Brain Matters: The Impact of CKD on Cognitive Function

Maiya Slusser, MS, RD, CD, CNSC

Patient Care America

Manager of Clinical Education and Research

Disclosures

Presenter is an employee of Patient Care America

Slides are scientific and based on information and research evidence available during the time of the lecture

Non-biased and Non-Promotional

Examples of products used are for educational purpose only

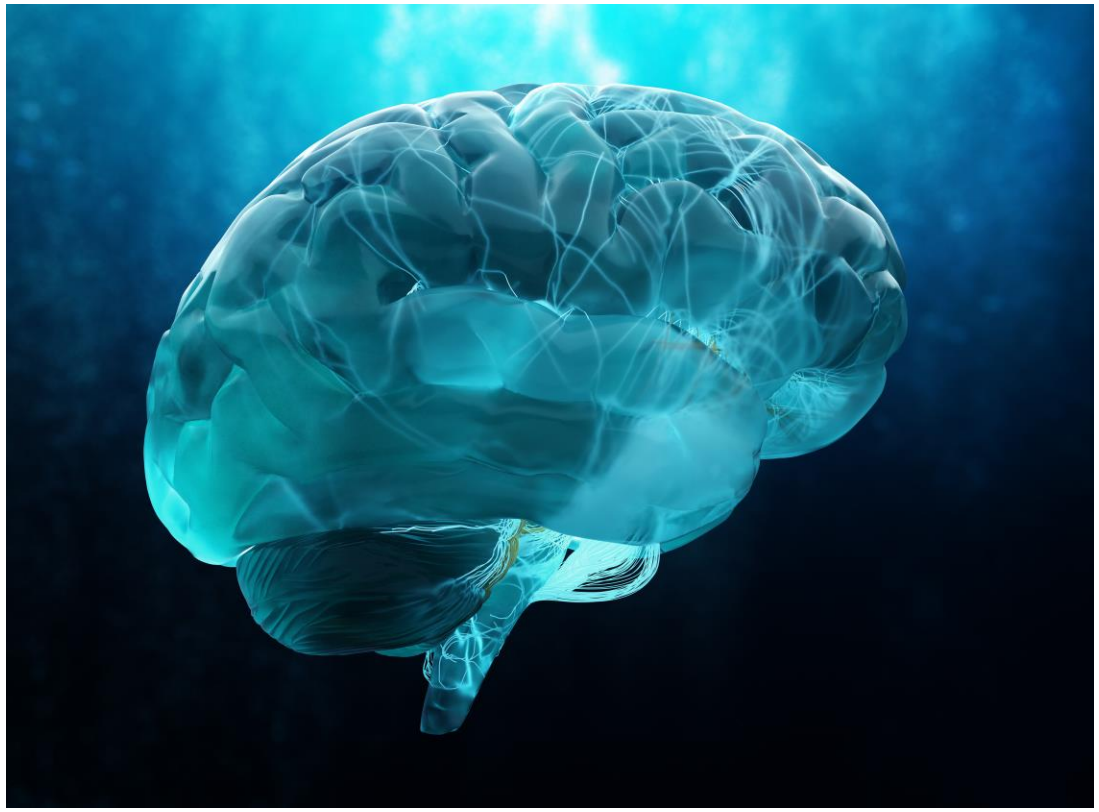
Objectives

- Name and describe domains of cognitive function
- Discuss prevalence of cognitive impairment in CKD
- Identify specific domains of cognitive function impacted by chronic kidney disease (CKD)
- Explain nutrition and lifestyle approaches to protect cognitive function
- Identify strategies to use with patients who have mild cognitive impairment

Cognitive Function

A general term used to describe many different functions including:

- Memory
- Perception
- Attention
- Processing speed
- Language skills
- Motor skills
- Executive Function



Domains of Cognitive Function

- Memory
  - Working memory – ability to hold information in consciousness for adaptive use. Includes maintenance of information and manipulation of information.
  - Episodic/declarative/explicit memory – encodes, maintains, and retrieves information into and out of long-term memory.
    - Encoding – taking information from working memory and processing it for long-term storage.
    - Storage – retention of information after encoding.
    - Retrieval – recalling encoded information
  - Procedural memory – memory for motor actions or skills (muscle memory)
  - Semantic memory – long-term storage of verbal information.
  - Prospective memory – the ability to remember to perform tasks in the future.

Domains of Cognitive Function

- Perception – processes and integrates sensory information. Ability to recognize objects, sounds, and the intactness of the perceptual field.
- Attention:
  - Selective attention – process of attending to information that is relevant and important and ignoring nonrelevant information.
  - Sustained Attention/Vigilance – ability to sustain attention over time

Domains of Cognitive Function

- Language Skills – ability to understand languages, access semantic memory, identify objects with a name, and respond to verbal instructions with behavioral acts.

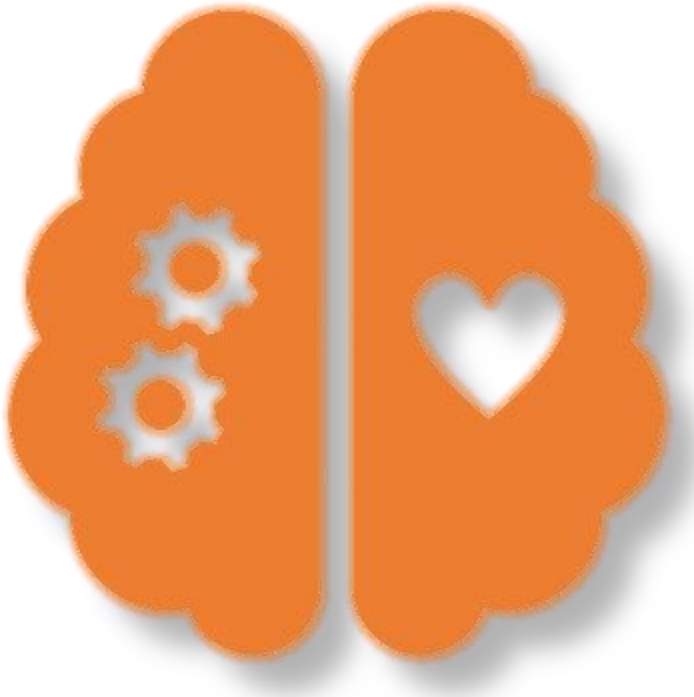
Domains of Cognitive Function

- Motor Skills – includes manual dexterity, motor speed, reaction time, and balance.
- Processing Speed – requires rapid performance of tasks ranging from simple to complex

Domains of Cognitive Function

- Executive Function
  - Set of processes that manifest control over other component cognitive abilities
  - Goal-directed behavior
  - Uses simpler cognitive functions for real-world adaptive success
  - Reasoning and problem-solving

A Healthy Brain



Optimal capacity to function adaptively in the environment.

Competency across domains of “thinking, moving, and feeling.”

Absence of overt vascular or neurodegenerative injury

Brain Health in Decline

3 out of 5 Americans will develop a brain disease in their lifetime.

