Strategies for Reducing Volume Overload in CKD Patients

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Global Renal EXercise

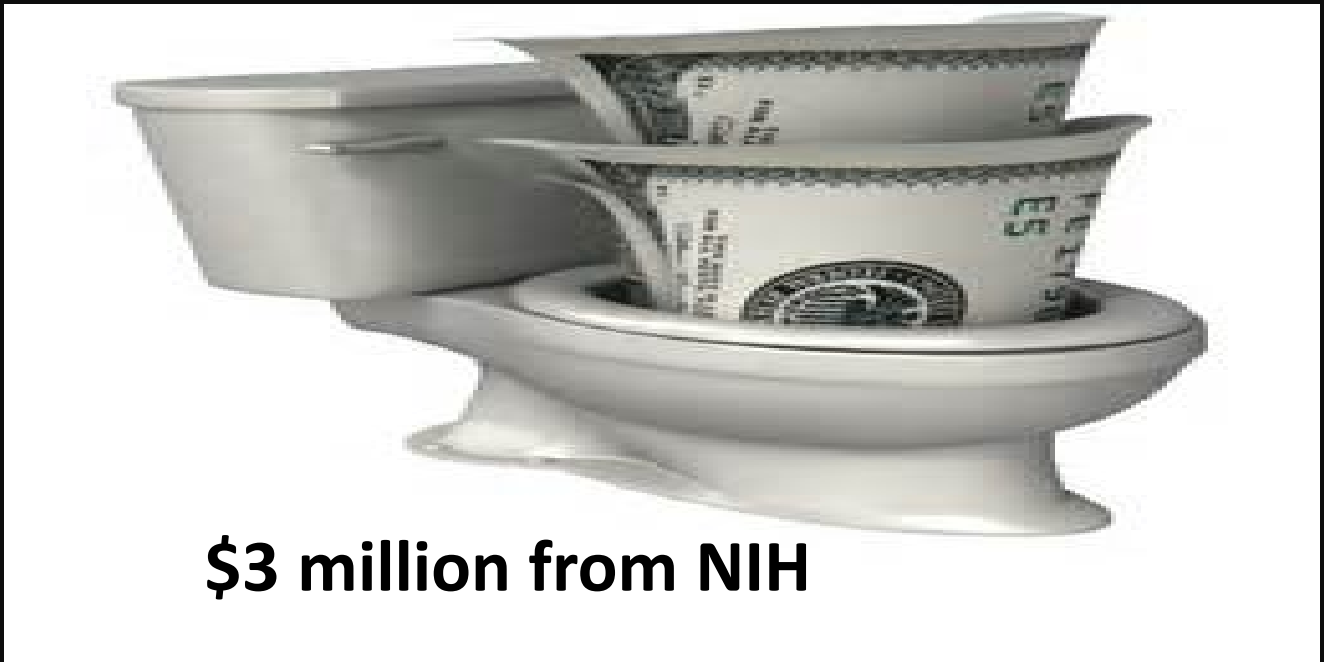
TK Cureton Physical Fitness Research Lab

How did an Exercise guy become so focused on volume overload?

- "D.J.": ~ 35 year old A.A. male, overweight, diabetic, high blood pressure…
- DJ was enrolled in an exercise study. One Monday, I discovered DJ had **gained 15 Kilos** over the weekend. WHY?

- Finished study… took bike away… then he asked for it back
- Started cycling 1-2 hours/session, stopped eating processed food (salt)… **lost 40 pounds and got a transplant.**

Good for DJ… but my study failed…



- **But I learned some things along the way:**
- **1) Exercise has to be more than sticking a bike in front of patients**
- **2) Dialysis patients eat a lot of salt…. And this contributes to volume overload. If we can't address this, *exercise will never work*! (actually NOTHING will)**

Chronic Volume Overload

- **Why a problem?**
  - **Increases Blood pressure**
  - **Enlarges the heart**
  - **Causes cramping… other symptoms**

- **How common is it?**
  - **Maybe > 80% of dialysis patients have volume overload?**
  - ***A LOT of CKD patients NOT on dialysis also have volume overload***

- **What to do about it?**
  - **Volume overload *can be nearly eliminated* using strategies practiced in Turkish dialysis clinics**

Izmir, Turkey's Remarkable Data

- ~ 90% of dialysis patients in Izmir have NORMAL BP (~ 120/80) *and take NO blood pressure meds!*
- Weight gain between dialysis treatments is < 2.0 kg
- Size and function of the heart is NORMAL. Heart failure is rare
- Mortality rate is ~ half of what it is in the U.S.
- **How do they accomplish this… *and why is nobody else doing it?***

How Does Turkey Do this?

