



Centre universitaire de santé McGill
McGill University Health Centre

*Les meilleurs soins pour la vie
The Best Care for Life*

DIVISION DE NEPHROLOGIE
NEPHROLOGY DIVISION



Physical impairment and exercise in patients with chronic kidney disease

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Overview

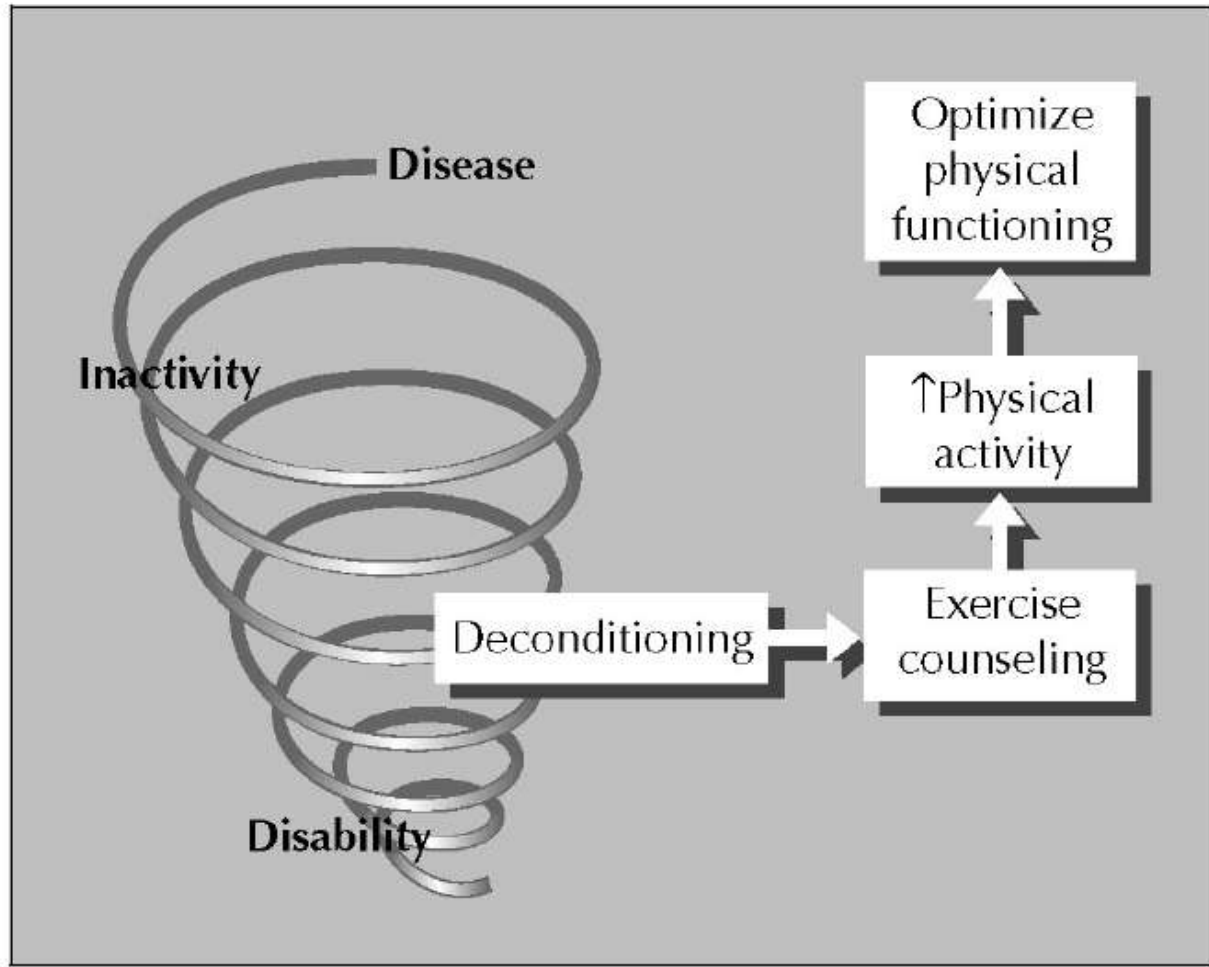
- Why, who, when, how?
- Existing exercise guidelines
- Assessment tools
- Research highlights
- Wellness & Ex. counseling clinics
- Conclusion

