

# **“Development of a STRONG Medicine Unit”**

(**S**trength **T**raining, **R**ehabilitation and **O**utreach to unidentified **N**eeds in **G**eriatric Medicine)

## **STRONG Medicine Unit Report on 12 months activity**

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## **Introduction**

I am happy to report the outcomes achieved 12 months into the **STRONG** therapy program.

I will present the outcomes in five areas:

1. Utilisation and implementation data
2. Safety
3. Health outcomes
4. Impact on health care system
5. Educational outreach

## Utilisation and Implementation data

Period June 1999 to July 2000.

### Total numbers

- 220 patients assessed
- 176 eligible (80%).
- Of those eligible a 30% drop out over the first year the majority (95%) in the first two weeks. of dropouts commonest reason was failure to turn up 42%, 11% sited musculoskeletal pain, other included death, moving, rectal bleed. 10% of people have been downloaded to another site over the year.

### Frequency and duration of training

- 47 assessment clinics performed
- Training sessions 7 per day 3\*week and two days 2 sessions = 1050 training sessions in the year.
- OOS- individual training sessions 4,289. Including initial assessments, ECG and medical reassessments. 4,700 oos.
  - 60% train twice a week
  - 20% train three times a week
  - 20% train once a week

### Demographics of the group

- Mean age  $75 \pm 6$  (42-97)
- 42% male 58% female
- 35% married
- 72% own their homes
- 60% earn less than \$15,000
- Chronic diseases 4+2
- Years of education  $10 \pm 4.0$
- Mini mental state score  $28 \pm 3$
- 41% veterans

### Reasons for referral

#### **Patient major reason for attending**

- Gait, balance and mobility problems 48%
- Depression 20%
- Deconditioning 17%

#### **Doctors reason**

- Arthritis 18%
- Depression 30%
- Sarcopenia 21%
- Gait and balance disorder 24%
- Diabetes 5%
- Parkinson's 3%

### Disease frequency in the group

Arthritis	70%
Cancer	10%
Cardiac failure	12%
Chronic lung disease	13%
Dementia	3%
Depression	30%
Diabetes	15%
Falls in last year	35%
Insomnia	13%
Joint replacement	10%
Obesity	10%
Osteoporosis with fracture	15%
Stroke	16%
Incontinence	10%
Parkinson's	5%
Requiring nutritional referral	35%
Angina	8%

### Summary

We have been able to recruit and screen 220 subjects in a year from over 50 general practitioners. Of all subjects prescribed STRONG therapy 80% completed their prescription in the first three months. Of the 20% who dropped out the vast majority were in the first two weeks. Over a one-year period 70% commenced are still training. Our population is typical in demographics and disease frequency with the 70-80 yo in large epidemiological studies. This is a positive aspect in generalising our results. No recruited patients were weight training prior to commencing STRONG therapy highlighting the lack of availability and use of this treatment. Patients were appropriately targeted for inclusion by disease with the majority of referrals for mobility problems. The cognitive ability of our group is high. We currently have between 75 people training per week and a waiting list of over six months for new referrals.

## Safety and compliance

### Adverse events for the group over 12 months

- No during exercise training cardiac event in 4,289 individual training sessions. Two patients developed UAP outside of the program over the year.
- One fall during exercise- no injury no fractures. Over the year: Fractures hip1, humerus 1, tib and fib 1.
- Surgery hip replacement 2 decompressive back surgery 2, knee replacement 1
- On testing one heart block on 6min walk, one angina,
- Over 700 1RM's tested with one minor muscle tear to the quadriceps on the leg press.
- No hospitalisation was related to the exercise program.
- Death was due to liver cancer; one subject also had bowel cancer diagnosed.

We have completed a policy and procedures manual.

