Live. Learn. Hope.

Dialysis Lab Interpretation – Part 2: Adequacy of Dialysis

Clinical Education
4/2021

NORTHWEST Kidney Centers

Learning Objectives

At the end of the presentation, the nurse will be able to:

1. Explain the meaning of dialysis adequacy.
2. Identify the lab tests to measure adequacy.
3. Recognize the adequacy goals.
4. Enumerate the factors that affect dialysis adequacy.
5. Describe the actions should be taken if adequacy goals aren't met.

What is Adequacy of Dialysis?

- Is the patient's volume of blood being "adequately" cleaned during treatment?

- ***Purpose***: to remove uremic toxins – relieve the s/s of uremia = tiredness, weakness, poor appetite, malnutrition, anemia, and others

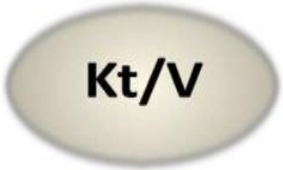
- ***Results***: Patients will feel better, be healthier, and live longer lives

Show Me The Results!

Adequacy Measurements

Kt/V: is the preferred method for determining the prescribed dose & for measuring the delivered dose

- **K** = **Clearance of urea** by the dialyzer
- **t** = total **Time** of treatment
- **V** = **Volume of urea** distribution, approx. equal to pts total body water



URR= **U**rea **R**eduction **R**atio

Adequacy Goals:

Kt/V = 1.2 or higher

= **1.4 or higher** (NKC specific)

For patients dialyzing 3x/wk

Kt/V = **2.0 or 2.2** (NKC specific)

For patients dialyzing </>3x/wk

URR = **65% or higher**

Factors Affecting Adequacy:

1. Size of Dialyzer
2. Flow Rates – Blood & Dialysate
3. Total Time on Dialysis
4. Anticoagulation
5. Access Recirculation – AVF, AVG, Catheter
6. Residual Kidney Function
7. Fluid Compliance
8. Accurate Blood Draw
9. Patient & Staff Education

Dialyzer Size

- Has to do with surface area & efficiency
- Affects the "**K**" = clearance of urea
- Size does matter – should be appropriate to patient's body size
- Bigger patient may need bigger dialyzer

- Remember: we use High-Flux dialyzers
  - More efficient in removing wastes (Urea & Creatinine)
  - More efficient in removing large amounts of fluids
  - They are biocompatible (less reactions)

Flow Rates

- Affects the "**K**" = clearance of urea

- **Blood Flow Rate** (BFR) or Pump Speed
  - The higher the BFR, the more the blood can be cleaned over & over during treatment
  - BFR ranges from 200 – 450mL/min
  - Condition of the access and needle size can affect BFR

- **Dialysate Flow Rate** (DFR)
  - Improves rate of diffusion of solutes
  - DFR 600-700-800mL/min

Treatment Time

- Affects the "**t**" = total time on dialysis

- Affected by:
  - Frequent alarms
  - Machine on bypass = no cleaning of blood
  - Going to the bathroom
  - Late on or early off = shortened treatment

- Time is the most important factor in achieving adequate dialysis.

- Every minute counts!

Anticoagulation

- Affects the ”**K**” = clearance of urea
- Heparin is widely used anticoagulant in dialysis
- Prevents the blood from clotting in the extracorporeal circuit, especially the dialyzer, during treatment
- Clotted dialyzer reduces surface area

- Always observe & document clotting of the circuit
- Evaluate pt.’s condition
- Alternative measures to prevent clotting – i.e. citrisate bath or NS flushes

Access Recirculation

- Affects the "**K**" = leading to low clearance of urea
- Means that arterial blood and venous blood are being mixed in the access.
- Same blood that was just cleaned goes back out into the circuit = inefficient dialysis
- Caused by improper needle placement or access problems –catheters lines reversed

- Patient will show s/s of uremia buildup
- May need access repair

Residual Renal Function

- Affects the "**K**" = low urea clearance
- If a patient still has fair amount of urine output & filtration functions, it can cause a falsely low Kt/V
- Residual renal function test may need to be ordered by MD – involves blood draws and urine collection