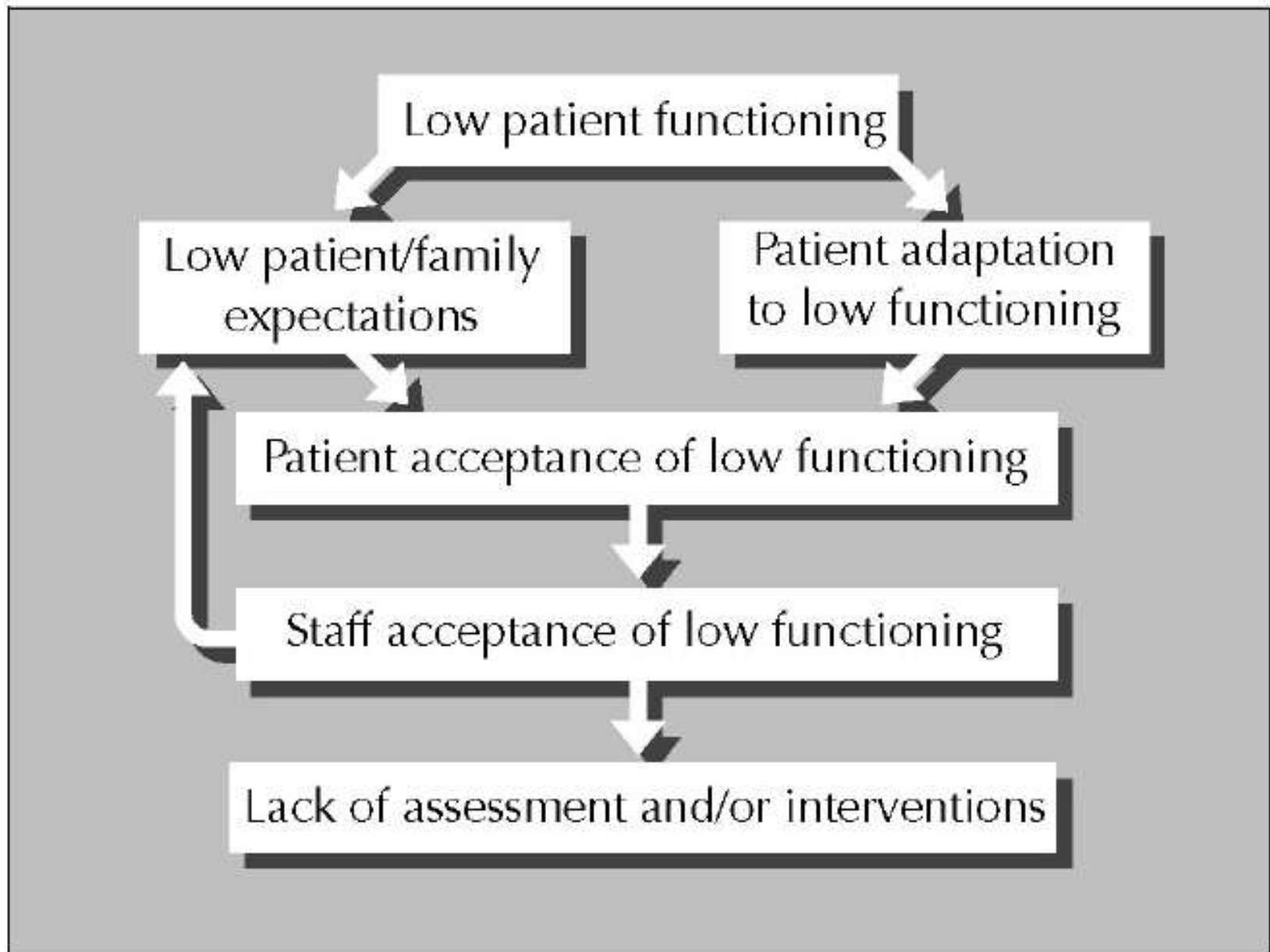
Case

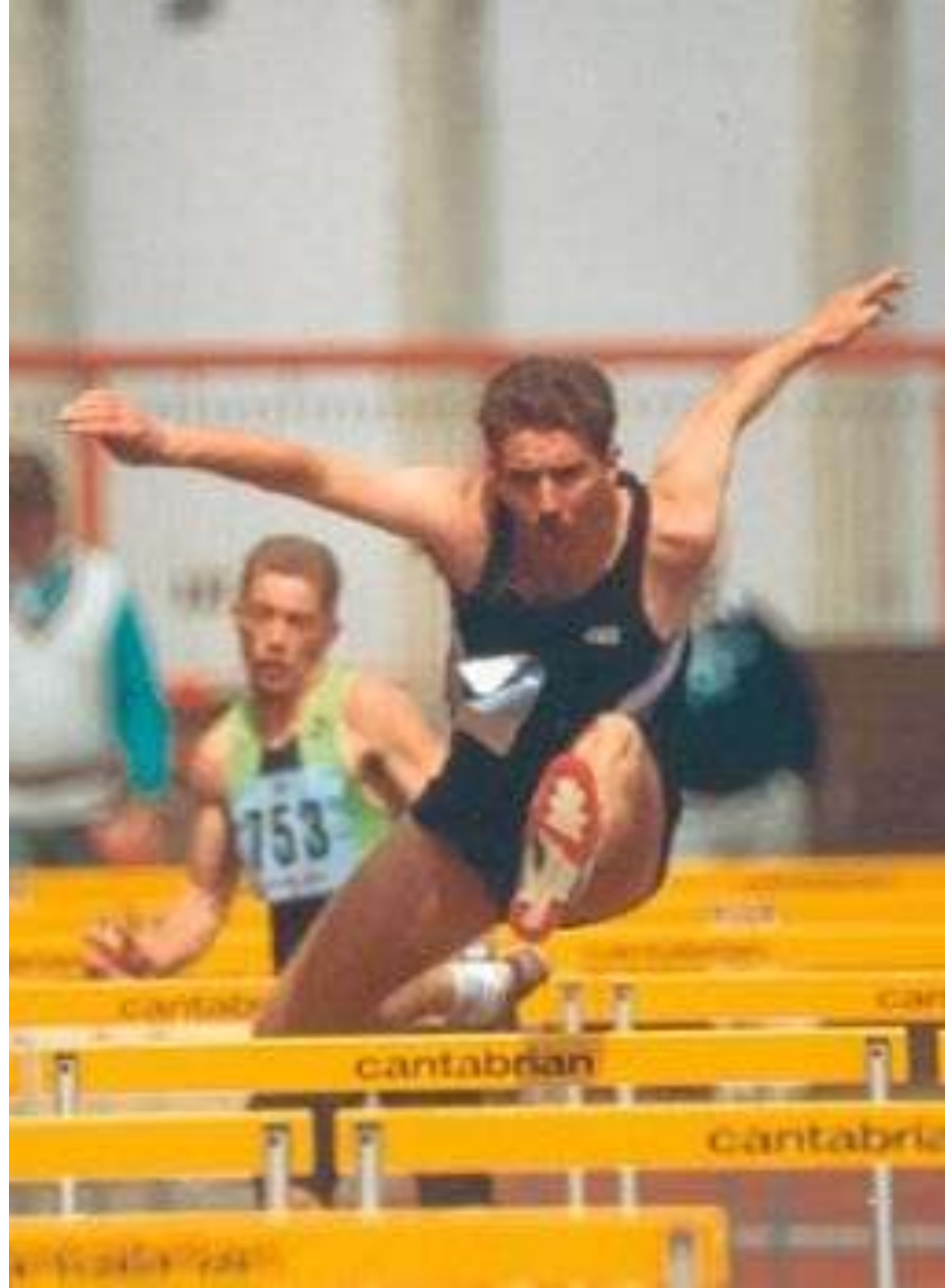
- 54 year old, 2 years post DDKTx
- GFR stable, no rejection
- 20 kg weight gain post Tx
- DM, hypertension
- Sedentary lifestyle
- Encouraged to exercise

Typical patient profile

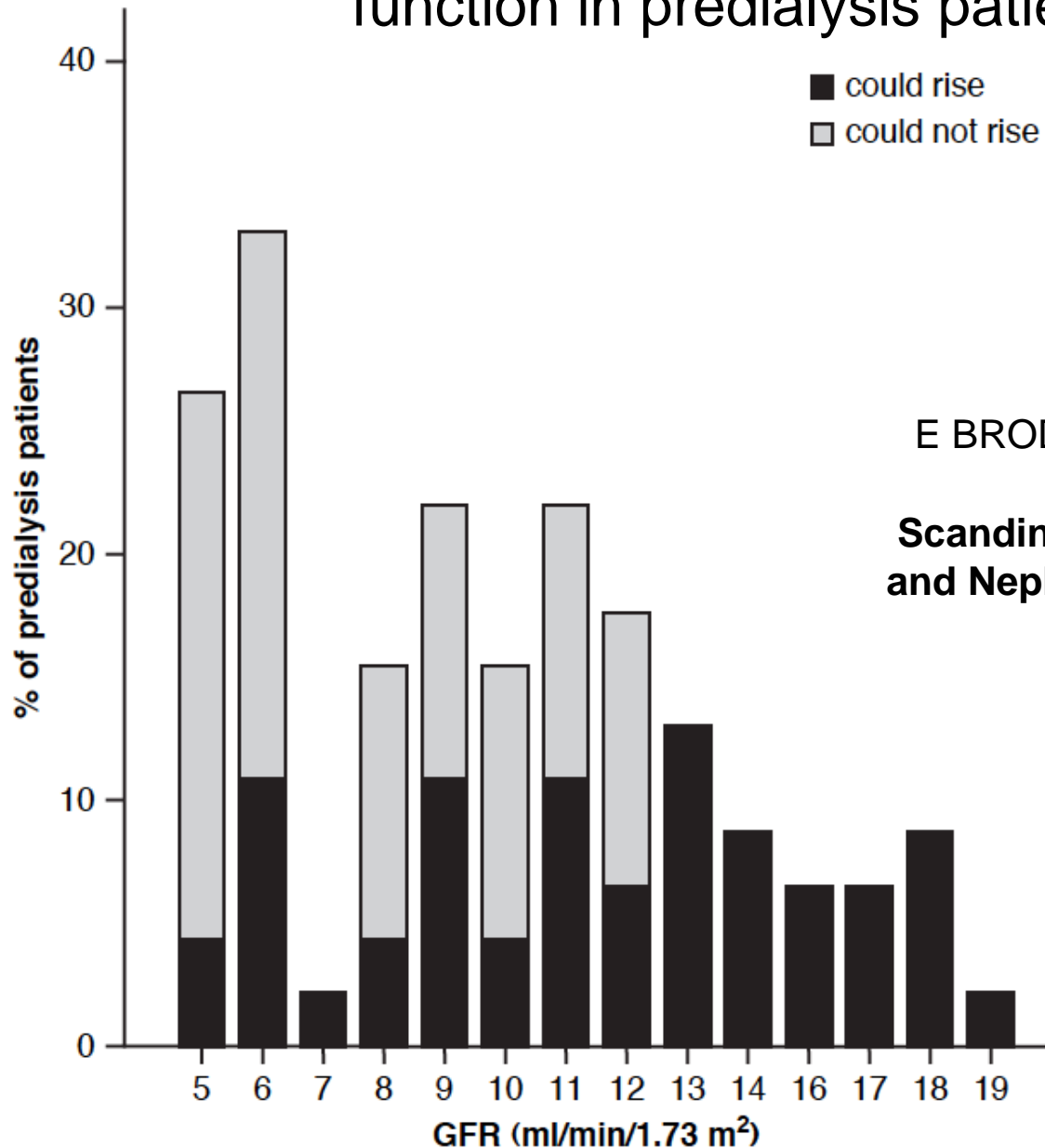
- Chronic disease
- Multiple co-morbidities
- Aging
- Sedentary lifestyle