### **Compliance in the subjects 0-3 months 87% +16**

- 0-6 months 77%
- 0-9 months 72%
- 0-12 months 71%

### Summary

Enrolled subjects are questioned weekly regarding adverse events. In this frail aged population we had no intraexercise cardiovascular or injurious falls, demonstrating that this high intensity weight training and balance program is extremely safe. The adverse cardiovascular outcomes were a patient who developed heart block during screening and had a pacemaker inserted and two patients who developed unstable angina unrelated to exercise which required referral to their GP.

The high intensity weight-training regimen and testing lead to one significant musculoskeletal injury requiring treatment. In the subjects who completed three months, compliance was extremely high for a non-research setting, as expected this reduced over a year to 70%. Would patients swallow 70% of their prescribed number of medications in a year?. This suggests palatability of prescription intensity, frequency and setting. This clinical program appears to be safe and able to be done at high intensity.

## Health outcomes

Statistical analysis was done with either a paired t test for continuous normally distributed data or a Wilcoxon sum rank test if not normally distributed. Results are reported as means  $\pm$  standard deviations. For all tables ns =  $p > 0.05$

### Total number of medications being taken by the group, a significant decrease in total number of medications used by three months.

- Baseline n=161, 4 $\pm$ 3 (0-15)
- 3 months n = 60, 3 $\pm$ 2 (0-11)\*\*
- 6 months, n=15, 3 $\pm$ 2.3

### Function

Self reported function NHANES questionnaire higher scores reflect more impairment of function.

\* means significantly different from baseline scores.

Function	0(n=161)	3(n=101)	6(n=40)	9(n=30)	12(n=15)	% 3 months
Arise(0-3)	1.0+1.0	<b>0.38+0.68*</b>	<b>0.41+0.59*</b>	<b>0.17+0.38*</b>	<b>0.07+0.8*</b>	62
Dressing(0-3)	0.45+0.73	<b>0.28+0.59*</b>	<b>0.23+0.48*</b>	<b>0.14+0.35*</b>	0.36+0.35	38
Eating(0-3)	0.55+0.5	0.5+0.8	0.5+1.0	0.34+0.61	0.07+0.27	0
Errands(0-3)	1.71+1.2	<b>1.33+1.27*</b>	<b>1.4+1.25*</b>	<b>0.73+0.92*</b>	<b>0.71+0.99*</b>	22
Grip(0-3)	0.31+0.62	<b>0.18+0.5*</b>	0.41+0.79	<b>0.17+0.54*</b>	0.21+0.58	41
Hygiene(0-3)	1.74+1.29	1.59+1.37	1.62+1.35	1.2+1.3	1.36+1.34	8
Reach(0-3)	0.8+0.9	<b>0.4+0.7*</b>	<b>0.4+0.6*</b>	<b>0.4+0.5*</b>	<b>0.4+0.8*</b>	50
Walk(0-3)	0.9+1.0	<b>0.6+0.9*</b>	0.8+1	<b>0.6+0.7*</b>	<b>0.3+0.6*</b>	30
Total disability (0-3)	0.9+.64	<b>0.66+0.54*</b>	<b>0.7+0.5*</b>	<b>0.5+0.4*</b>	<b>0.38+0.28*</b>	27

### Physiological function and performance based testing

Variable	Baseline N=161	3 mo N=101	6mo n=40	9 mo n=30	12 mo n=15	improved
Habitual gait/speed (m/s)	0.98 $\pm$ 0.3	1.1 $\pm$ 0.3*	1.1 $\pm$ 0.3*	1.2 $\pm$ 0.2*	1.3 $\pm$ 0.3*	22%
Maximal gait/speed (m/s)	1.4 $\pm$ 0.5	1.6 $\pm$ 0.7*	1.6 $\pm$ 0.5*	1.7 $\pm$ 0.5	1.84 $\pm$ 0.8	21%
Timed 5 chair rise (sec)	16.4 $\pm$ 9	12.8 $\pm$ 7*	10.4 $\pm$ 3.5*	8.8 $\pm$ 2.5	8.4 $\pm$ 2.3	21%
6 minute walk dist(m)	437 $\pm$ 151	480 $\pm$ 150*	491 $\pm$ 133*	529 $\pm$ 124	551 $\pm$ 147	20%
Tandem stand (sec)	9.9 $\pm$ 5.8	13.1 $\pm$ 3.6*				32%
Tandem gait walk(m/s)	0.2 $\pm$ 0.1	0.3 $\pm$ 0.1*	0.4 $\pm$ 0.1*	0.4 $\pm$ 0.2*		50%
Tandem gait walk/ number errors	4.2 $\pm$ 3.6	2.4 $\pm$ 2.4*	2.1 $\pm$ 2.5*	2.7 $\pm$ 3.2		48%