- The brain begins showing cognitive decline as a person enters their 20’s.
- Disorders associated with dementia are progressive, degenerative, and irreversible.

Does this sound familiar…

You provide education to a patient during dialysis, or a clinic visit and set a goal for them to work on.

- At follow-up, patient shows no improvement, and you basically repeat the entire education.
- In some cases, pressing too hard to help the patient improve makes them defensive or upset.

Is this patient…

Non-Compliant

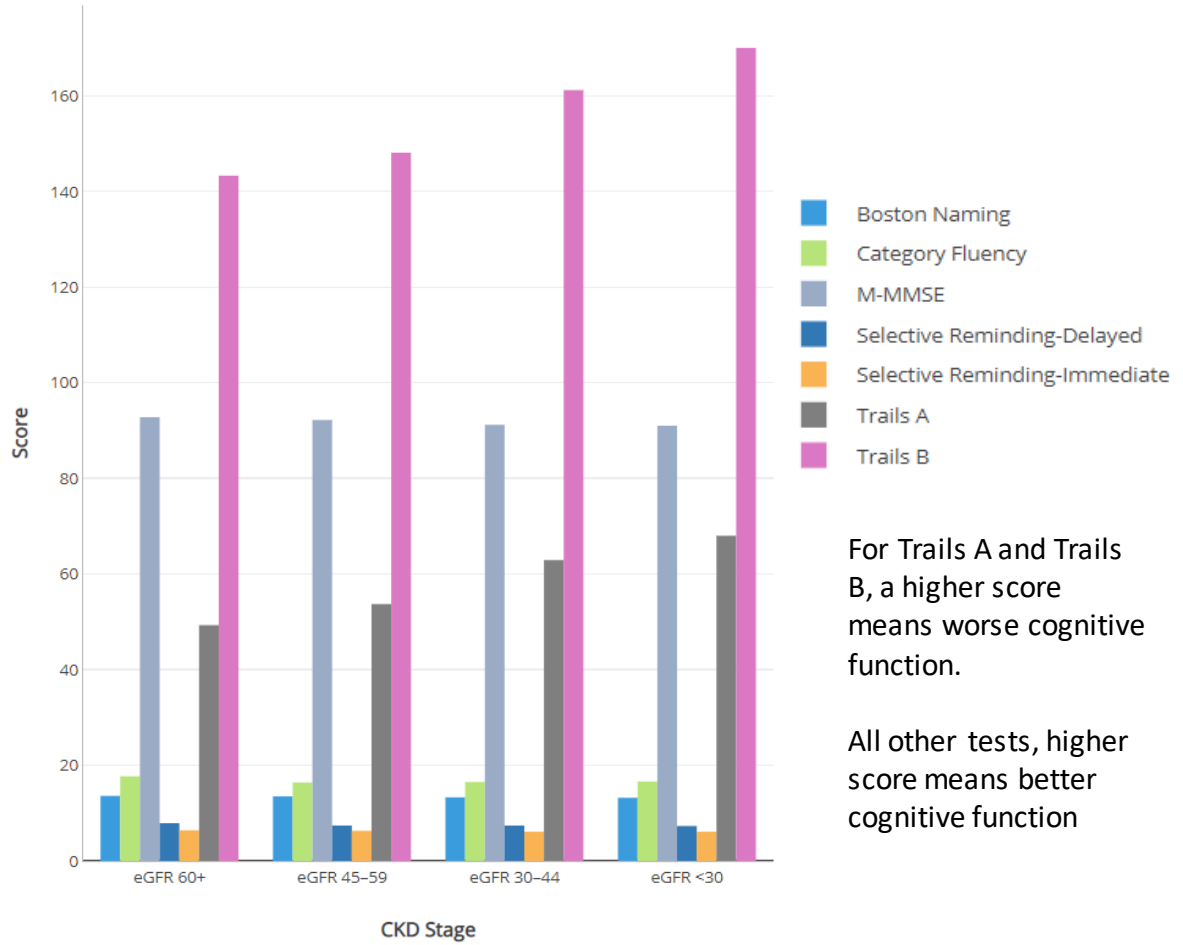
Unmotivated

Stubborn

Health Illiterate

Cognition and CKD

- Cognitive decline occurs early in CKD
  - Different domains change at different rates
  - Cognition worsens as eGFR declines
- In HD, >70-% of patients show impairment in as least 1 cognitive domain



For Trails A and Trails B, a higher score means worse cognitive function.

All other tests, higher score means better cognitive function

Centers for Disease Control and Prevention. Chronic Kidney Disease Surveillance System—United States. website. http://www.cdc.gov/ckd

Mild Cognitive Impairment (MCI) - A condition in which individuals demonstrate cognitive impairment with minimal impairment of instrumental activities of daily living.

- ~46% of people with MCI develop dementia within 3 years.

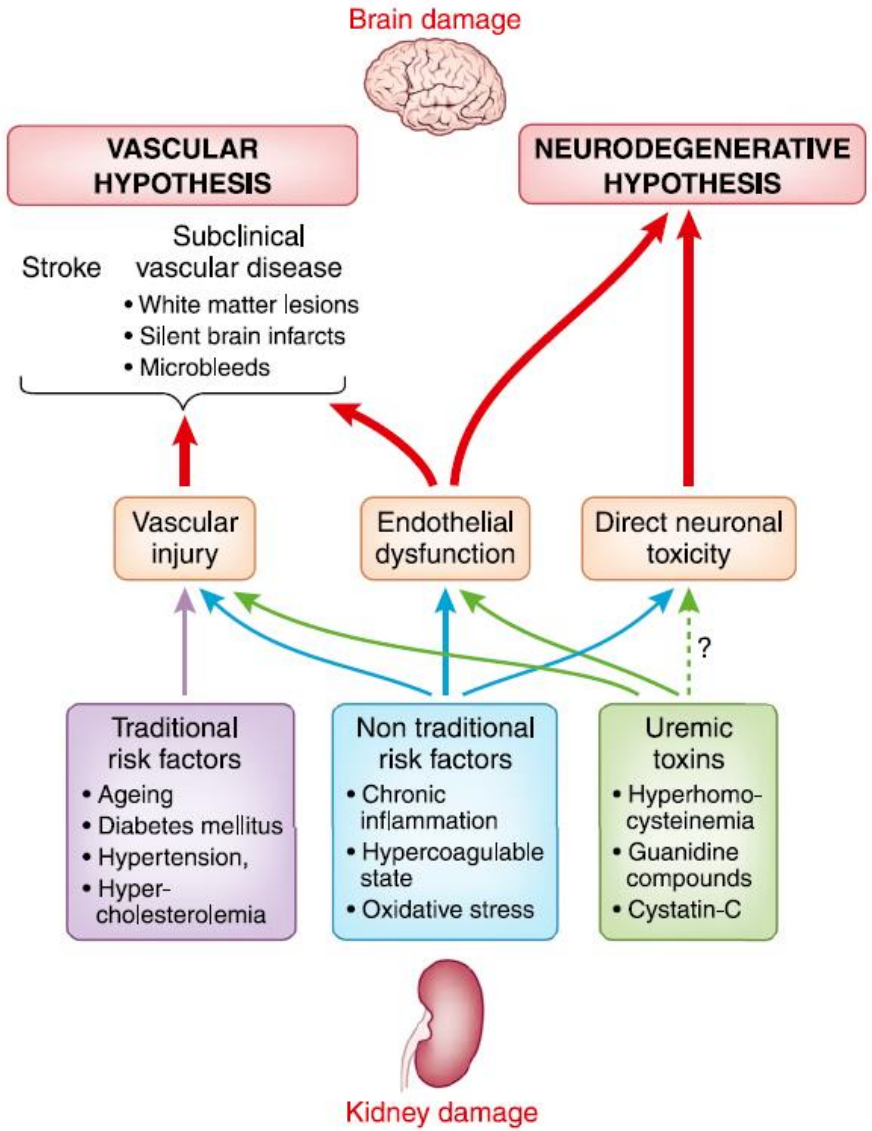
Dementia - a chronic or persistent disorder of the mental processes caused by brain disease or injury and marked by memory disorders, personality changes, and impaired reasoning.