Izmir's Volume Reduction Protocol (~1993) - 3 components:

1) RARELY use Blood pressure meds

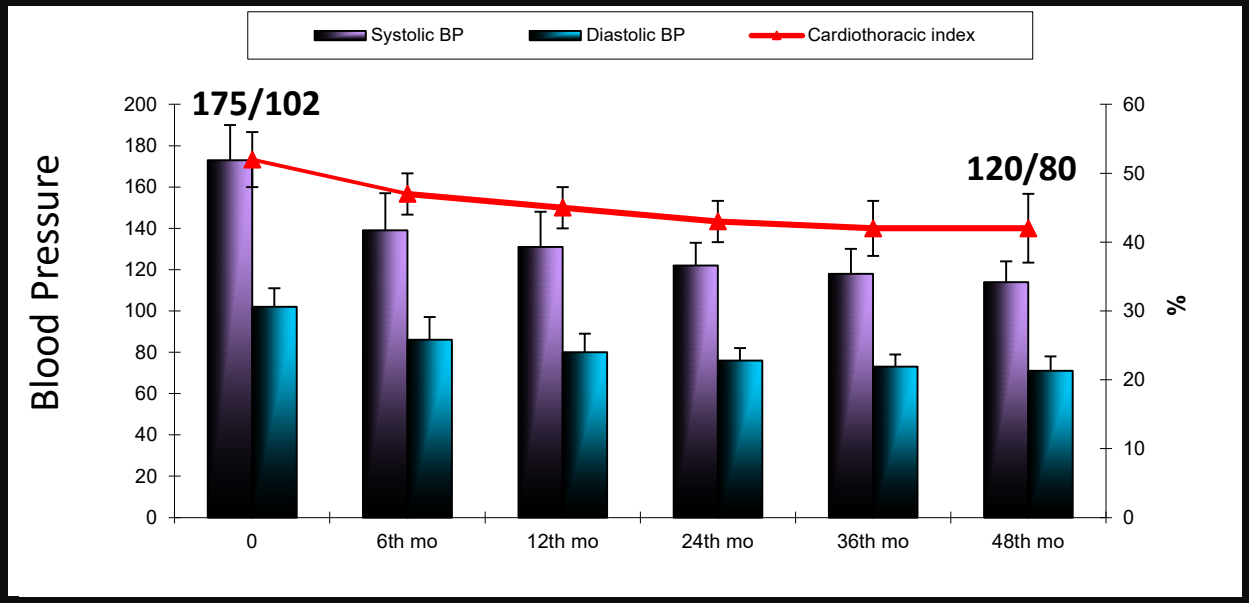
2) SLOWLY reduce "post-dialysis (dry) weight"

- May initially require a few extra dialysis sessions

3) Focus of the renal diet is on SALT, and SALT ALONE

- <u>continuous counseling via clinic STAFF</u> (nurses/techs….)
- Do NOT give patient's saline for cramping…

Volume Control WORKS!
(GREATLY reduces blood pressure)

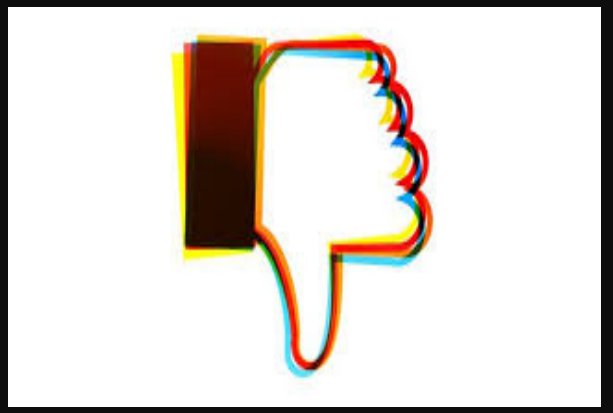


121/80

- 67 hypertensive dialysis patients – 100% were on blood pressure meds
- Started Volume control program
- Interdialytic weight gain dropped from 3Kg to 2 kg
- **After 4 years, Only 4% need Blood Pressure meds!**
- Zero patients had edema and heart failure!