Fluid Management

- Affects the "**V**" = the **V**olume of distribution of urea (approx. equal to pts total body water)
- High fluid gains in between treatments means higher UFR which could lead to complications during treatment which often leads to shortened treatments
- Educate pt about fluid managements
- Refer to dietician

The Blood Draws

- **Pre & Post BUN (URR & Kt/V)**

Plasma

Green Top Tube (Pre-Dialysis)

Draw **before** giving Heparin (**before** start of treatment)
Follow instructions on inverting after draw, proper spinning, & refrigeration of sample

Green/Yellow Top Tube (Post-Dialysis)

Draw at **completion of treatment** – before rinseback
Follow instructions on inverting after draw, proper spinning, & refrigeration of sample

Blood Draw – Urea Rebound

- Urea levels rapidly increase after dialysis
- Timing and accuracy of the **Post BUN** blood draw are critical. Let's review the steps:

When the machine indicates completion of treatment - **DO NOT** press the Red Arrow (do not end treatment)

1. Press **Bypass**
2. Reduce **Pump Speed to 100 ml/min** & start timing 15 seconds
3. At **EXACTLY 15 seconds**, draw the sample from the arterial bloodline port
4. Follow inversion, spinning, and refrigeration of samples after blood draw

Patient Education

- Explain the meaning and benefits of getting adequate dialysis every treatment

- Focus on the factors that can improve their treatment
- Encourage patients to complete their treatment – every minute counts!
- Emphasize health benefits to patients
- Educate on how fluid and diet affect their treatment adequacy

Staff Education

Help technicians understand meaning, benefits, and factors that affect adequacy

- Assessment of treatment is needed i.e., clotting, dialyzer size, & access status
- Correctly setting machines based on orders: BFR, DFR, needle size, & dialyzer
- Completion of treatments
- Accuracy of blood draws

Other Reasons

Meeting adequacy has a very huge impact to both patients and the dialysis provider.

Why Is KT/V So Important?

Patients with an adequate KT/V (1.2-1.6) have better long-term survival rates!

- Underdialysis can lead to chronic anemia, nausea, vomiting, poor appetite, mental fog, and increased fatigue

- Underdialysis overtime contributes to vascular disease, increased incidences of calciphylaxis and bone disease, etc.

Implications For Dialysis Patients:

Better Quality of Life

The adequate removal of wastes from patients' blood will relieve them of the s/s of uremia.

They will feel better and will live better and have a consequent reduction in morbidity and mortality.

Why Else Is KT/V So Important?

Previously, CMS has required reporting of Kt/V monthly and it has been tied into the star rating of each clinic.

- In 2020, CMS now bases treatment payments on meeting goals associated with KT/V
- If goals are not meet, the clinic's payments from Medicare for EVERY single patient for an ENTIRE year are reduced by at least 10%

Implications For The Dialysis Provider:

Mission and Budget Accomplishments!

When patients meet adequacy goals, it will give the provider a sense of dual accomplishments:

- ✓ achieving the mission of quality care delivery
- ✓ appropriate financial recovery

What Tools Do Nurses Have?

How can you quickly review & act on Kt/V results?

Go to "Clarity" > "Reports" > "Reports Wizard" > Clinic Report > "*Kt/V: Excel"

Patient	Physician	Nurse	Time to DW	Time Req to Access	(+)/- Time Needed	Kt/V Date	Kt/V	URR	BUN Pre	BUN Post	Pre Weight	Post Weight	Dry Weight	HDTo	HDTa	UFV (L)	BVP (L)	Avg BFR (mL/min)	BFR	DFR	Membrane	Reuse #	Access
			2.8	253	13	02/03/2021	1.62	75.0	48.0	12.0	86.1	83.9	84.5	240.0	240.0	2.51	97.3	394.0	400	600	F160NR		Fistula
						02/12/2021	0.64	44.0	72.0	40.0	85.5	84.6			120.0	1	30.1	247.0					Fistula
			3.8	189	-51	02/03/2021	1.43	72.0	66.0	10.0	62.6	62.4	63.0	240.0	240.0	0.5	47.7	199.0	200	600	F160NR		Graft
			4.5	159	-81	02/03/2021	1.71	78.0	60.0	11.0	53.8	52.9	53.0	240.0	183.0	1.29	66.9	300.0	300	600	F160NR		Fistula
			1.7	429	189	02/15/2021	1.35	69.0	100.	31.0	148.0	145.8	143.0	240.0	239.0	3.5	102.2	443.0	400	800	F200NR		Fistula

This report gives you the Kt/V & URR results as well as all the factors that affect adequacy of dialysis such as: weights, ordered & actual treatment time, BVP, Avg BFR, DFR, type of dialyzer.