Vascular Hypothesis

- Kidneys and brain are both low-resistance end organs exposed to high volume blood flow which causes vascular damage
- Similar impairments seen in CKD and stroke:
  - Declines in executive function, psychomotor speed, and memory.

Neurodegenerative Hypothesis

- Exposure to ACE inhibitors and/or uremic toxins cause damage within the brain leading to cognitive decline
  - Uremic guanidine is a neurotoxic agent



Bugnicourt, J. M., Godefroy, O., Chillon, J. M., Choukroun, G., & Massy, Z. A. (2013). Cognitive disorders and dementia in CKD: the neglected kidney-brain axis. *Journal of the American Society of Nephrology*, *24*(3), 353-363.

General Risk Factors for Cognitive Decline

- Increased age
- Having a specific form of the APOE e4 gene
- Diabetes
- Smoking
- Hypertension
- High cholesterol
- Obesity
- Depression
- Lack of exercise
- Low education level
- Infrequent participation in mentally or socially stimulating activities

Risk Factors Specific to CKD and ESRD

- Albuminuria
- Normalized brain tissue volume
- Hemoglobin levels
- Serum parathyroid hormone levels
- Uric acid levels
- Hyponatremia
- Poor nutrition and/or protein-energy wasting
- Functional impairment
- Anemia
- Acidosis
- Disturbed sleep
- Polypharmacy
- Duration of CKD

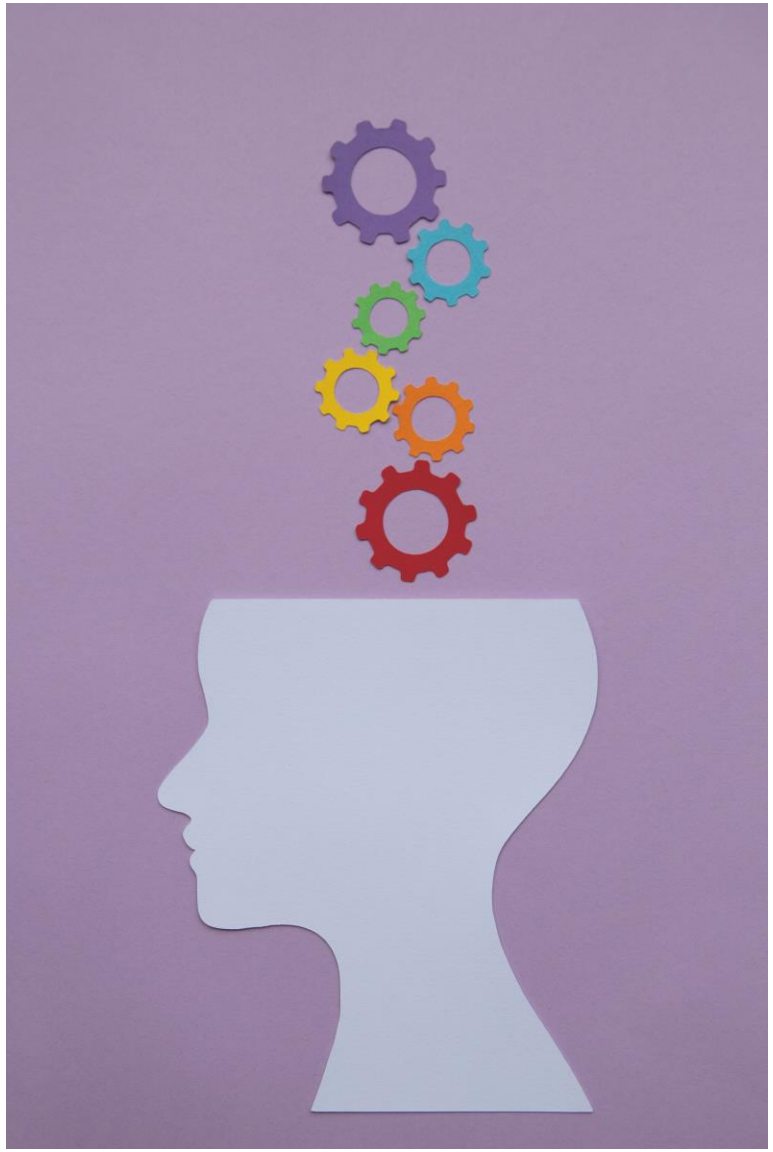
Risk Factors in ESRD

Modality of dialysis may have an impact on severity of cognitive decline:

- Risk for mild cognitive impairment is lower in patients using peritoneal dialysis (PD) and in patients who avoid ever using a CVC
  - PD causes more gentle fluid shifts which may lead to less brain injury

MCI and CKD

- Cognitive functions most impacted:
  - Memory
  - Learning
  - Attention
  - Processing and problem-solving
  - Self-control
    - Emotions
    - Depression



MCI and CKD

- Memory, learning, attention, processing, and problem-solving all contribute to Health Literacy.
- **Health Literacy** = the cognitive and social skills that determine the motivation and ability to gain access, understand, and use information in ways which promote and maintain good health.
  - In CKD, this is suspected to be the first area of cognition to decline

Symptoms of Mild Cognitive Impairment

- Increased forgetfulness including appointments and social engagements
- Losing train of thought
- Overwhelmed by decision making and/or understanding instructions
- More impulsive
- Poor judgment
- Depression
- Irritability
- Aggression
- Anxiety
- Apathy

	Mild Cognitive Impairment	Depression	Sleep Deprivation	Anemia
Forgetfulness	X	X	X	X
Impulsiveness	X			
Irritability	X	X	X	
Poor Judgement	X	X		
Apathy	X			X
Overwhelmed by decision making	X	X		
Depression	X	X	X	

MCI vs Depression

- Prevalence of depression in dialysis patients estimated between 20-30%
- Depression can exist on its own or could be a result of MCI
- Depression in CKD is sometimes to referred to as:
  - Pseudodementia
  - Functional Dementia
- After depression symptoms significantly improve, cognitive impairment often persists

What this Means for Patients?