Ozkahya M et al. Am J Kidney Dis 1999; 34: 218-21

How does a dialysis patient normally respond when a nurse/tech suggests taking off extra fluid?



- Why? Cramping, drops in blood pressure….

- Interesting fact: Patients in Turkish volume control program have FEWER symptoms during dialysis, DESPITE removing more fluid! Why?

  1) They eat WAY LESS SALT

  2) They are on very few (if any) blood pressure medications

Can This Be done elsewhere?

- There are No similar volume control strategies practiced in the U.S. **Why?**
- **Primary reason:** it's really hard to reduce salt intake

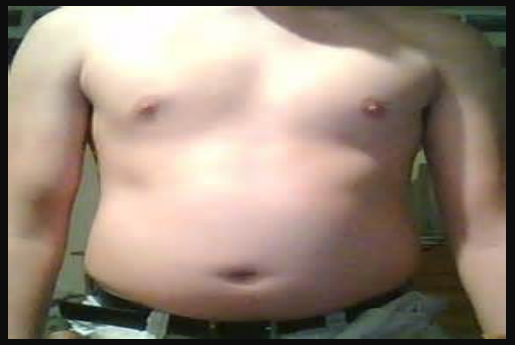
But we are trying anyway!

- Pilot study in my lab:

- Goal:
- 1) “copy” the Turkish volume control protocol

- 2) add an exercise program to get even better benefits!

Volume control:
Reduce dry weight
And BP meds



Na+Restriction

Intradialytic cycling

Comprehens
Program to
Physical Fu
- strength
- balance,
- cardiovas

Nutrition Approach

- *"Immerse clinics in a culture of sodium restriction"*
- The ENTIRE staff is trained to help. EVEN the bus drivers!
- "Remind them every day"!!
- There are NO fluid restrictions!
  - "Drink as thirst indicates"

Where is most of the salt in YOUR diet?

"The Salty 6"

****MANY of the foods ALSO have a lot of Phosphorus and Potassium Additives!**

Main message we preach:
Restrict the Salt… and you quench the thirst!

Salt in diet
THIRST STARTS HERE!

***

Thirst

cramps

↑ UF

Fluid overload

Strain on heart/arteries

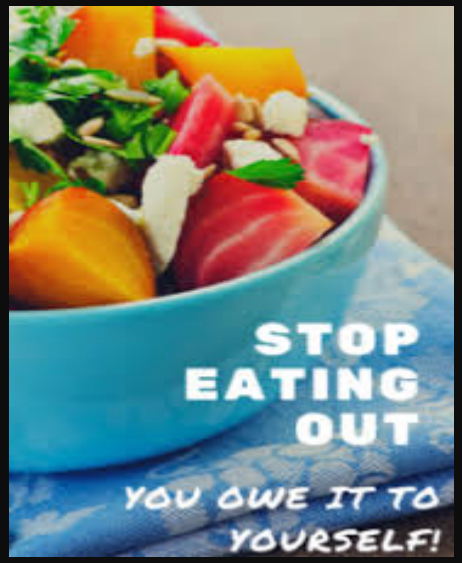
↑BP and plasma volume

Guiding Principles for low Na intake
(rules we reinforce to staff & patients)

1. **Shop More**
   - And Get families involved

2. **Shop Better**
   - Shop for "whole foods", with less restrictions on Phosphorus & pottasium
   - **Label reading (1 mg Na/kcal rule)**

3. **Eat out less**



4. **NEW RULE: FEED THEM**
   - ***I will come back to this***

"The 1mg Sodium/Kcal Rule"