What to do if…

Kt/V & URR are below the goals

Do we check and/or recheck or take action?

Ask yourself:

1. Why is the patient are not meeting adequacy goals?
2. Is this a trend or one-time occurrence?
3. If it is one-time occurrence, what happened during that treatment? Do we recheck?
4. If this is a trend, think of negative effects to the patients' health status. What adjustments do we need to take?

Analyzing Adequacy Results

Where do we start if not meeting goals?

- ✓ Review HD orders
- BFR
- DFR
- Duration
- Dialyzer size
- Needle gauge

The Investigation

✓Review treatment detail information from the day of the lab draw:

- actual time dialyzed vs ordered
- actual dialyzer used vs ordered
- actual BFR vs ordered
- actual needle size vs ordered
- actual DFR vs ordered

The Not So Obvious Evidence

We need to dig deeper on our investigation:

- look at of dialyzer appearance post HD
- correct pre and post weight entry
- any other treatment complication that affected the blood draw?
- how's the access?

Most importantly, how is the patient?

One-Time Occurrence?

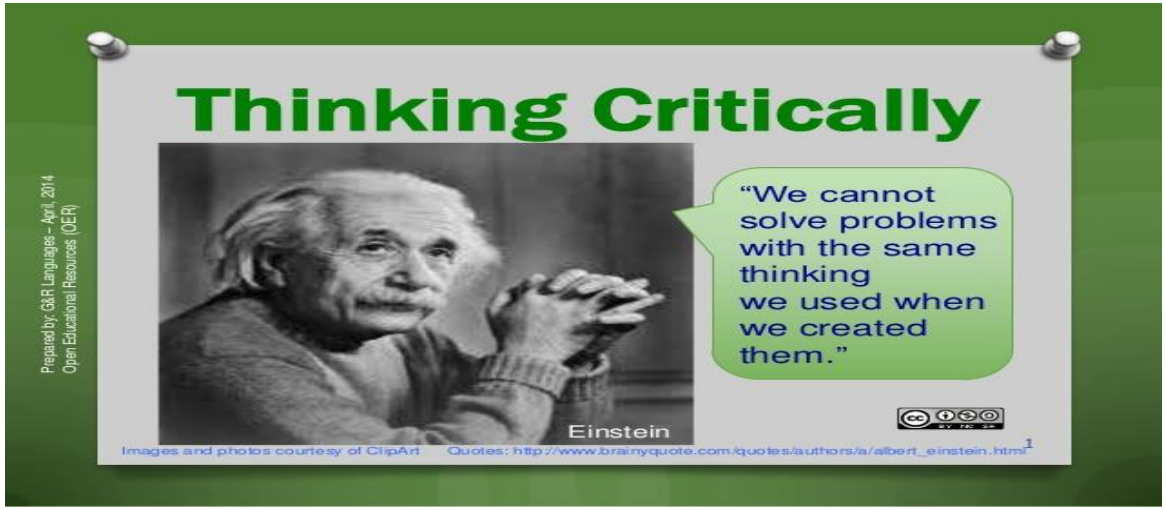
YES, if an unexpected treatment complication occurred. For example:

- ✓The blood pump speed was not up to ordered QB due to needle position or access issues.
- ✓The patient lost 10 minutes of dialysis time from late getting, using the restroom, or came off early.

Recheck Kt/V in these situations or more, especially if patient typically reaches Kt/V goal.

Seeing a Downward Trend?

Put Your Thinking Caps On!