Patient will likely require assistance navigating care pathways, weighing treatment options, compiling advice from multiple sources, maintaining medication regimens, remembering appointments, etc.

Ask Yourself…

How can I offset or ease patient burden?

How can I accommodate CI to support patient participation?

Support Better Brain Health at All Stages

Screen for cognitive decline	MMSE 3MS MoCA
Prevent, slow progression, or support new pathways	Promote neuroplasticity and neurogenesis
Adapt to accommodate cognitive impairment	Nutrition support Resources Education methods and materials

Mini Mental State Examination (MMSE)

- 30-point test, ~10 minutes to administer
- The best-known and the most often used short screening tool for providing an overall measure of cognitive impairment in clinical, research and community settings.

Mini-Mental State Examination (MMSE)

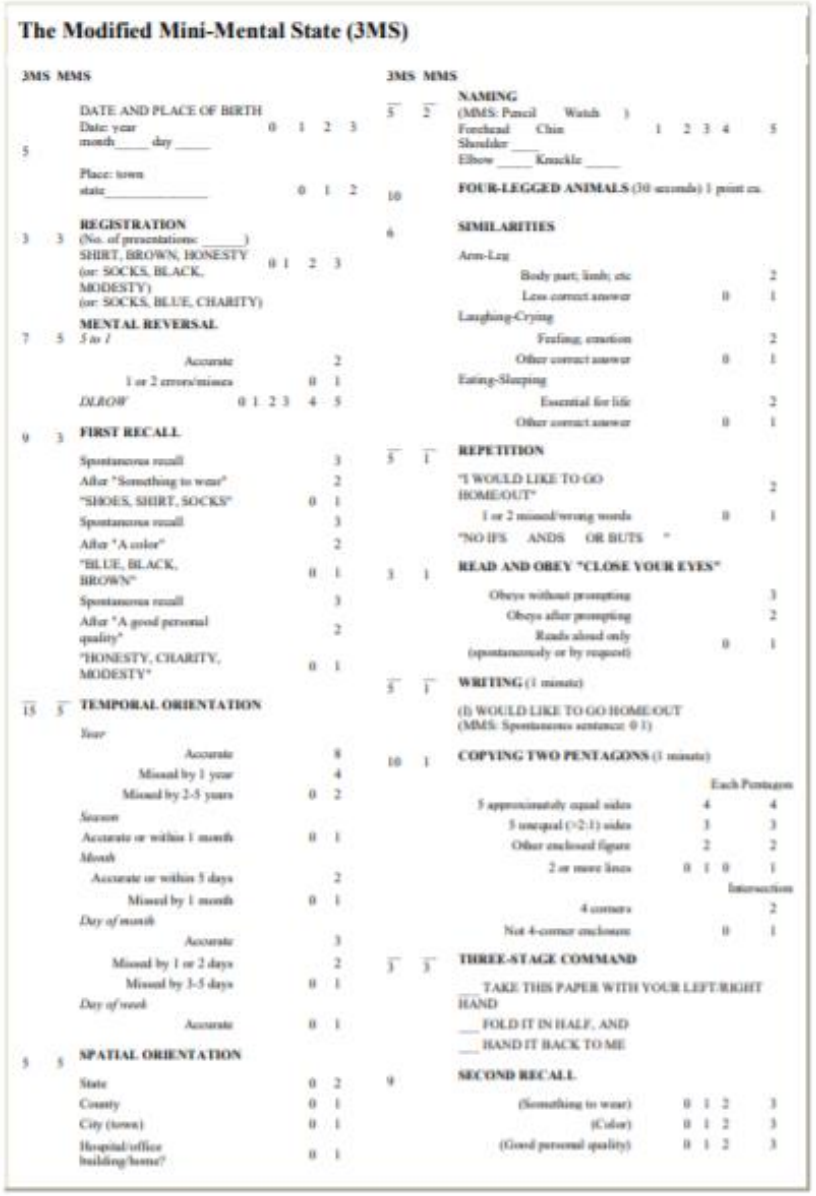
Patient's Name:_____ Date:_____

Instructions: Ask the questions in the order listed.
Score one point for each correct response within each question or activity.

Maximum Score	Patient's Score	Questions
5		"What is the year? Season? Date? Day of the week? Month?"
5		"Where are we now: State? County? Town/city? Hospital? Floor?"
3		The examiner names three unrelated objects clearly and slowly, then asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible. Number of trials:_____
5		"I would like you to count backward from 100 by sevens." (93, 86, 79,72, 65, ...) Stop after five answers. Alternative: "Spell WORLD backwards." (D-L-R-O-W)
3		"Earlier I told you the names of three things. Can you tell me what those were?"
2		Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs, ands, or buts.'"
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says." (Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything." (This sentence must contain a noun and a verb.)
1		"Please copy this picture." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.) 
30		**TOTAL**

Modified Mini Mental State Examination (3MS)

- 100-point exam, administered in ~15 minutes
- Modified from the MMSE
- Designed to be more sensitive to detect individuals with baseline MCI who would clinically convert to dementia



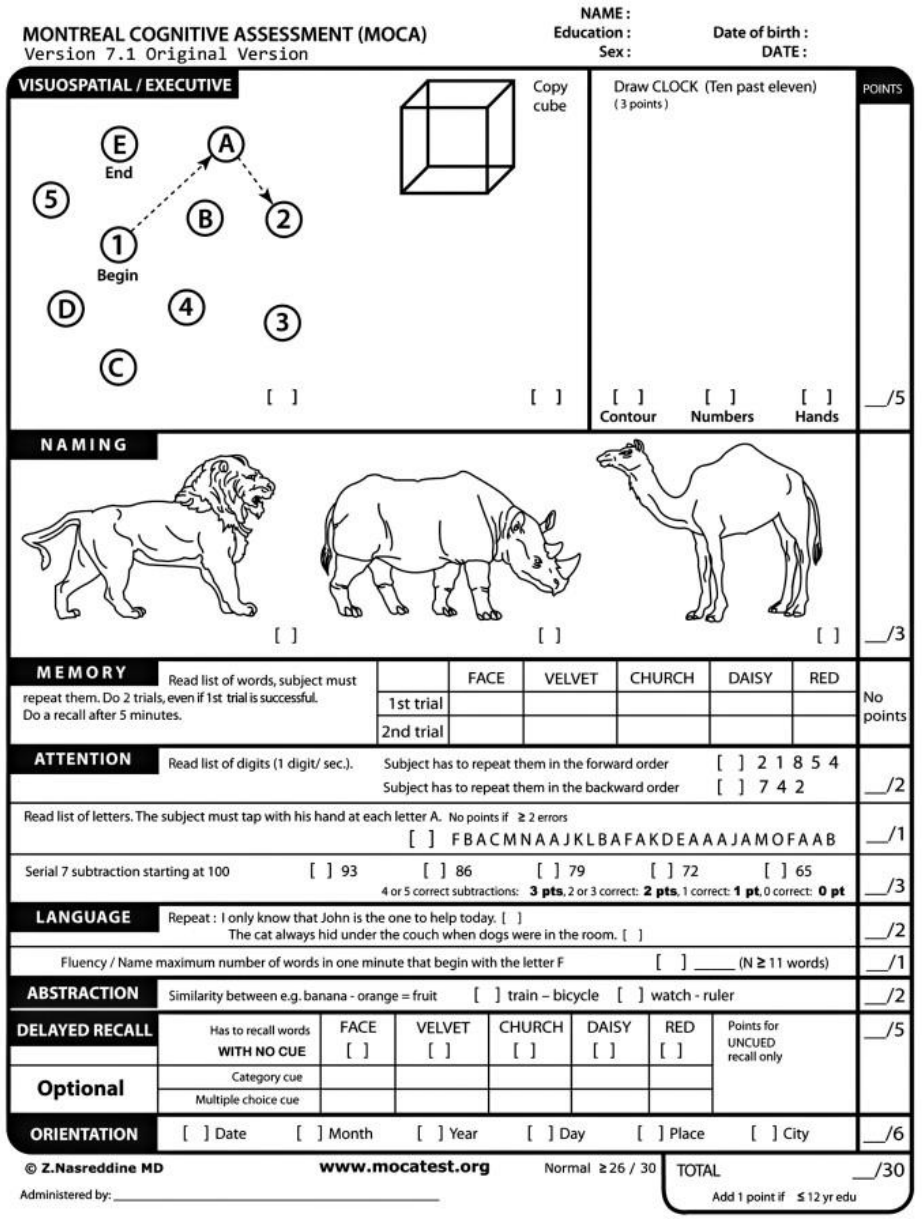
The Modified Mini-Mental State (3MS)