Rising from a chair: A simple screening test for physical function in predialysis patients

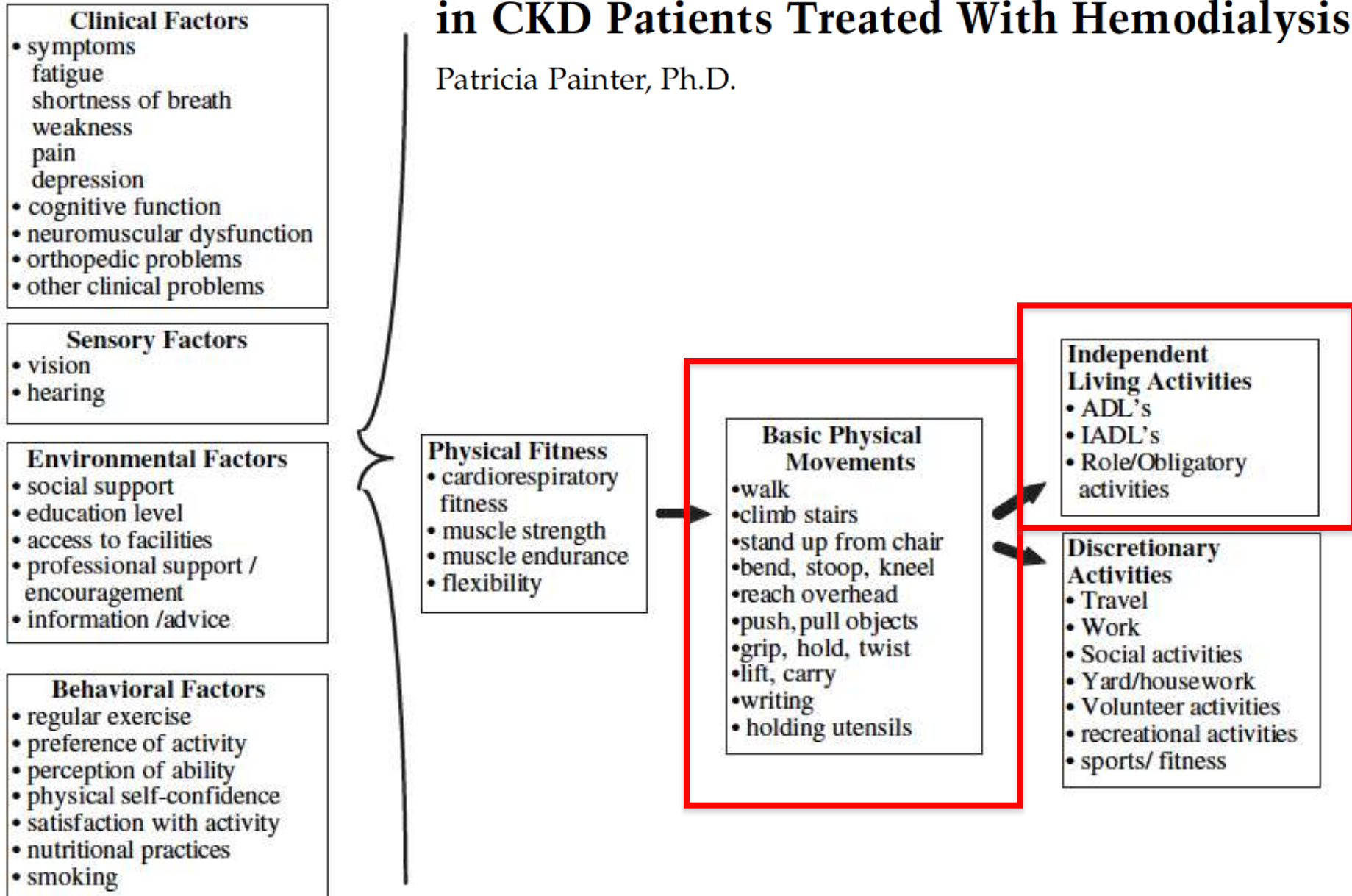


E BRODIN et al.:

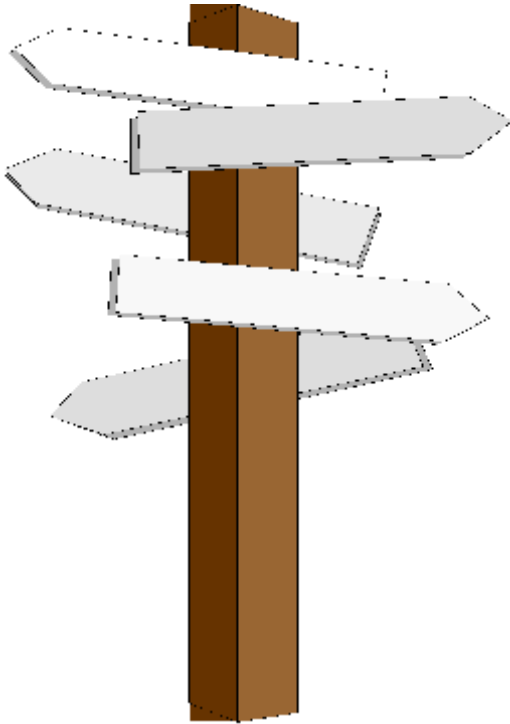
**Scandinavian Journal of Urology
and Nephrology, 2008; 42: 293300**

Determinants of Exercise Capacity in CKD Patients Treated With Hemodialysis

Patricia Painter, Ph.D.



The 5 E's of rehabilitation



- **Exercise**
- Encouragement
- Education
- Evaluation
- Employment

Exercise - definition

- Activity requiring physical effort, done especially as training or to **sustain or improve health**

NEW USDA DIETARY GUIDELINES

AVOID
FATTY
MEATS

GET
DAILY
EXERCISE

EAT
YOUR
VEGGIES



Cox &
Forkum
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Effects of CKD

- Reduced physical function
- Inflammation/malnutrition
- Obesity
- Cardiovascular disease
- Metabolic syndrome
- Depression, impaired QoL
- Disability

Effects of exercise

- **Improved physical fitness/function**
- **Reduced inflammation**
- **Favorable body composition**
- **Better BP control**
- **Better metabolic control**
- **Reduced anxiety**
- **Better functional status**
- **Improved QoL**

Prescription for patients

Cardiovascular exercise:

- Mode (walk, jog, cycle, swim)
- Frequency (4-5 days/week)
- Intensity (65-80% PHR, 12-15 RPE)
- Duration (>30 min of cont. ex.)
- Progression (int. to cont.)

rating	description
6	NO EXERTION AT ALL
7	EXTREMELY LIGHT
8	
9	VERY LIGHT
10	
11	LIGHT
12	
13	SOMEWHAT HARD
14	
15	HARD (HEAVY)
16	
17	VERY HARD
18	
19	EXTREMELY HARD
20	MAXIMAL EXERTION

Rating of perceived exertion (Borg – 20)

Prescription for patients

Strengthening exercise:

- Mode (theraband, weights)
- Frequency (3-5 times/week)
- Sets (x3 for major muscle groups)
- Repetitions (12-15 of each exercise)
- Progression (increase gradually)

Prescription for patients

Special considerations:

- Gradual progression
- Weight management
- MSK and orthopedic discomfort
- Avoid infectious situations
- Role of drugs and rejections

Question

- Of the patients followed at your Centre, how many exercise according to the ACSM guidelines?
 - 1) 100%
 - 2) 65-70%
 - 3) 50%
 - 4) 30-35%
 - 5) < 10%

Self-Reported Physical Activity in Patients with End Stage Renal Disease

If you do not participate in regular activity, we are interested why. Please check all that apply.