Investigate: Dialyzer

First: *How well is the dialyzer clearing during rinseback? Why does it matter?*

- ✓Assess the dialyzer post rinseback – streaks on the fibers, clots on the headers?
- ✓Look at trends, check previous notes
- ✓Investigate changes in patient's health status and medications
- ✓Evaluate Heparin dose or NS boluses?

Remember: Streaked or clotting in dialyzer = less surface area = affects clearance "**K**"

Investigate: Access, Needles, BFR

Second: *How is the access? Needle size? Is it tolerating the BFR? Why does it matter?*

- ✓ Review treatments – frequent alarms? Lower BFR than ordered?
- ✓ Assess the access. Is there any whistle (high-pitched sound) heard while listening to access?
  - If yes, notify MD/access surgeon = stenosis
  - Suggest recirculation studies to MD, if appropriate
- ✓ Evaluate if access can tolerate bigger needle size and higher BFR

Remember: BFR affects total blood liters processed = affects clearance "**K**"

Investigate: DFR & Body Size

Third: *What is the patient's TW? Is the dialyzer size appropriate? What is the DFR? Why do they matter?*

- ✓ Assess if bigger dialyzer is needed
  - When requesting an increase in dialyzer size, request increase in QD to 800ml/min (maintains delta pressure >200)
- ✓ Evaluate if patient can tolerate bigger dialyzer & higher DFR

Remember: Size & flow matters! Surface area and flow rates affect clearance "**K**"

Investigate: Fluid Status

Fourth: *Speaking of weight, what is the average fluid gains of the patient? Why does it matter?*

- ✓ Evaluate the fluid gains in between treatments. Higher UFR leads to complications resulting in shortened runs.
- ✓ Provide patient education about fluid managements
- ✓ Refer to dietician

Remember: high fluid gains affect the "**V**" = **V**olume of distribution of urea

Investigate: Treatment Time

Last, but certainly not the least: *Is the prescribed time sufficient? Why does it matter?*

- ✓ Assess the completion of the run – does the total completion matches the prescribed duration?
- ✓ Evaluate factors that consistently affect the time – interruptions, tardiness, skipped runs, early offs
- ✓ Provide patient education
- ✓ If all else fails, consult MD for an increase in treatment time

Remember**: Time** "t" is the **most important** factor for attaining dialysis adequacy BUT the most difficult to "sell" to the patient

Also Investigate: Frequency

Patients dialyzing 4x a week almost always have issues with fluid management but occasionally, 4x a week is also related to severe cardiac disease

4x/week frequency require a different Kt/V draw:

- Kt/V Standard, URR (<>3x/wk)
- The calculation for Kt/V standard is preformed in Ascend by adding in the treatment details for the day of the draw
- The Kt/V goal for patients with 4x/week order is 2.0-2.2