3MS	MMS		
		DATE AND PLACE OF BIRTH	
		Date: year ____ month ____ day ____	0 1 2 3
5			
		Place: town ____ state ____	0 1 2
		REGISTRATION (No. of presentations: ____)	
3	3	SHIRT, BROWN, HONESTY (or: SOCKS, BLACK, MODESTY) (or: SOCKS, BLUE, CHARITY)	0 1 2 3
		MENTAL REVERSAL	
7	5	*5 to 1*	
		Accurate	2
		1 or 2 errors/misses	0 1
		DLROW	0 1 2 3 4 5
		RECALL	
9	3	Spontaneous recall	3
		After "Something to wear"	2
		"SHOES, SHIRT, SOCKS"	0 1
		Spontaneous recall	3
		After "A color"	2
		"BLUE, BLACK, BROWN"	0 1
		Spontaneous recall	3
		After "A *good* personal quality"	2
		"HONESTY, CHARITY, MODESTY"	0 1
		TEMPORAL ORIENTATION	
15	5	*Year*	
		Accurate	5
		Missed by 1 year	4
		Missed by 2-5 years	0 2
		Season	
		Accurate or within 1 month	0 1
		Month	
		Accurate or within 5 days	2
		Missed by 1 month	0 1
		Day of month	
		Accurate	3
		Missed by 1 or 2 days	2
		Missed by 3-5 days	0 1
		Day of week	
		Accurate	0 1
		SPATIAL ORIENTATION	
5	5	State	0 2
		County	0 1
		City (town)	0 1
		Hospital/office building/home?	0 1

3MS	MMS		
		NAMING	
5	2	(MMS: Pencil Watch)	
		Forehead Chin ____ Shoulder ____ Elbow ____ Knuckle ____	1 2 3 4 5
10		**FOUR-LEGGED ANIMALS** (30 seconds) 1 point ea.	
		SIMILARITIES	
6		Arm-Leg	
		Body part, limb, etc	2
		Less correct answer	0 1
		Laughing-Crying	
		Feeling, emotion	2
		Other correct answer	0 1
		Eating-Sleeping	
		Essential for life	2
		Other correct answer	0 1
		REPETITION	
5	1	"I WOULD LIKE TO GO HOME/OUT"	2
		1 or 2 missed/wrong words	0 1
		"NO IFS ANDS OR BUTS "	
		READ AND OBEY "CLOSE YOUR EYES"	
3	1	Obeys without prompting	3
		Obeys after prompting	2
		Reads aloud only (spontaneously or by request)	0 1
		WRITING (1 minute)	
5	1	(I) WOULD LIKE TO GO HOME/OUT (MMS: Spontaneous sentence: 0 1)	
		COPYING TWO PENTAGONS (1 minute)	
10	1		Each Pentagon
		5 approximately equal sides	4 4
		5 unequal (>2:1) sides	3 3
		Other enclosed figure	2 2
		2 or more lines	0 1 0 1
			Intersection
		4 corners	2
		Not 4-corner enclosure	0 1
		THREE-STAGE COMMAND	
3	3	___ TAKE THIS PAPER WITH YOUR LEFT/RIGHT HAND	
		___ FOLD IT IN HALF, AND	
		___ HAND IT BACK TO ME	
		SECOND RECALL	
9		(Something to wear)	0 1 2 3
		(Color)	0 1 2 3
		(Good personal quality)	0 1 2 3

Montreal Cognitive Assessment (MoCA)

- 30-point test that can be administered in 10 minutes.
- Superior to MMSE for detecting MCI and early Alzheimer's dementia (AD).



MONTREAL COGNITIVE ASSESSMENT (MOCA)
Version 7.1 Original Version

NAME :
Education :
Sex :
Date of birth :
DATE :

VISUOSPATIAL / EXECUTIVE — Copy cube — Draw CLOCK (Ten past eleven) (3 points) — POINTS

E End, A, 5, B, 2, 1 Begin, D, 4, 3, C

[ ] [ ] [ ] Contour [ ] Numbers [ ] Hands /5

NAMING — [ ] [ ] [ ] /3

MEMORY — Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.

	FACE	VELVET	CHURCH	DAISY	RED
1st trial					
2nd trial					

No points

ATTENTION — Read list of digits (1 digit/ sec.).
Subject has to repeat them in the forward order [ ] 2 1 8 5 4
Subject has to repeat them in the backward order [ ] 7 4 2 /2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors
[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B /1

Serial 7 subtraction starting at 100 [ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65
4 or 5 correct subtractions: **3 pts**, 2 or 3 correct: **2 pts**, 1 correct: **1 pt**, 0 correct: **0 pt** /3

LANGUAGE — Repeat : I only know that John is the one to help today. [ ]
The cat always hid under the couch when dogs were in the room. [ ] /2

Fluency / Name maximum number of words in one minute that begin with the letter F [ ] ____ (N ≥ 11 words) /1

ABSTRACTION — Similarity between e.g. banana - orange = fruit [ ] train – bicycle [ ] watch - ruler /2

DELAYED RECALL

	Has to recall words WITH NO CUE	FACE	VELVET	CHURCH	DAISY	RED
		[ ]	[ ]	[ ]	[ ]	[ ]
Optional	Category cue					
	Multiple choice cue					

