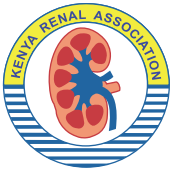
GUIDELINES FOR MANAGEMENT OF HYPERTENSION IN PATIENTS ON MAINTENANCE DIALYSIS

2017

MAINTENANCE DIALYSIS

MINISTRY OF HEALTH



KENYA RENAL ASSOCIATION

FOREWORD: MINISTRY OF HEALTH

Message from the Chairman, Kenya Renal Association

The Kenya Renal Association (KRA) is pleased to partner with the Ministry of Health in the formulation of the dialysis guidelines. This is the first edition of the guidelines covering many areas relevant in dialysis care. The writing of these guidelines was motivated by the realization of the existing human resource capacity gap in the country. The expansion in installed hemodialysis infrastructure has far out - paced the requisite trained human resource complement needed to offer these services. As a result, services are offered by personnel who have only undertaken short preceptorship courses. These short courses in no way substitute formal training. These guidelines attempt to provide a guide to management of common conditions and situations that may be encountered during the course of dialysis and in management of dialysis dependent patients.

These guidelines are deliberately simplified to make them easy to use. In coming up with these guidelines, we have borrowed from other major guidelines which we acknowledge at the references section. KRA is grateful to all who contributed their time and effort to ensure that these guidelines come to fruition. Special gratitude goes to the pioneer EAKI Nephrology Fellows who took the time to painstakingly go through these guidelines as well as the Nephrologists who mentored them.

These guidelines are by no means exhaustive and the user must not hesitate to ask for help or consult more detailed nephrology texts if they encounter situations not envisioned or well captured in these guidelines. KRA hopes to review these guidelines periodically as and when significant changes to best practice recommendations occur.

It is hoped that these guidelines will prove educative and practical to the user and help improve the quality of care offered to the dialysis patient.

Prof. S. O. McLigeyo, Chairman,

Kenya Renal Association.

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Abbreviations, acronyms and definitions

ABPM: - Ambulatory blood pressure monitoring

BP: - Blood Pressure

ESRD: - End stage Renal disease

Dry weight: - The lowest tolerated post-dialysis weight at which there are minimal signs or symptoms of either hypovolemia or hypervolemia

Introduction

Hypertension is a common finding in dialysis patients. Uncontrolled hypertension is an important risk factor for increased cardiovascular disease and mortality in dialysis patients. Clinicians should therefore strive for better blood pressure control in these patients.

The aim of treatment outlined in this guideline includes optimizing blood pressure control while avoiding hypotension and obtaining maximum cardiovascular benefits and quality of life.

Hypertension in maintenance dialysis: Pathogenesis

Volume expansion is the major cause of hypertension in dialysis patients.

Others factors include:

- Sympathetic overactivity.
- Activation of the renin-angiotensin system.
- Changes in endothelium-derived vasoactive peptides.
- Increases in intracellular calcium.
- Decreases in renalase (a catecholamine-metabolizing enzyme released by the kidney in response to catecholamine surge).
- Treatment with erythropoiesis-stimulating agents (ESAs).
- Nonsteroidal anti-inflammatory drugs (NSAIDs) use.
- Preexistent essential hypertension.

BP monitoring and Diagnosis of hypertension

- Health care professionals who have been specifically trained to measure BP accurately should assess BP in all adult patients during all clinic visits.

- Standardized BP measurement techniques and calibrated equipment should be used for all methods of measuring BP.

- S*elf-recorded home blood pressure monitoring* is recommended to diagnose hypertension and monitor BP as these readings are efficient, accurate, and correlate with ABPM and with outcomes. Measurements should be done using an automated BP measuring device, at least once per week. These inter-dialysis recordings should be reviewed by the a clinican at monthly intervals.

- *Office BP measurements*: - Office readings are known to vary from day to day. It is therefore suggested that diagnosis and management decisions be based on repeated measurements.

- *Ambulatory blood pressure monitoring (ABPM)*: - Although considered the gold standard for the diagnosis of hypertension, it is too cumbersome and poorly suited to day-to-day management of hypertension. It is recommended that ABPM be used in patients with variable office, self-recorded or intradialytic BP measurements.

- *Intra-dialysis blood pressures*: Although BP is closely monitored throughout the dialysis treatment to assess the hemodynamic stability of the patient during the treatment, use of pre- and post-dialysis BP measurements to diagnose hypertension or titrate antihypertensive therapy is not recommended because these readings do not correlate with ABPM or with clinical outcomes.