> 1 mg/kcal

Nutrition Facts

Serving Size 1 Bag (1g)
Servings Per Container 1

Amount Per Serving	
Calories 250	Calories from Fat 90
	% Daily Values*
Total Fat 10g	**15%**
Saturated Fat 4g	**20%**
Trans Fat 0g	
Cholesterol 100mg	**33%**
Sodium 440mg	**18%**
Total Carbohydrate 38g	**13%**
Dietary Fiber 2g	**8%**
Sugars 0g	
Protein 2g	**4%**

*Percent Daily Values are based on a 2,000 calorie diet.

Na/kcal = 440/250 > 1 (BAD)

< 1 mg/kcal

Nutrition Facts

Serving Size 1 Cup (1g)
Servings Per Container 1

Amount Per Serving	
Calories 300	Calories from Fat 108
	% Daily Values*
Total Fat 12g	**18%**
Saturated Fat 3g	**15%**
Trans Fat 0g	
Cholesterol 120mg	**40%**
Sodium 130mg	**5%**
Total Carbohydrate 45g	**15%**
Dietary Fiber 5g	**20%**
Sugars 0g	
Protein 4g	**8%**

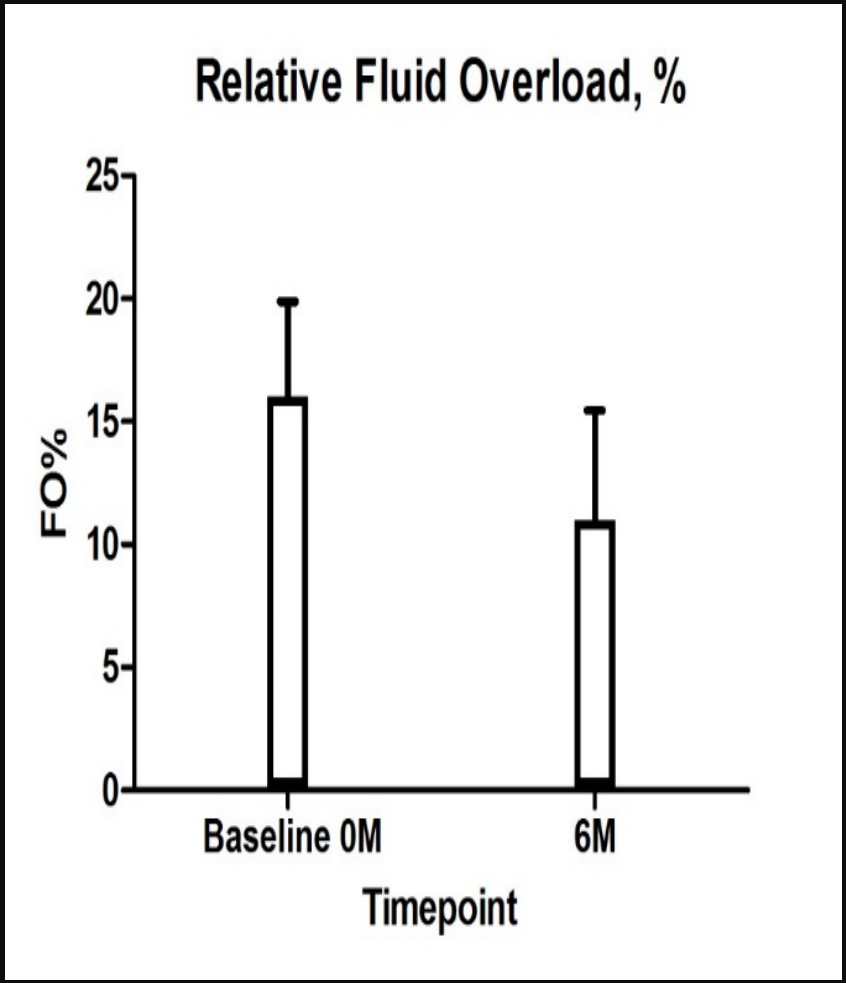
*Percent Daily Values are based on a 2,000 calorie diet.