**Strength gains%**

	<b>3mo(n91)</b>	<b>6mo(n=40)</b>	<b>9mo(n=30)</b>
<b>Chest press</b>	27	32	35
<b>Shoulder press</b>	77	104	126
<b>Upright row</b>	40	45	50
<b>Knee extension</b>	47	58	51
<b>Knee flexion</b>	34	44	42
<b>Leg press</b>	22	24	44
<b>Lower limb</b>	34+26	42+23	41+31
<b>Upper limb</b>	46+43	60+48	70+76

**Quality of life SF36**

(range 0-100 higher scores reflect higher quality of life )

\*\* Indicates significant difference p&lt;0.05

SF36	<i>Normal Aust women 70-74 n = 11,000</i>	<i>Normal USA &gt;75yo N=264</i>	<b>STRONG n=160</b>	<b>3 months n=101</b>	<b>p value</b>
physical functioning	63+25	53+30	<b>52+26</b>	<b>56+28</b>	<b>ns</b>
role physical	57+43	45+41	<b>42+40</b>	<b>56+42</b>	<b>**</b>
bodily pain	65+27	60+26	<b>57+28</b>	<b>65+27</b>	<b>**</b>
general health	65+22	56+21	<b>61+21</b>	<b>65+21</b>	<b>**</b>
vitality	60+20	50+23	<b>50+22</b>	<b>55+22</b>	<b>**</b>
social functioning	81+25	73+28	<b>72+26</b>	<b>79+26</b>	<b>**</b>
role emotional	75+38	63+42	<b>58+41</b>	<b>66+39</b>	<b>ns</b>
mental health	76+17	74+20	<b>65+22</b>	<b>73+16</b>	<b>**</b>

**Geriatric Depression Scale**

(GDS higher scores more depressed)

GDS	Baseline	3 months	6 months	9 months	p
total group (n=161)	10.0+6	8.0+6	7+7	9+7	<b>**</b>
Depressed ( n=47)	13.0+6	9.0+5	9.0+4		0.1

**Pittsburgh Sleep Quality Index**

(PSQI higher scores reflect worse sleep)

PSQI	Baseline	3 months	p value
Total group	7.4+4	6.4+4	0.03**

No significant change in activity levels, self-efficacy or arthritis measures as a total group

**Nutritional component****36% of patients seen referred to the dietitian**

<b>Recommendation</b>	<b>baseline kg</b>	<b>3 month kg</b>
<b>Weight gain(56%)</b>	58.1 $\pm$ 13 (n=28)	60.7 $\pm$ 10 (n=18)
<b>no advice (64%)</b>	74.7 $\pm$ 14	77.0 $\pm$ 13
<b>Weight loss(37%)</b>	97.3 $\pm$ 22 (n=19)	93 $\pm$ 20 (n=14)

It appears that we are affecting weight in the direction intended by nutritional advice.



## Example of disease specific results

Results in 10 Parkinson's patients over six months

72 yo (60-82). 4.6 chronic diseases, medications 5.6, 30% had depression.

### Physiology

Strength increased by 36% at 3 months and 50% by 6 months.