Four Times/Week Frequency

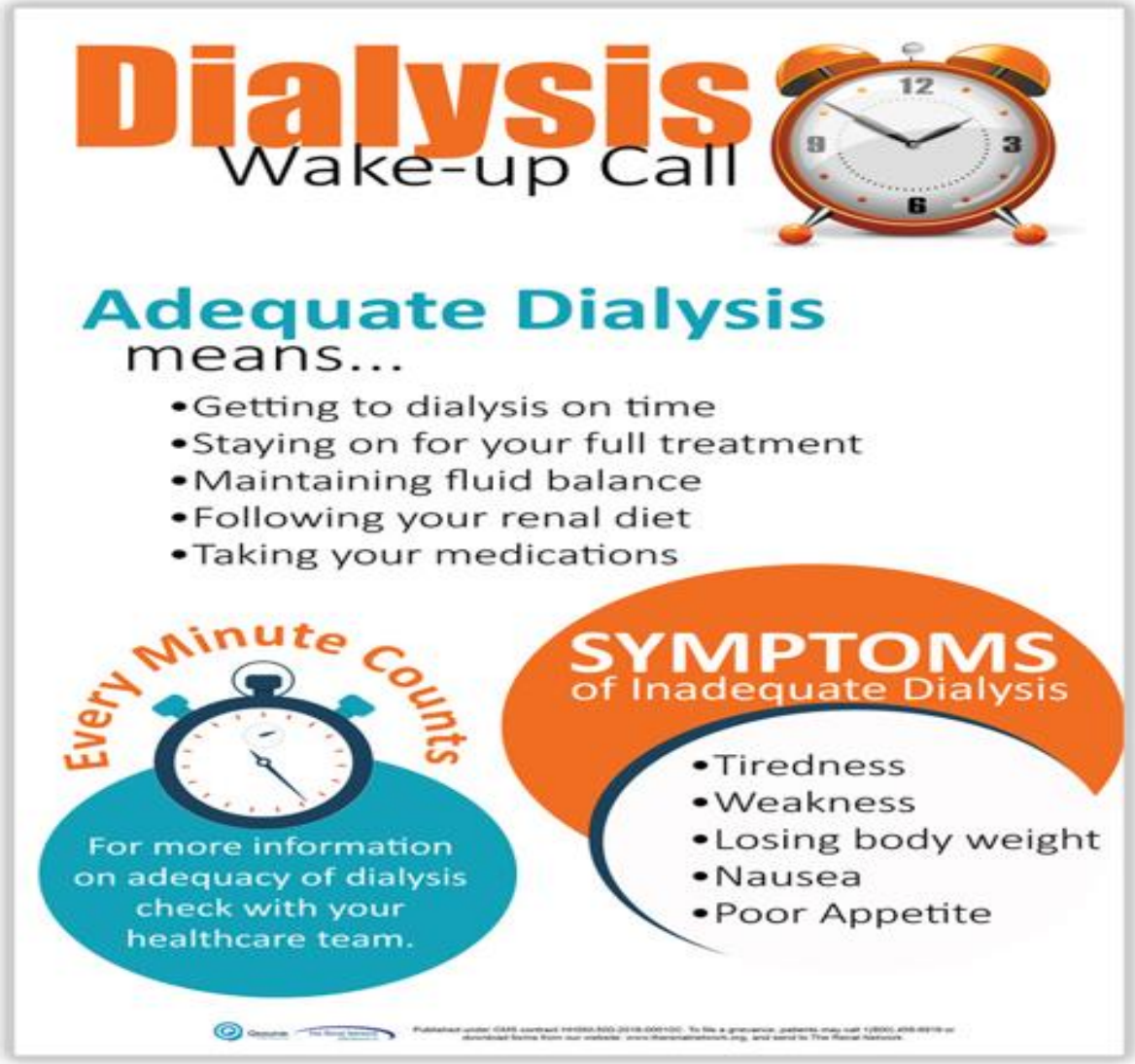
Primary Nurses are responsible for putting the necessary treatment data into **Ascend Lab**

Treatment information includes:

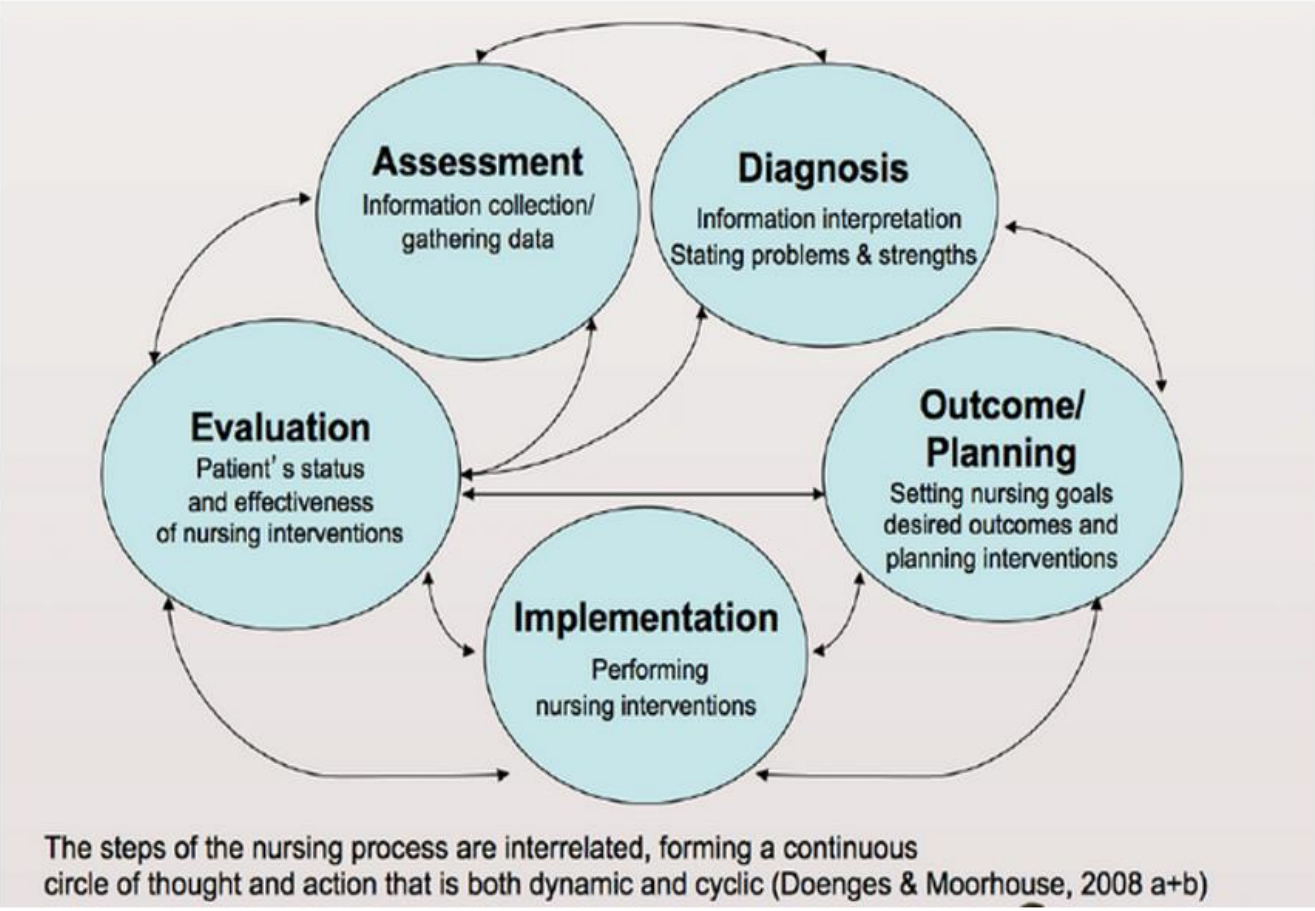
- Pre-Weight
- Post Weight
- Number of treatments per week
- Amount of treatment time (in minutes)

All the above info can be found in **Clarity**:
Pt Chart View > **Treatment tab**

We All Play a Role



Remember The Nursing Process!



The steps of the nursing process are interrelated, forming a continuous circle of thought and action that is both dynamic and cyclic (Doenges & Moorhouse, 2008 a+b)

*Remember, it is more than just about numbers!

References

- Bodin, S. (2017). *Contemporary Nephrology Nursing.* Pitman, N.J.: American Nephrology Nurses Association.
- Brockenbrough, A. (2017). Residual Kidney Function. Kent.
- *Clarity*. (2021). Retrieved from Patient Chart View Lab Results: https://id.visonex.net/IdMg/
- *Core Curriculum for Dialysis Technician.* (2012). Madison: Medical Education Institute.
- Doenges, M., & Moorhouse, M. (2008). *Application of Nursing Process and Nursing Diagnosis* (Fifth ed.).
- Lewis, M. (2019, March 6). *Pre/Post BUN (URR and Kt/V).* Retrieved from NWKidney Policy Medical Web site: https://nwkidney.policymedical.net/policymed/newSearch/searchDocuments?sfContent=bun&queryStr=%2Fpolicymed%2FnewSearch%2FdoSearchReg%3FsfContent%3Dbun#
- *NIDDK*. (2014, June). Retrieved from Hemodialysis: Dose & Adequacy: https://www.niddk.nih.gov/health-information/professionals/clinical-tools-patient-management/kidney-disease/identify-manage-patients/manage-ckd/hemodialysis-dose-adequacy

QUESTIONS?