Reason	Percent of Respondents Checking Item
I'm just not motivated	51.7%
I'm too tired	49.5%
I'm too sick	24.0%
I don't have any place to exercise or any exercise equipment	21.4%
I don't know what to do	15.5%
I don't have time	12.4%
I feel sad	6.5%
I don't think it's good for me	5.5%

Self-Reported Physical Activity in Patients with End Stage Renal Disease

Have you noticed any of the following as a result of exercise or physical activity?
Please check all that apply.

Benefits	Percentage of Total Respondents Checking Item
Improved Energy Levels	61.8%
Improved muscle strength	60.1%
Enhanced ability to do the things I need to do in life	56.7%
Improved sleep	46.0%
Improved mood	43.3%
Improved Blood pressure	35.2%
Less cramping	26.0%
More stable blood pressure during dialysis	21.2%

Self-Reported Physical Activity in Patients with End Stage Renal Disease

What do you think is the best way to get people with kidney disease to increase their physical activity? (please mark 1 as very important, 2 as somewhat important and 3 as not at all important)

Suggestion	Percentage of Respondents Rating "Very Important" N(%)*
Encouragement and recommendations from the doctor	973 (56.30%)
Making it part of the routine education of patients when they get kidney disease	968 (54.03%)
Encouragement from family and friends	1005 (51.84%)
Encouragement from health care team	941 (50.58%)
Participation in a supervised exercise program (such as cardiac rehab)	889 (39.03%)
Encouragement from other patients	851 (29.02%)

* Not all respondents rated each suggestion, thus the N for each suggestion is presented.

Profile of exercise behaviour in a sample of renal Tx patients

- 208 kidney Tx patients
- 42.3% sedentary
- 57.7% formal exercise program
- **Only 7% meeting the ACSM guidelines**

Assessment tools

- Cardio-Pulmonary Ex. Test (CPET)
- Six Minute Walk Test (6MWT)
- Duke Activity Status Index (DASI)

What is Cardiopulmonary Exercise Testing (CPET)?

- Measurement of rate of oxygen uptake ($\dot{V}O_2$), rate of CO_2 production ($\dot{V}CO_2$), minute ventilation and other ventilatory parameters while monitoring 12-lead ECG, BP and O_2 saturation during **maximal “symptom-limited” exercise**

CPET (VO_2)

Indications:

- Evaluate aerobic capacity (ml/kg/min)
- Assess exercise-limiting factors
- Screen high risk patient for exercise safety
- Determine exercise Rx for rehabilitation



Contraindications to CPET

- acute ischemic changes on ECG
- unstable angina
- uncontrolled CHF
- uncontrolled dysrhythmia
- third-degree AV block
- uncontrolled hypertension (SBP>250, DBP>120)
- thrombophlebitis or intracardiac thrombi
- acute myocarditis or pericarditis
- severe AS
- acute febrile illness
- O₂ saturation < 85% on RA

CPET (VO_2)

Resting oxygen consumption

3.5 ml/kg/min = 1 metabolic equivalent of
task (**MET**)

Physical Activity	MET
Light Intensity Activities	
sleeping	0.9
watching television	1.0
writing, desk work, typing	1.8
walking, 1.7 mph (2.7 km/h), level ground, strolling, very slow	2.3
walking, 2.5 mph (4 km/h)	2.9
Moderate Intensity Activities	
bicycling, stationary, 50 watts, very light effort	3.0
walking 3.0 mph (4.8 km/h)	3.3
calisthenics, home exercise, light or moderate effort, general	3.5
walking 3.4 mph (5.5 km/h)	3.6
bicycling, <10 mph (16 km/h), leisure, to work or for pleasure	4.0
bicycling, stationary, 100 watts, light effort	5.5
Vigorous Intensity Activities	
jogging, general	7.0
calisthenics (e.g. pushups, situps, pullups, jumping jacks), heavy, vigorous effort	8.0
running jogging, in place	8.0
rope jumping	10.0

Energy Cost of Activities

10 METS

Cycle 200 watts
Run 6 mph



Carry groceries up stairs

Walk up stairs

Golfing (carry clubs)

Digging the garden

5 METS

Walk 3.5 mph

House cleaning, shopping

Dressing, grooming, showering

Walk 1.5 mph

Threshold for Independence

Severe functional impairment

1 MET

Resting, watch TV



CPET (VO_2)



- Safe (symptom-limited VO_{2peak})
- Recommended for high risk patients prior to beginning exercise program
- Can also be used to assess treatment
- Costly

Do all patients need a CPET?

Six-Minute Walk Test

- Easy, inexpensive evaluation of physical performance
- Valid method to evaluate functional capacity in various populations
- Correlates with VO_{2peak} in CKD population

Functional capacity

1 MET 	Can you take care of yourself?
	Eat, dress, or use the toilet?
	Walk indoors around the house?
	Walk a block or two on level ground at 2 to 3 mph or 3.2 to 4.8 km per h?
4 METs 	Do light work around the house like dusting or washing dishes?
	Climb a flight of stairs or walk up a hill?
	Walk on level ground at 4 mph or 6.4 km per h?
	Run a short distance?
	Do heavy work around the house like scrubbing floors or lifting or moving heavy furniture?
Participate in moderate recreational activities like golf, bowling, dancing, doubles tennis, or throwing a baseball or football?	
Greater than 10 METs	Participate in strenuous sports like swimming, singles tennis, football, basketball, or skiing?

- A fundamental requirement in carrying out many of these activities of daily living (ADL) is primarily the ability to perform aerobic work

Duke Activity Status Index (DASI)

Can you...	Yes, with no difficulty. (score)
1. Take care of yourself, that is, eating, dressing, bathing, and using the toilet?	2.75
2. Walk indoors, such as around your house?	1.75
3. Walk a block or two on level ground?	2.75
4. Climb a flight of stairs or walk up a hill?	5.50
5. Run a short distance?	8.00
6. Do light work around the house like dusting or washing dishes?	2.70
7. Do moderate work around the house like vacuuming, sweeping floors, carrying in groceries?	3.50
8. Do heavy work around the house like scrubbing floors, or lifting or moving heavy furniture?	8.00
9. Do yard work like raking leaves, weeding or pushing a power mower?	4.50
10. Have sexual relations?	5.25
11. Participate in moderate recreational activities, like golf, bowling, dancing, double tennis, or throwing baseball or football?	6.00
12. Participate in strenuous sports like swimming, singles tennis, football, basketball or skiing?	7.50

Total Score _____

No points for "Yes, with some difficulty;" "No, I can't do this;" or "Don't do this for other reasons."
Adding the point values for all questions above scores the DASI.