Na/kcal = 130/300 < 1 (GOOD)

"Is the sodium # bigger than the calorie #?"

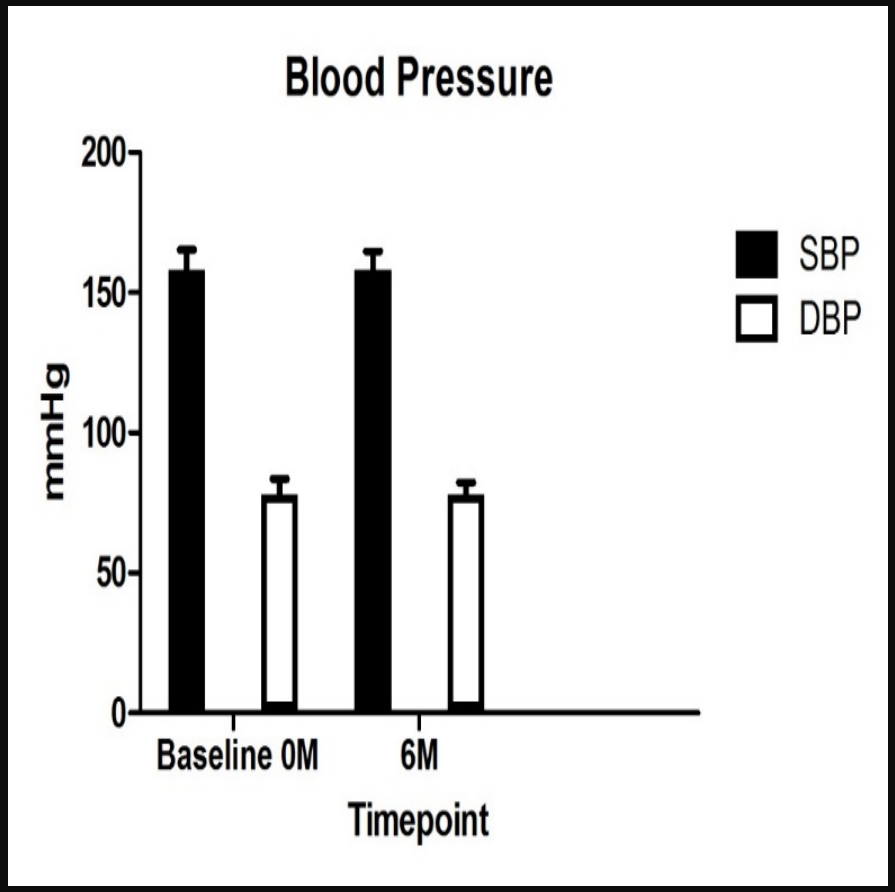
I taught 75% of these people how to shop using the 1mg/kcal rule