Points for UNCUED recall only /5

ORIENTATION — [ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City /6

© Z.Nasreddine MD — www.mocatest.org — Normal ≥ 26 / 30

TOTAL /30

Add 1 point if ≤ 12 yr edu

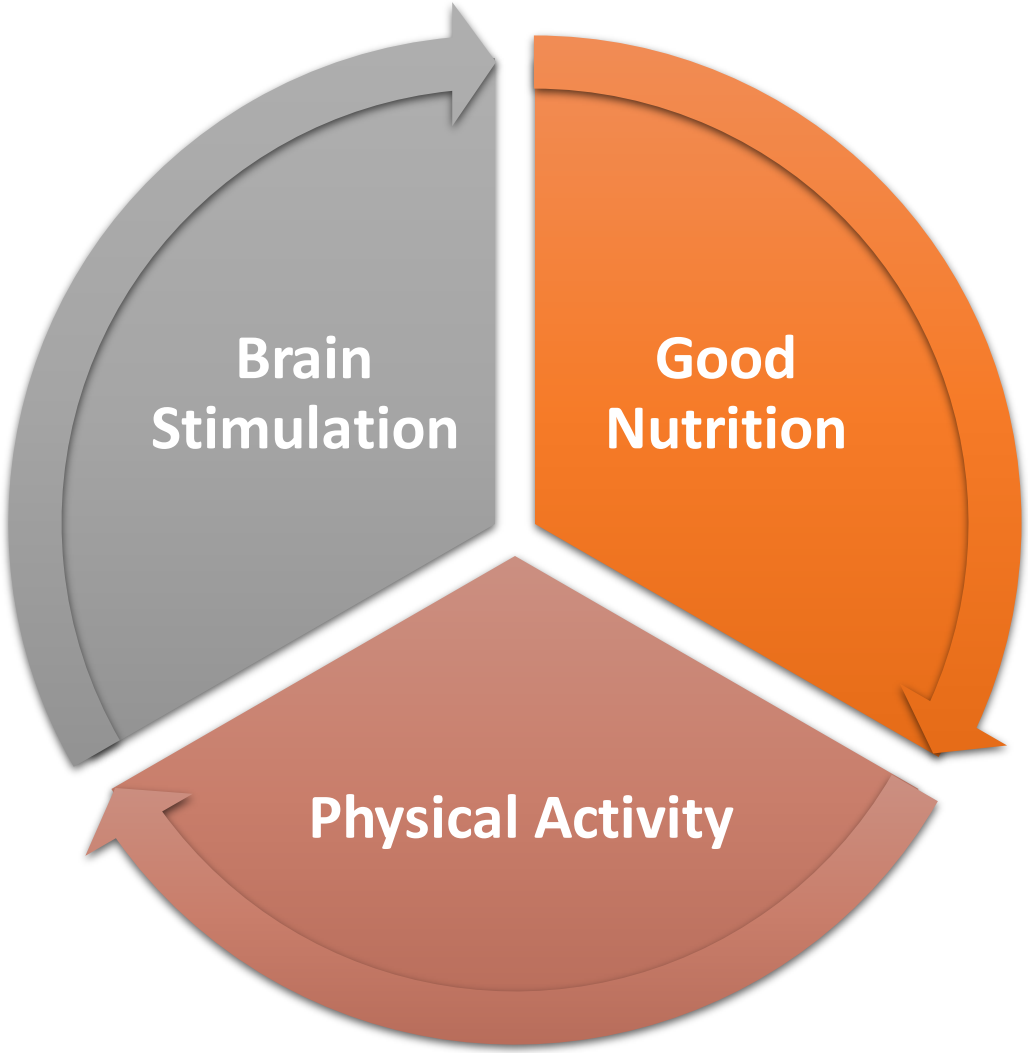
Administered by: _____

Mahendran, R., Chua, J., Feng, L., Kua, E. H., & Preedy, V. R. (2015). The Mini-Mental State Examination and Other Neuropsychological Assessment Tools for Detecting Cognitive Decline. In *Diet and Nutrition in Dementia and Cognitive Decline* (pp. 1159-1174). Academic Press.

Screening for Cognitive Impairment

- There are currently no recommendations regarding routine screening for cognitive impairment in CKD or ESRD.
- Viggiano et al -> Encourage the nephrologist to suspect cognitive impairment when the patient:
  - Reports forgetfulness and/or confusion about medications or appointments
  - Reports depression or altered sleep patterns
  - Is unable to answer questions without family member/caregiver assistance
  - Has a history of stroke or unexplained falls

Reducing Risk and Slowing Progression



Important Definitions

- Neuroplasticity
  - The ability of the brain to form and reorganize synaptic connections, especially in response to learning or following brain injury
  - Makes behavior change possible. New behavior = new pathway
- Neurogenesis
  - The process by which new neurons are formed in the brain

Nutrition

- Typical Western diets high in fat and sugar have a direct negative impact on neurogenesis and neuroplasticity.
  - Increased inflammation and oxidative stress
  - Contributes to co-morbidities
  - Low fiber, high protein intake leads to gut dysbiosis
- Research has also found a connection between a typical Western diet and increased prevalence of depression

Nutrition

Diets rich in plant-based foods, fish, and olive oil and limited in red meat, alcohol, and processed food have been implicated in supporting cognitive function, slowing progression of CKD, improving gut health, and reducing risk for depression.

- Examples include Mediterranean, Norwegian, and Japanese diets

Mediterranean-Dash Intervention for Neurodegenerative Delay (MIND) Diet

- Lowered risk of Alzheimer's Dementia as much 53% in patients who strictly followed the diet and by 35% in who followed it moderately well.
  - Encourages 10 foods:
    - Leafy greens, all vegetables, berries, nuts, olive oil, whole grains, fish, beans, poultry, wine.
  - Discourages 5 foods:
    - Butter/margarine, cheese, red meat, fried food, pastries and sweets.

Nutrition in Dialysis

Fill in nutrition gaps whenever possible

- Prevent, slow, or reverse malnutrition and protein energy wasting
  - ONS and/or IDPN/IPN can improve nutrition status
    - Correct albumin
      - Low albumin linked to impaired cognition and functional capacity
      - Crucial for binding uremic toxins, anti-inflammatory and antioxidant effects, and correcting osmotic pressure in the vascular system.
- Correct vitamin and mineral deficiencies.