Research highlights – Dr.
Stefan Mustata, University of
Calgary

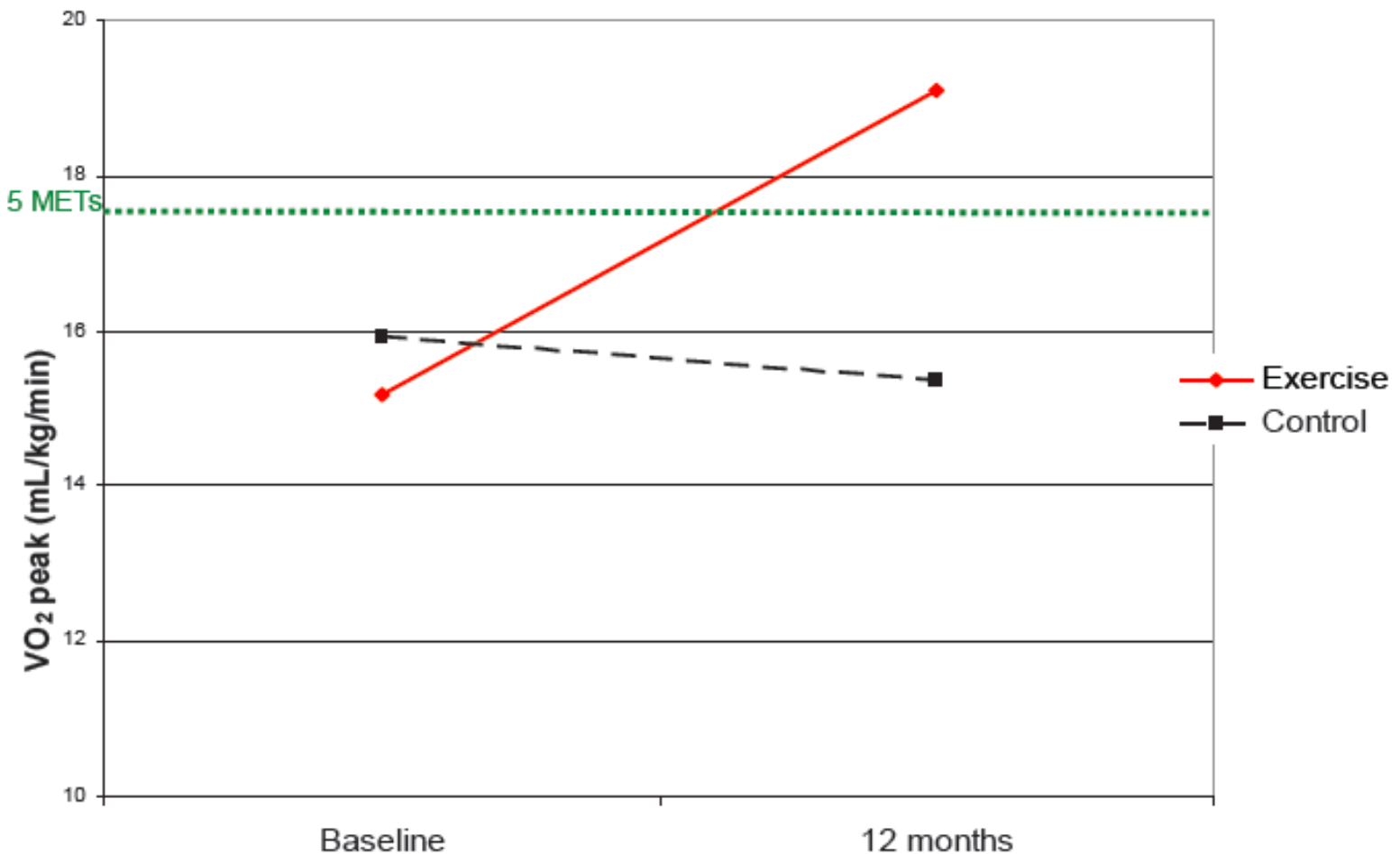
Numbers

- Six years of local experience at the University of Calgary
- > 100 patients (CKD, HD and TX)
- ~ 400 cardiopulmonary exercise tests
- > 300 supervised exercise classes

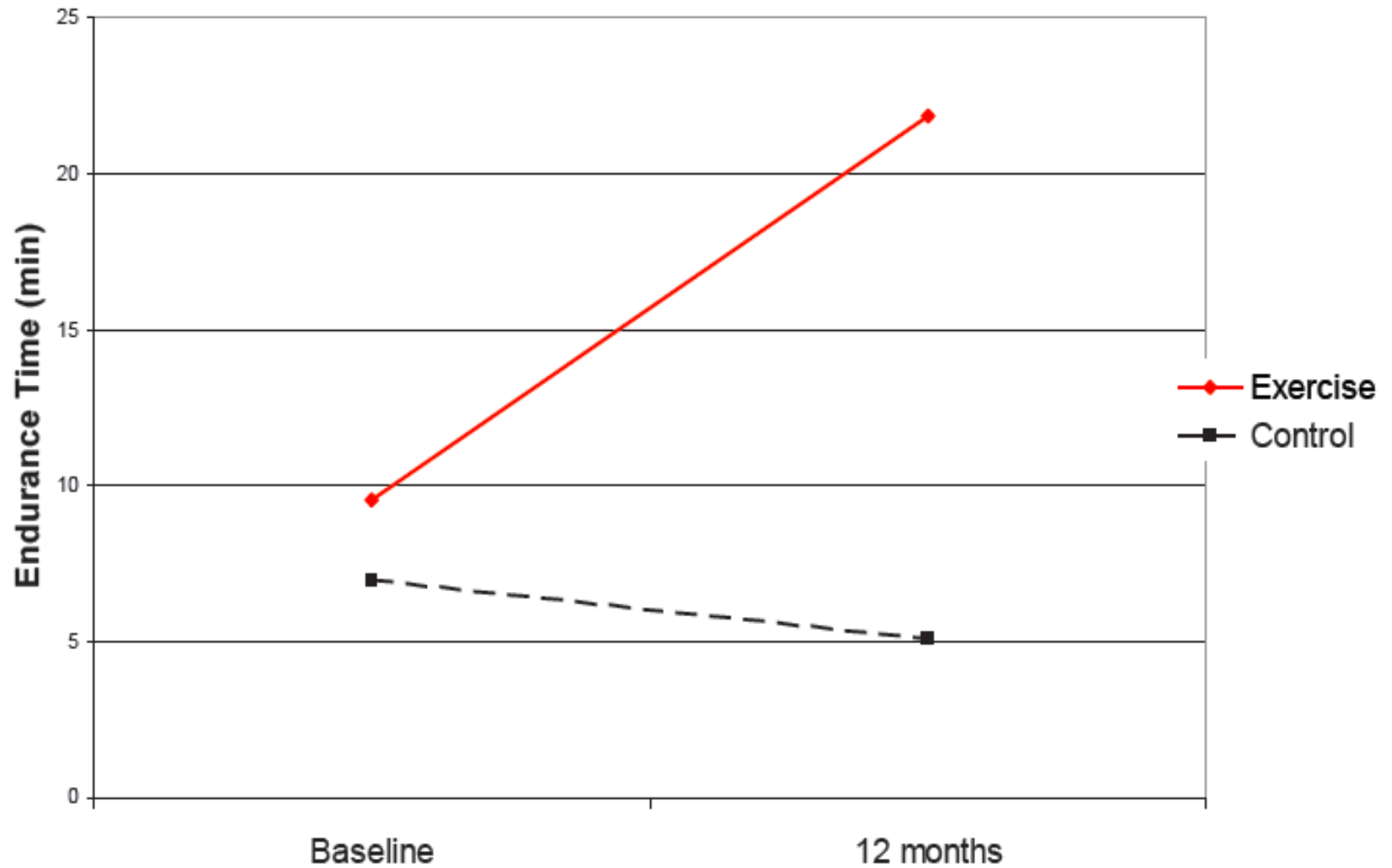
Pilot project

- Effects of exercise training on physical impairment, arterial stiffness and quality of life in patients with chronic kidney disease
- 20 patients with CKD randomized to exercise vs standard care and followed for 1 yr