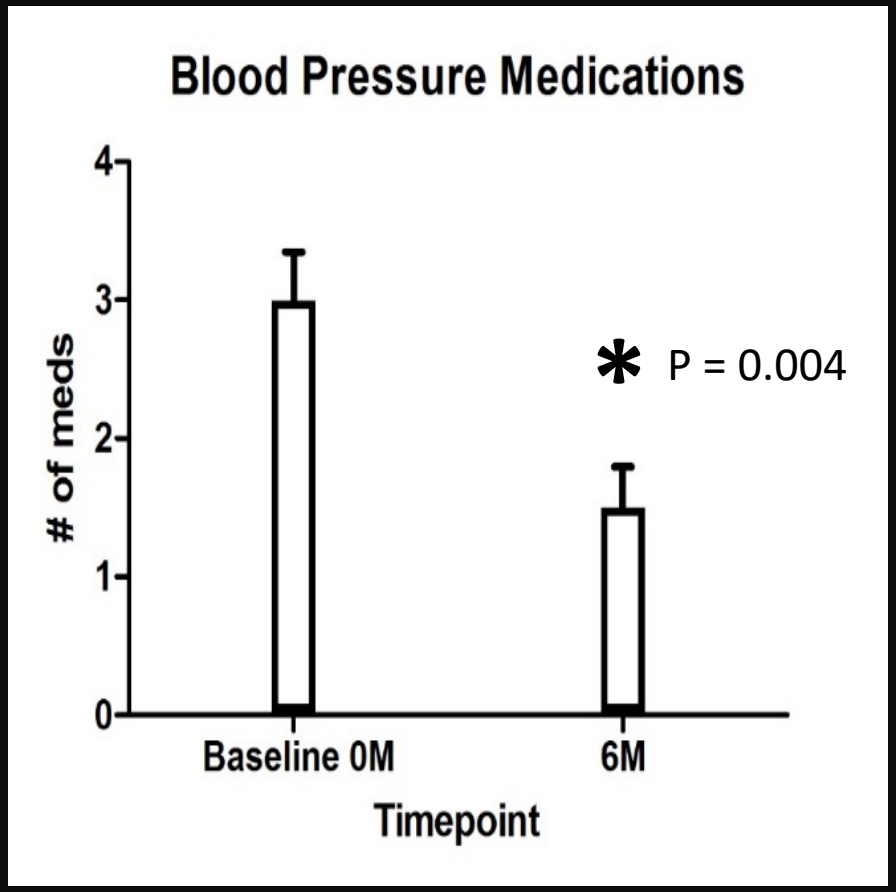
Results: Significant reduction in Fluid overload and Estimated Dry Weight



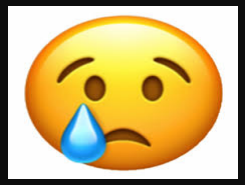
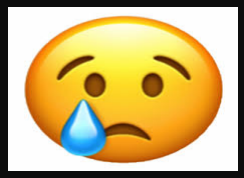
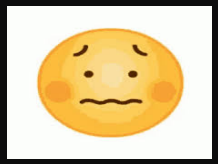
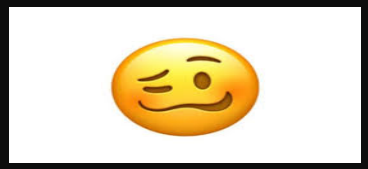
Estimated Dry Weight (Kg)		
Month	Mean	Std dev
Baseline (0M)	89.0	23.2
1M	88.4	23.2
2M	88.1	22.7
3M	***87.6**	22.3
4M	***86.9**	22.7
5M	87.7	22.4
6M	***86.7**	22.5

Unfortunately, No change in blood pressure, BUT… fewer BP medications





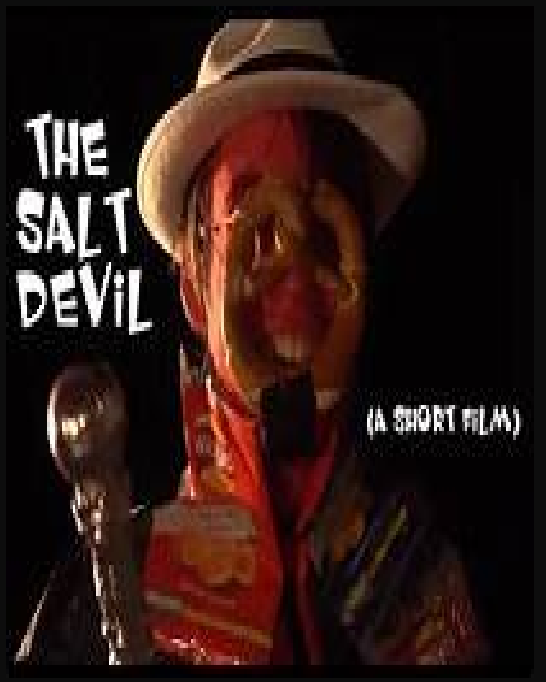
Summary: Our volume protocol had *Modest* Success

- Decreased dry weight and volume overload 
- *But not as much as we hoped* 
- Blood pressure was the same 
- But blood pressure meds were reduced! 
- Small reduction in dietary salt intake 
- Overall: 


WE CAN DO
BETTER

Why did we not do as good as Turkey???