Rotondi et al, 2023, *Association between Cognitive Impairment and Malnutrition in Hemodialysis Patients: Two Sides of the Same Coin*

- Purpose - Investigate whether cognitive impairment is associated with nutrition status in HD patients
  - Inclusion criteria: ≥18yo, chronic HD ≥3 months
  - Exclusion criteria: major cognitive impairment or dementia based on DSM-5 diagnosis, presence of active CA, decompensated cirrhosis, severe heart failure, or intestinal malabsorption; medication that alters mental status
  - Data collected: ages, sex, level of education, comorbid conditions, dialysis vintage, BP, medications, BMI, MIS, 3-day food record, MoCA, blood markers – Hb, Ca, PO4, Mg, PTH, VitD, Alb, hsCRP, Tchol, Urea, bicarb
- MIS possible score 0-30, score ≥8 indicates malnutrition
- MoCA possible score 0-30, score <26 indicates cognitive impairment

Rotondi et al, 2023, *Association between Cognitive Impairment and Malnutrition in Hemodialysis Patients: Two Sides of the Same Coin*

- 84 patients, 44M 40F, median age 75.8years, avg dialysis vintage 46 months
  - 3-day food record indicated average intake of 1.04g protein/kg/day and 24.92kcal/kg/day
  - Malnutrition identified in 34 patients (40%)
    - 80% of malnourished patients had MCI compared to 70% in the non-malnourished group
    - Cognitive domains most impacted – memory (100%), executive function (90%), and language (85%)
  - No difference in BMI or protein and energy intake between malnourished vs non-malnourished group

Physical Activity and BDNF

- Brain-derived neurotrophic factor (BDNF)
  - Supports differentiation, maturation, and survival of neurons in the nervous system
  - Expressed in the central nervous system (CNS), gut, and other tissues
  - Decreased levels associated with neurodegenerative diseases with neuronal loss

Physical Activity and BDNF

Exercise promotes synthesis of BDNF which modulates neural plasticity, promotes neurogenesis, and builds resilience to depressive disorders.

- Dose-dependent
- Single sessions can increase BDNF, results are amplified when exercise is consistent
- Best outcomes with moderate intensity aerobic exercise

Exercise Intensity

Target HR for Moderate Intensity

- 50% to about 70% of max heart rate
  - To estimate your maximum age-related heart rate, subtract your age from 220.
    - For example, for a 50-year-old person, the estimated maximum age-related heart rate would be calculated as 220 – 50 years = 170 beats per minute (bpm).
      - 70% maxHR: 170 x .7 = 119 bpm

Talk Test

- If you can talk and sing without puffing at all, you're exercising at a low level.
- If you can comfortably talk, but not sing, you're doing moderate intensity activity.
- If you can't say more than a few words without gasping for breath, you're exercising at a vigorous intensity.

Physical Activity and Dialysis Patients

- *Exercise in Patients on Dialysis: A Multicenter, Randomized Clinical Trial*, Manfredini at al, 2017
  - Duration of 6 months, N = 227
    - Control group n = 123 -> 102 HD, 21 CAPD
    - Exercise group = 104 -> 90 HD, 14 CAPD
  - Intervention:
    - 20 minutes of walking at low-to-moderate speed every second day with gradually increasing intensity.
  - Results:
    - Functional status improved in walking group, measure by 6-minute walking test and 5x sit-to-stand
    - Cognitive function and quality of social interaction showed statistically significant improvement in Exercise group compared to Control group

Other Factors

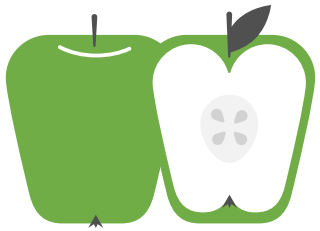
- Social Engagement
  - Consider creative strategies during social distancing
- Mental Stimulation
  - Learning a new skill – language, music, dance, etc.
  - Exposure to new surroundings – travel, etc.
  - Brain games – need to switch it up to gain benefits
    - Online programs - BrainHQ, Lumosity
    - Sudoku, puzzles, etc.

Adapting Educational Approach

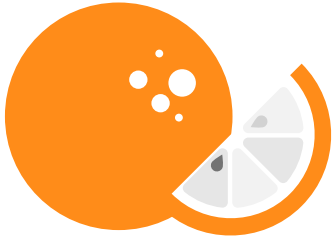
Rely on Motivational Interviewing and Behavior Change Science

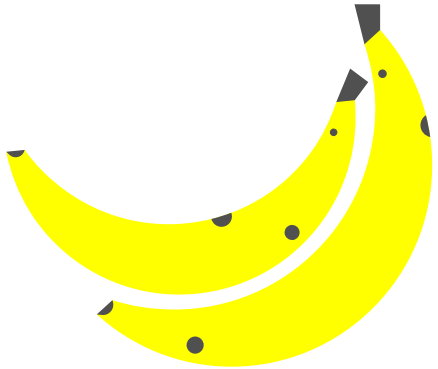
- Focus on truly meeting the patient where they are at, not where you want or expect them to be.
- Allow them the opportunity to exercise their brains through guided problem-solving.

Education



- Know when to educate
  - Murray et al. determined cognitive performance is worst during hemodialysis session.
  - Best time to educate is shortly before dialysis or the day after dialysis.
- Use pictures, cartoons, and lots of color with text
- Provide large print visuals of diet plans

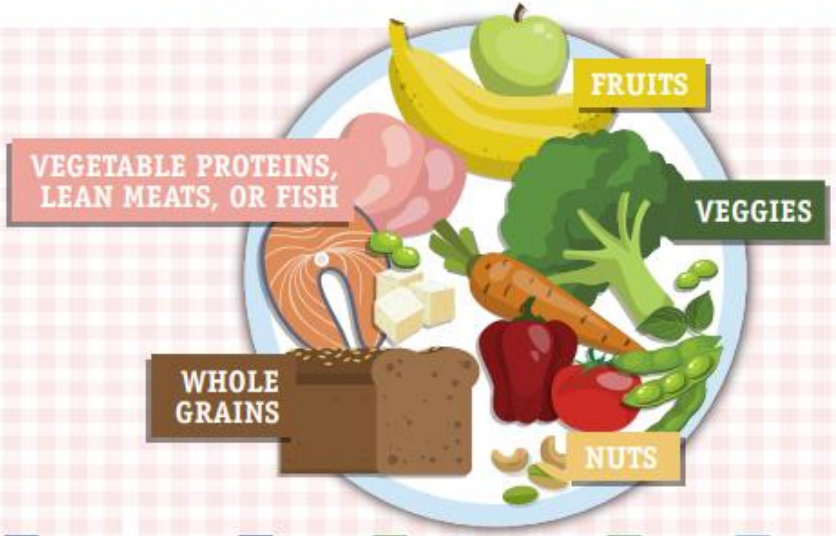




HEART-HEALTHY NUTRITION

CardioSmart
American College of Cardiology

To PROTECT YOUR HEART, eat more...



MEDITERRANEAN

- ↓ Light on dairy, meats and sweets
- ✓ Fish
- ✓ Olive oil
- ✓ Wine (in moderation)

VEGETARIAN

- ✗ Cuts out meat
- ✓ Vegetable proteins (soy products, legumes)

VEGAN goes further with no meat, fish, eggs or dairy products

WHOLE FOOD PLANT-BASED EATING avoids processed foods

DIETARY APPROACHES TO STOP HYPERTENSION (DASH)

- ↓ Limits salt to less than 1,500 mg/day
- ✓ Lean meat, poultry, fish
- ✓ Fruits and vegetables rich in potassium (bananas and leafy greens)

CUT BACK on processed meats and saturated fats

AVOID trans fats

DRINK WATER instead of sodas or juice!