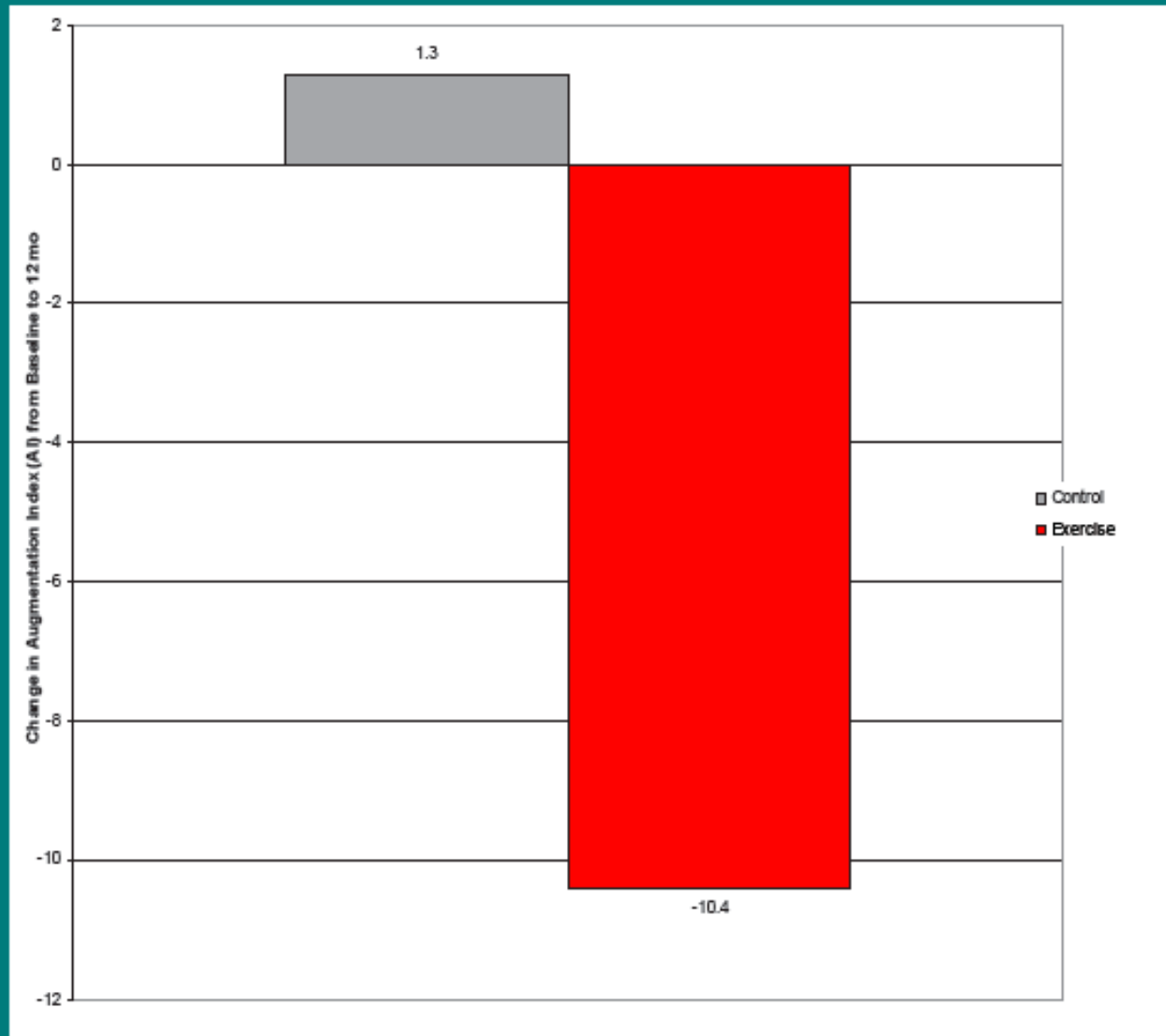
Results - VO_2 peak



Results – endurance time



Results – arterial stiffness

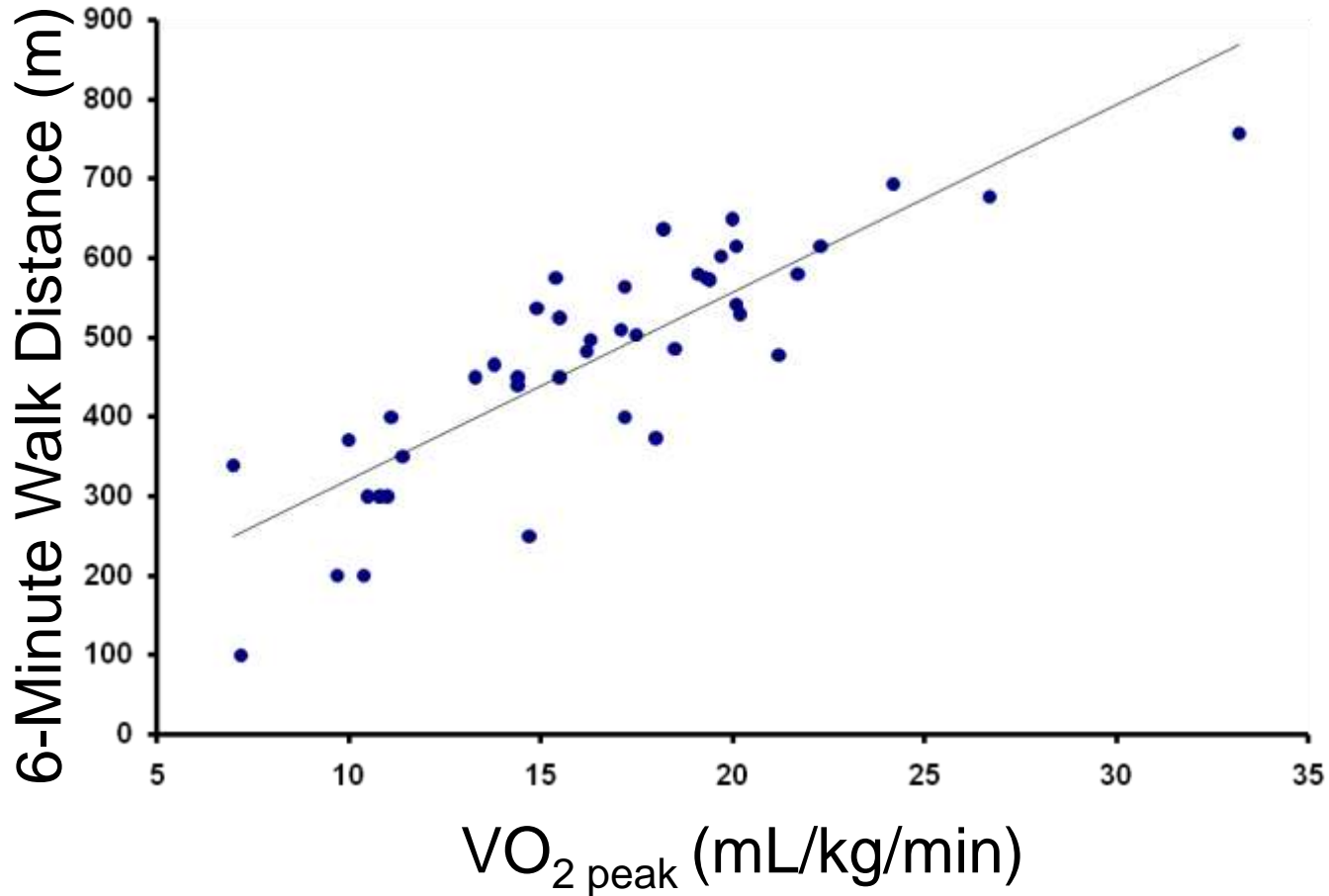


Validating the 6MWT in patients with CKD

Six-Minute Walk Test

- Easy, inexpensive evaluation of physical performance
- Valid method to evaluate functional capacity in various populations
- Correlates with VO_{2peak} in CKD population