	Baseline	3 months	6 months	% Change
Chair rise *5	13	10	8	40
Gait speed m/s	0.97	1.06	1.17	20
Distance m 6 min	470	527	576	22

Function	Baseline	3 months	6 months	% Change
Walking	1.33	0.4	0.2	85
Errands	2.3	1.8	1.4	40
Transfers	1.1	0.6	0.4	63
Dressing	0.44	0	0.2	50
Eating	1.4	1.8	1.2	14
Reach	0.8	0.2	0.4	50
Disability	1.3	0.87	0.77	40

Activity levels improved by over 50%

GDS or depression score was reduced by 66% (12 to 4)

QoL, vitality, mental health, physical performance and general health were all improved.

Compliance was 80%, no increase in falls and no major injuries.

### Summary

Despite Parkinson's disease being a central problem it appears appropriate exercise will improve abnormalities such as weakness gait and balance problems, functional performance and depression.

## Patient satisfaction

Patient rating of their enjoyment and perceived improvement in the condition for which they joined the program on a Likert scale (1-5) with 5 being the maximal enjoyment or improvement imaginable

Satisfaction	3m N=85	6m N=30	9m N=29	12m N=10
Enjoyment	4.4+0.5	4.5+0.9	4.4+1.0	4.8+0.7
Helped problem	4.1+1.1	4.2+1.0	4.5+0.8	4.6+0.7
Kindness	5.0+0	4.9+0.3	5.0	5.0

- 37% drove themselves
- 11% driven by a family member
- 9% taxi
- 7% walked
- 33% public transport

88% of people surveyed at three months wished to continue, at six months 90% wished to continue.

In nominating what they felt the program had improved 60% said, general health, strength, mobility or mood, 3% said nothing had improved. In response to what had gotten worse over this period 70% said nothing, 16% said some joint pain.

In response to where would they like to continue training 85% said the current setting, 6% said at home and 9% said a gym.

In response to how could we improve the program 82% said nothing, other suggestions included air conditioning, more space, aerobic equipment, abdominal exercises, a sauna etc.

## Impact on the Health Care System

### Referral sources

60 different general practitioners have referred patients. The clinic now has a lengthy waiting list and self generates its referrals

### Piloting of other units

We have established links with the Uniting churches aged care facilities locally and have set up a strength-training gymnasium in one of their nursing homes. We are screening their hostel clients at the STRONG clinic and have trained the coordinator of their program in screening assessment and training after a two-month internship at the STRONG unit.

## Educational Outreach

We have now incorporated attachments of Sydney University exercise physiology students, advanced trainees in geriatrics, medical students from Sydney university year 5.

### Summary

The educational outreach is now infiltrating into mainstream clinical practice on the wards to undergraduate curriculum in exercise physiology at the University and the clinical training program for doctors in geriatric medicine. The seminars conducted at our Lucan care site have now seen an extension into institutional living settings for all professionals involved in clinical care.

## Summary

Our major findings 12 months into the STRONG experiment are in a targeted group of diverse individuals and diseases we have significantly improved function, QOL, depression and physical performance. These findings in a clinical treatment program for the elderly selected for a wide variety of disease are previously undemonstrated. The continual strength gains with approximately 50% of gains in the first three months are exactly what has been found in highly controlled research settings. Gait speed, distance walked, getting in and out of a chair and balance all improved about 20-50%. Self-rating of functions involving both upper and lower limbs such as walking, reaching, gripping, transferring, dressing and performing errands were all significantly improved. The improved measures of physical performance may be translating into better function and quality of life. Patient's mental health, vitality, emotional role, bodily pain, social functioning all improved. Sleep and depression measures improved in the group as a whole. The addition of nutritional support to our model of care appears to be assisting our goals. We are now able to look at specific diseases and whether the program is having an effect. The example of Parkinson's disease where treatment concentrates on central replacement of dopamine, yet in our program where medications have remained stable over the six months improvements in function and physical capabilities are marked.

Subjects enjoy the high intensity program and see a major change in the health problem for which they presented. They rate our program at a high level. We have worked hard on appropriate training to exact physiological change in our patients; this appears to be giving us changes similar to research laboratory controlled trials of weight lifting. Despite this emphasis on high intensity we have a safe program with few adverse events and possible reduction in medications.