MORE TIPS

For more information, visit *CardioSmart.org/Nutrition*

@CardioSmart

VS

Risk Factors for Heart Disease

There are numerous conditions and lifestyle habits that can increase your chance of developing heart disease. We call these conditions and lifestyle habits, **risk factors**, and while you may be able to control some factors, others are simply out of your control. That's why **understanding the factors** that can increase your risk of developing heart disease is so important. **Knowledge is power** so that you can take the necessary steps to help reduce the possibility of developing heart disease.

Risk Factors You CAN NOT Control

HEREDITY (INCLUDING RACE)

Having a family history of heart disease increases your risk, and so can race. Black and Hispanic Americans have higher rates of heart disease risk factors such as hypertension, obesity and diabetes.[1] Furthermore, black men and women are at greater risk for cardiovascular disease and stroke than white men and women.[2]

AGE

As you age, your risk for heart disease increases. About 82 percent of people who die of coronary heart disease are 65 or older.[1]

GENDER

Heart disease kills more women than men, although men have higher rates of being diagnosed with heart disease.[2,3]

Since you can't do anything about your heredity, age or gender, it's even more important for you to **manage the risk factors that can be changed.**

Risk Factors You CAN Control

DIABETES

Diabetes significantly increases your risk of developing cardiovascular disease. In fact, at least 65 percent of people with diabetes die from some form of heart or blood vessel disease.[1]

SMOKING

Smokers are 2-4 times more likely to develop coronary heart disease than of nonsmokers. Just smoking one pack of cigarettes a day doubles your risk of having a heart attack.[1]

HIGH BLOOD PRESSURE (HYPERTENSION)

One in three adults living in the United States have high blood pressure.[2] For blacks, the prevalence of high blood pressure is among the highest in the world.[2]

HIGH CHOLESTEROL

Only 47.3 percent of adult Americans have healthy cholesterol levels.[2] Too much cholesterol (a waxy, fat-like substance) can build up in blood vessels, slowing and possibly blocking blood flow.

OBESITY

Overall, 68 percent of adult Americans are overweight or obese.[1] Black and Latino American women have a higher rate of obesity, which puts them at a higher risk of developing heart disease.[1]

INACTIVITY

The risk of heart disease increases with physical inactivity. Women, Black and Latino Americans are more likely to be inactive than white men.[1]

1. "American Heart Association, Risk Factors and Coronary Heart Disease. Available at: http://www.americanheart.org/presenter.jhtml?identifier=4726. Accessed March 17, 2014."
2. "Go AS, Mozaffarian D, Roger VL, et al. Heart disease and stroke statistics - 2014 update. A report from the American Heart Association. Circulation 2014; 129: e28-e292."
3. "American Heart Association, Common Myths About Heart Disease. Available at: https://www.goredforwomen.org/about-heart-disease/facts_about_heart_disease_in_women-sub-category/myths-about-heart-disease/. Accessed March 17, 2014."

Education

- Frame information as positive/negative or as do's/ don'ts
  - Avoid using numbers as numerical values are quickly forgotten thus carry little to no meaning
- Provide explicit descriptions of benefits with specific examples
  - MI tip -> tie in benefits that they specifically mention as motivating factors
- Provide infrastructure for them to find additional information
- Provide repeat education, instructions, and help set up reminders
  - Especially before decision making

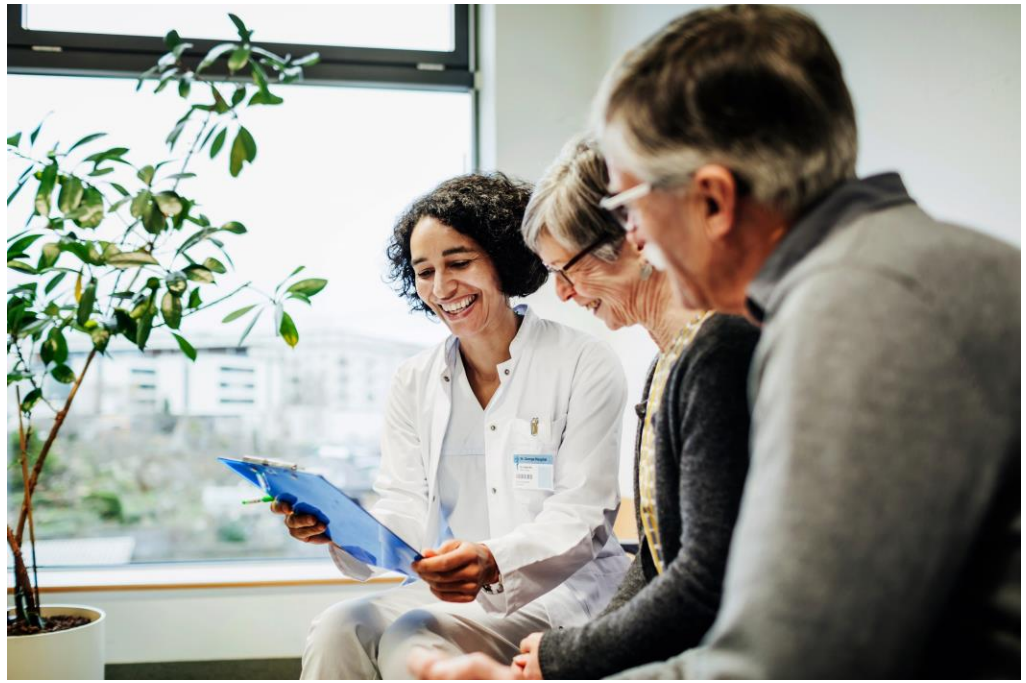
Education

Strategy Training

- Treatment model that focuses on activation through performance of daily activities
- Keys to Strategy Training:
  - Self-selected goal
    - Individuals with cognitive impairment may learn best when given the opportunity to problem solve personally motivating goals or activities.
  - Self-evaluation of performance
  - Guided discovery
    - Allows individuals to decide what's effective and/or ineffective and then plan and modify as necessary
    - Use global strategy to engage in activities in organized and consistent format

Education

- Recruit family members, caregivers, and community
  - Help with reminders
  - Receive education
- Focus on low-cost strategies



Key Take-Aways

- Cognitive impairment is at least 2x more prevalent in CKD and ESRD than healthy age-matched controls.
- Cognitive decline begins at earlier stages of CKD than previously thought and is associated with worse outcomes including increased hospitalizations and mortality.
- Interventions should be geared towards:
  - Mitigating the risk of cognitive decline through a systems approach.
  - Adapting education, counseling, and medical nutrition therapy with consideration to cognitive impairment.

Recommended Reading

- Rotondi et al, 2023 - Association between Cognitive Impairment and Malnutrition in Hemodialysis Patients: Two Sides of the Same Coin
- Drew et al. 2019 - Cognitive impairment in CKD: pathophysiology, management, and prevention.
- Manfredini et al. 2017 – Exercise on Dialysis: A Multicenter, Randomized Clinical Trial

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Questions?

Thank you!

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Patient Care America
Manager of Clinical Education and Research