to exercise



# Do you have shoulder pain today?

Should pain this week



**Assessment of physiological and psychosocial outcomes of home exercise with and without telehealth reinforcement**

# Data Collection and Outcomes

General Health Perception	SF 36V
Secondary Conditions	SCSI
Physical Activity Status	PAQ, PASIPD
Wheelchair ergometry	WAFT
Shoulder Function	HB Questions, Constant
Adherence	Amount of time spent
Satisfaction	Questionnaire

## Implementation Plan - Looking Ahead

- Continued refinement of Health Buddy content and case management strategies.
- Evaluation of cost-effectiveness is needed.
- Potential for dissemination within VA SCI Centers through National VA Contract with Health Hero Corp.
- Peripheral remote exercise monitoring is also available.
- Additional demonstration projects can include different patient populations, other clinical problems and telerehabilitation.





Health Buddy

Questions?

The logo for Rectech, featuring a stylized orange figure running or jumping to the left of the word "rectech" in a bold, black, sans-serif font.