- We *only had modest benefits* b/c:
- We failed to "inundate clinics in a culture of sodium restriction"
- The focus of the renal diet is still on phosphorus and potassium restrictions



Important Question: How Can we "Inundate our clinics in a culture of sodium restriction"

- 1) Relax restrictions on Nuts, grains, dairy, fruits, veges:
- IN MODERATION, these are fine!
- 2) Convince the nephrologists…. The bus drivers…. And Everyone at the clinic!
- 3) Work with Patient's FAMILIES
- 4) And Remind the Patients everyday!

How to achieve successful salt restriction ? (From Ercan Ok - Izmir)

- Are physicians convinced on the following ?
  - Salt intake leads to irresistible thirst and fluid intake
  - High weight gain is due to SALT intake (not fluid)
  - Symptoms such as cramping and large drops in blood pressure do NOT indicate that a dialysis patient is “dry”.
  - INSTEAD, it means that fluid gains are too large to safely remove it all during dialysis.

Nurse and technician buy-in is also key for success

- Are nurses and techs convinced ?

- Do they remind their patients in every session that "salt is a poison for them" ?

- Do they remind patients that large drops in BP and cramps in this session occur b/c weight gain is too high b/c of high dietary salt intake ?

- Do nurses mention good results to patients?
  - E.g., someone who has normal BP without meds after reducing salt intake and IDWG ?

Tips for helping patients overcome their sodium "addiction"

- "Don't tell them once… tell them EVERY DAY"

- Engage family members
  - Who is doing cooking/shopping?
  - Grocery store tours?

- Peer mentoring/support
  - Identify compliant patients and incentivize them to share positive experiences with sodium restriction

- Feed them? ("priming behavior change")

We KNOW counseling is HARD.
Is there another approach?

- An interesting anecdote on sodium:

- Patient X: 65 year old female with history of high salt intake:
  - We failed to change her diet by "counseling" her for 6 months

- BUT: Everything changed after providing her low sodium meals for one month
  - from momsmeals.com

“Renal Friendly” Low-Sodium Diet Intervention

-3 “renal friendly” meals/day mailed to patient’s home for 1 month

-Low in Salt, phosphorus and potassium

070117-093017/7948

Mom's Meals NourishCare

Menu

Renal-Friendly

TO PLACE AN ORDER
or if you have comments or concerns, please call:
1-866-971-6667
M-F 7 AM to 6 PM CST
www.MomsMeals.com

Menu based on NKF guidelines for Stage 5 hemodialysis, home and peritoneal dialysis patients.

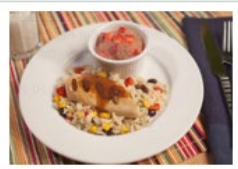
Carbs (g): Approximate grams of carbohydrates are shown for the **entree (tray only)** and the full meal
♥ **Heart Friendly:** <800mg Sodium <30% Fat <10% Sat. Fat

ITEM	Breakfast	Calories	Protein (g)	Sodium (mg)	Phosphorus (mg)	Potassium (mg)	Carbs (g)		Heart-Friendly
95047	**Cinnamon French Toast Sticks with Chipotle Berry Sauce and Turkey Sausage,** Mandarin Orange Cup, Fruit Juice and Gelatin	595	13	637	104	540	**66**	118	♥
95132	**Vegetable Egg Scramble and Peaches with Cherries,** Peach Cup and Maple Oatmeal Cookie	604	16	620	303	532	**43**	89	
95139	**Ham, Egg and Cheese Scramble and Spiced Blueberries and Apples,** Fruit Juice, Pineapple Cup and Fudge Round	604	19	682	292	629	**37**	90	♥
95977	**Colby Cheese Omelet with Cinnamon French Toast Sticks,** Syrup, Margarine, Mandarin Orange Cup and Blueberry Applesauce	598	12	691	177	249	**35**	100	♥
95998	**Maple Apple Walnut Oatmeal and Scrambled Eggs** and Peach Cup	618	15	503	330	452	**86**	105	♥

Lunches & Dinners

Chicken/Turkey Entrees

Chicken Breast with Jerk Sauce and Cilantro Rice



Vegetarian Entrees

Vegetable Primavera in Creamy Alfredo Sauce

Sodium intake during feeding period was much lower (despite similar calorie intake)

	Start of Study	After 1 month feeding low salt diet
Calories (kcal/d)	1868	1948
Protein (g/d)	69	64
Protein (g/kg/d)	1.0	0.9
Sodium (mg/d)	**3926**	**1932**

What happened when we STOPPED meal delivery?