6MWT results



$r = 0.85$
($P < .001$)

Duke Activity Status Index

- Reliability and validity of the Duke Activity Status Index for assessing aerobic capacity in patients with chronic kidney disease

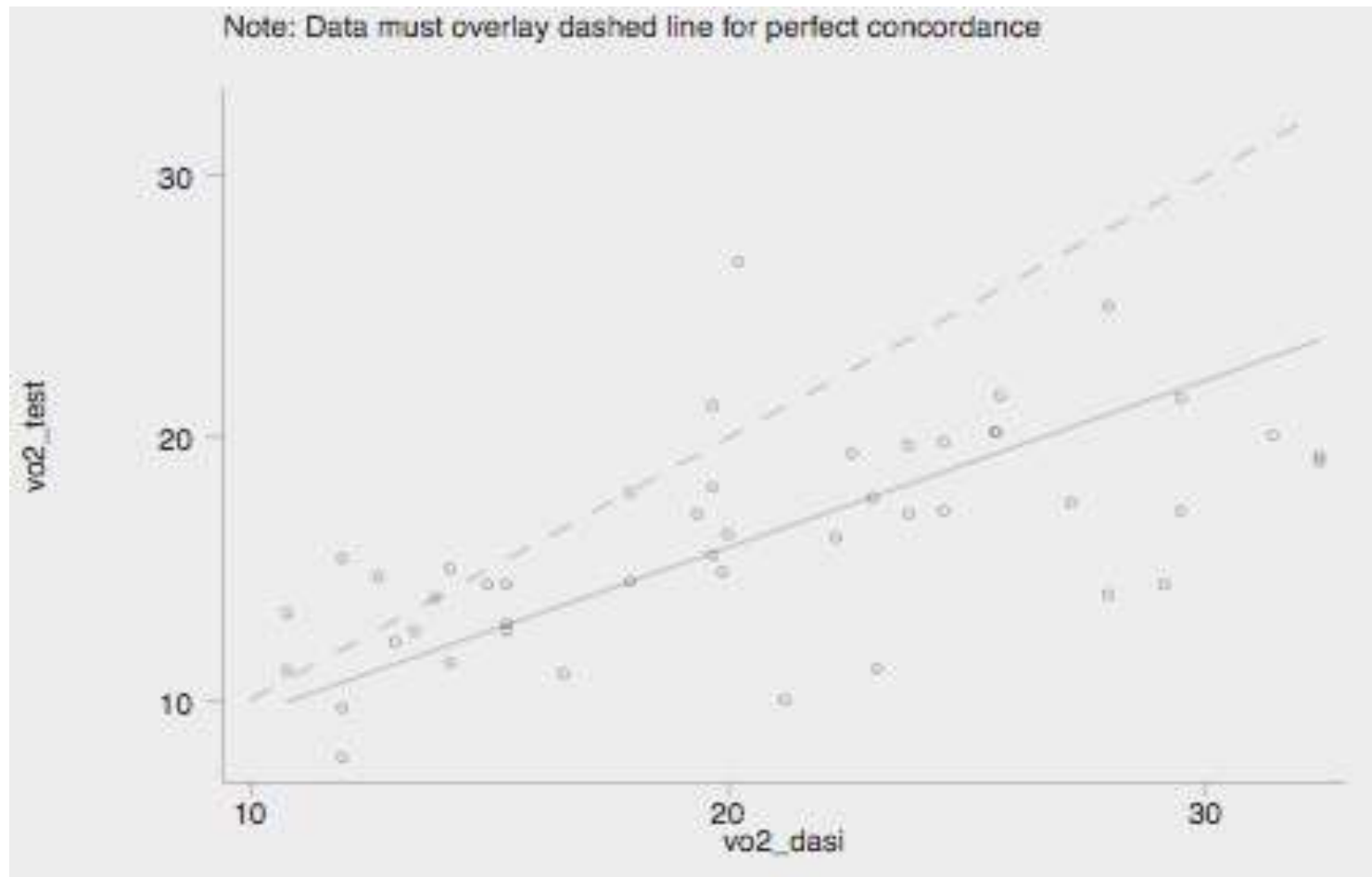
Duke Activity Status Index (DASI)

Can you...	Yes, with no difficulty. (score)
1. Take care of yourself, that is, eating, dressing, bathing, and using the toilet?	2.75
2. Walk indoors, such as around your house?	1.75
3. Walk a block or two on level ground?	2.75
4. Climb a flight of stairs or walk up a hill?	5.50
5. Run a short distance?	8.00
6. Do light work around the house like dusting or washing dishes?	2.70
7. Do moderate work around the house like vacuuming, sweeping floors, carrying in groceries?	3.50
8. Do heavy work around the house like scrubbing floors, or lifting or moving heavy furniture?	8.00
9. Do yard work like raking leaves, weeding or pushing a power mower?	4.50
10. Have sexual relations?	5.25
11. Participate in moderate recreational activities, like golf, bowling, dancing, double tennis, or throwing baseball or football?	6.00
12. Participate in strenuous sports like swimming, singles tennis, football, basketball or skiing?	7.50

Total Score _____

No points for "Yes, with some difficulty;" "No, I can't do this;" or "Don't do this for other reasons."
Adding the point values for all questions above scores the DASI.

DASI reliability



DASI

- Reliable and valid tool to estimate $VO_{2\text{peak}}$
- Easy screening test
- Cost-efficient



**Southern Alberta Transplant Program
Wellness Clinic**

Patient-centered approach

Departments (Fragmented Care) Matrix (Continuity of Care)



Strengths

- Maintains and develops professional standards
- Allows economy of scale by sharing resources

Weaknesses

- No integration of functions
- No managerial focus for programs that require combined effort
- Discourages interaction among Departments
- Allows territorialism