	0M Baseline	1 month (when fed)	3 Month Follow-up
Pre-dialysis weight (kg)	72.3	70.6 (-1.7)	70.4 (-0.2)
Post-dialysis weight (kg)	70.9	69.4 (-1.5)	68.2 (-2.7)
Dry Weight (kg)	71.0	70.0 (-1.0)	68.5 (-2.5)
IDWG (kg)	2.5	1.1 (-0.5)	1.6 (-0.9)

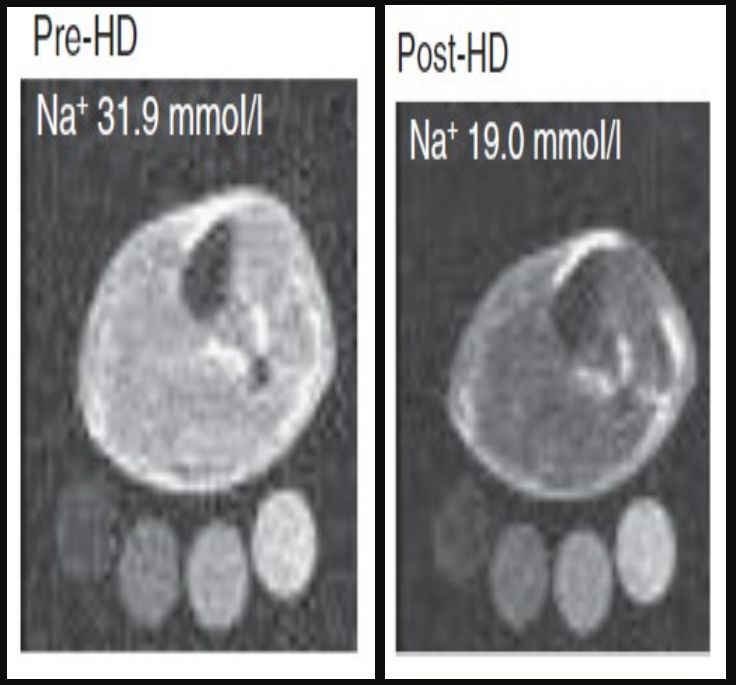
- Patient response: *"I see and feel the benefits… I get it now"*
- *"I can cook these meals… and do it BETTER"*

Moving Forward:

- Starting new study in January
- Patients will receive 2 meals per day in 1st month, and 1 meal per day in 2nd month
- Continued Counseling for 5 months on how to maintain a low salt diet
- Hypothesis: short-term meal delivery will help change long-term dietary behaviors
  - Patients will NOT like salt as much… so it will be easier to change habits.

Besides volume control… are there other reasons CKD patients should reduce salt intake?

- We know that dialysis leads to muscle weakness and wasting.
- One possible cause? Patients accumulate salt in their muscles and skin
  - Can we get rid of it?
- Pilot study: feeding dialysis patients low salt diet to see if we can remove salt from the muscle
- Also exercising patients during dialysis to see if that helps!
- Perhaps another reason to exercise more and eat better!



Summary/Conclusions

- Chronic volume overload is one of the most difficult problems for dialysis patients to control (and ALL CKD patients)
- We have good evidence that it can be successfully managed in ~90% of dialysis patients (Izmir, Turkey)
- Reducing dietary salt intake is the key to reducing fluid overload. To achieve this, we need to "immerse clinics in a culture of Na restriction"
- This will ALSO get rid of A LOT of the added phosphorus and potassium!
- *This will require a culture change at clinics*
- Will feeding low sodium diets help?
- Reducing salt intake may also benefit the muscle!
- Are YOU willing to make changes in your diet to have NORMAL BP with no meds?

Questions?