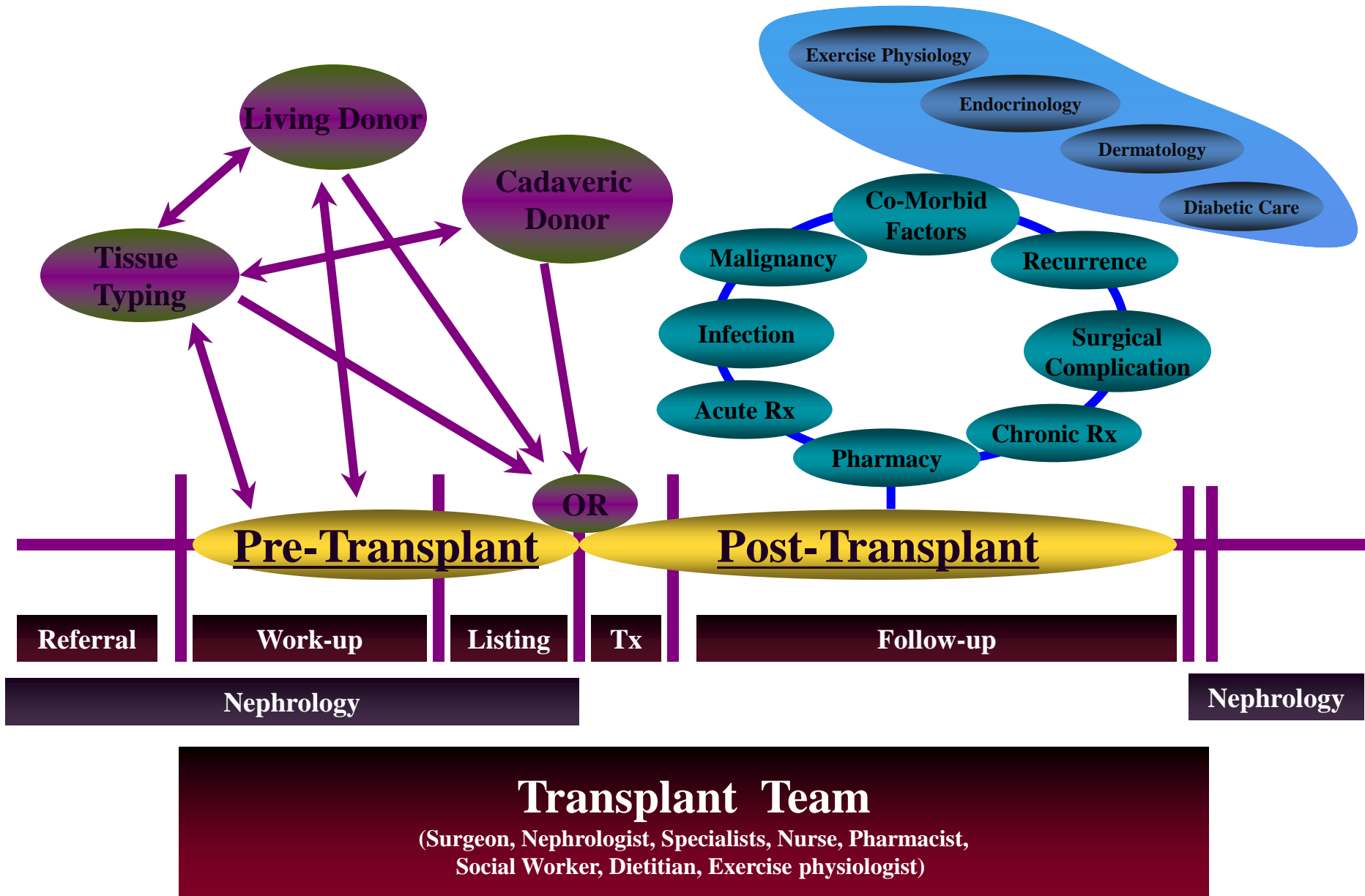
Strengths

- Encourages a multi-disciplinary approach
- Can greatly improve performance

Weaknesses

- Integrative managers do not control resources needed to deliver service
- Can place conflicting demands on functional departments
- Can be costly

Kidney/Pancreas Transplant



Case

- 54 year old, 2 years post CKTx
- GFR stable, no rejection
- 20 kg weight gain post Tx
- DM, hypertension
- Sedentary lifestyle
- Encouraged to exercise

This nurse keeps telling me I'm supposed to be more active, BUT.... she just doesn't realize how tired I feel all the time.

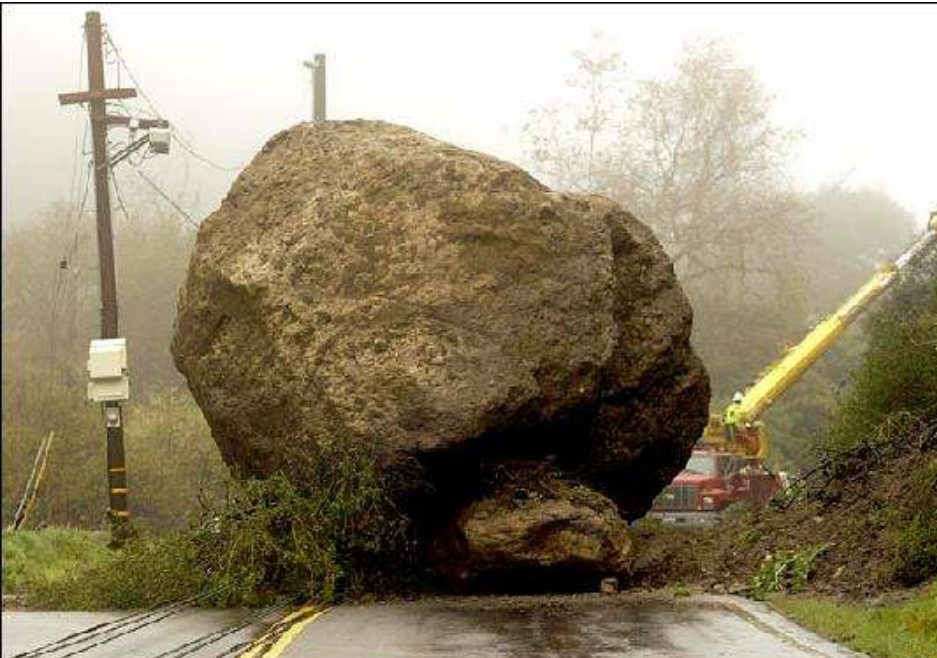
My doctor told me that walking would be good for me, BUT....I'm just not sure I can walk long enough for it to make a difference.

I probably should do more exercise, BUT....I tried before and wasn't very successful.

My family thinks that exercise might help me, BUT....can't they see how worried I am about my health getting worse.

Exercise might be fine for those people, BUT....my situation is not like theirs

How can I get around these roadblocks?



Health care team with exercise physiologist



Role of exercise physiologist

- Counseling
- Ex. test, prescription & supervision
- Program development & evaluation
- Patient ‘coaching’ & education
- Staff education & research

Exercise prescription

- Current health status
- Risk factors profile
- Exercise/functional test results
- Behavioural characteristics
- Individual' s needs, goals, preferences
- Response to exercise

Exercise for life

- Motivation
- Goals
- Priorities and planning
- Self-monitoring
- Strategies to overcome barriers
- On-going support and encouragement

Exercise counseling clinic

- Referrals (Nephrologist, RN, RD, self)
- MD - Brief Medical Assessment
- Ex. Physiologist - Motivational Interviewing
- Monthly follow-up (phone/email)
- Clinic outcomes:
 - DASI (functional capacity)
 - EQ-5D (quality of life)
 - 30s chair stand (lower limb strength)
 - Hand grip (upper limb strength)

Numbers

- 34 pts seen, age 40-88 (mean 62), BMI 18-52 (mean 31)
- 5 pts unable to do chair stand test

	All	Female	Male
VO _{2DASI} (ml/kg/min)	19.6	17.3	21.3
Hand Grip (kg)	59	46	70
¹ General population averages		51-57	88-95
30 s Chair Stand (#)	12	11	12
² General population averages		15-17	16-19
EQ-5D VAS	62.5	58.7	65.4

Exercise as medicine

- Patient – Person
- Disease - Condition
- Loss of control – Control
- Dependence – Independence

Conclusion

- Exercise interventions are needed in the CKD population
- Exercise is safe
- Long term follow-up is necessary
- Exercise physiologist plays key role



“My doctor told me to start my exercise program very gradually. Today I drove past a store that sells sweat pants.”