Blood pressure targets

The target BP goals should be individualized: - Inter--dialysis blood pressures should be used for diagnosis and monitoring. Wherever possible, target BPs should be a systolic BP of <140mmHg systolic and a diastolic BP of < 90 mmHg.

Intra-dialysis BP monitoring: - Blood pressure should be monitored every hour during every dialysis session in stable patients and more frequently in unstable patients.

Management of hypertension in patients undergoing Hemodialysis

Control of volume status:

- All efforts should be made to set and achieve **'dry weight'** for each patient. This should be based on clinical assessment of volume status such as edema, fluid in lungs and serous cavities, jugular venous pressures (JVP), chest x-ray and echocardiography. Objective methods of assessing dry weight accurately include: -
    - Bioimpedance plethysmography
    - Relative plasma volume (RPV) monitoring
    - Measurement of the inferior cava diameter
    - Measurement of plasma natriuretic peptides (particularly atrial and B-type) concentrations
- Achieving dry weight should be individualized and is best done gradually, within 1-3 months as tolerated.
- Patients should be advised to avoid large interdialytic weight gain (ideally <2 Kgs) in order to limit the amount of fluid that needs to be removed in an individual dialysis session.
- The best way to limit interdialytic weight gain is to limit salt intake. All patients should adhere to a restricted salt diet (refer to nutrition guidelines).
- In patients with difficulty in achieving dry weight, the following is recommended: -
    - Increasing the length and /or frequency of dialysis sessions.
    - Reduce the dialysate sodium concentration: Reduced gradually by 1 mEq/L every three to four weeks to approximately 136 mEq/L.

Choice of Antihypertensive agent:

Beta-blockers and Calcium channel blockers (CCB)

- These are ideal first-line agents in patients whose hypertension is not adequately controlled with dialysis alone.

- Most beta blockers (**except carvedilol**) are removed by hemodialysis and therefore require additive doses after hemodialysis (Appendix 2).

- CCBs are not removed by haemodialysis and thus do not require dosage alteration before or after hemodialysis (Appendix 2).

Angiotensin converting enzyme inhibitors(ACE-I) and angiotensin receptor blockers (ARBs)

- In patients where BP control is not achieved by a beta blocker and a calcium channel blocker or where these agents cannot be used, an ACE inhibitor or an ARB may be considered (especially in patients with compelling indications such as left ventricular hypertrophy).

- All ACE-I are removed by haemodialyis and thus require additive doses after hemodialysis. ARBS are not removed by hemodialysis (Appendix 2).

- Serum potassium levels should be closely monitored when ACE inhibitors or ARBs are prescribed.

For dialysis patients whose BPs are not well controlled by both volume control measures and initial antihypertensive medications above, the following classes of antihypertensive agents may be added: -

- **Direct Vasodilators:** Minoxidil, Hydralazine

- **The central sympathetic agonists:** Methyldopa, Clonidine

NB: Mineralocorticoid receptor antagonists*: Although commonly used in non-dialysis patients with resistant hypertension, they are generally* ***not recommended*** *in hemodialysis patients because of the potential risk of hyperkalemia.*

In patients where BP control is not achieved with above measures, the following measures should be considered: -

- Ensure adherence to prescribed medications.
- Reducing the doses of erythropoiesis stimulating agents (ESA).
- Address other factors that may contribute to poor BP control e.g. concurrent use of nonsteroidal anti-inflammatory drugs (NSAIDs).
- Investigate for secondary causes of hypertension e.g. renovascular hypertension, thyroid pathology, adrenal pathology, expanding cyst size in polycystic kidney disease, etc.
- Switching patient from hemodialysis to peritoneal dialysis where possible.

BP management in patients undergoing peritoneal dialysis (PD)

- Dietary salt restriction to <4gms/day is recommended.
- ACEIs and ARBs are recommended as first line antihypertensive agents in patients on PD because inhibition of the renin- angiotensin- aldosterone (RAAS) system has been shown to be beneficial for preserving peritoneal membrane ultrafiltration/ transport function.
- In patients whose BP is not controlled with ACE-I/ARBS, other classes of antihypertensive agents mentioned above should be added.

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8. Uptodate Version 21.6

APPENDIX: Pharmacologic properties of antihypertensive agents in haemodialysis

Pharmacologic properties of antihypertensive agents in haemodialysis

Class	T1/2 in ESRD	Range of dosing	Removal during hemodialysis
Angiotensin converting enzyme inhibitors			
Captopril	20–30 hours	12.5–50 mg q24 hours	Yes
Benazepril	?	5–40 mg q24 hours	20–50%
Enalapril	Prolonged	2.5–10 mg q24 to 48 hours	35%
Fosinopril	Prolonged	10–80 mg q24 hours	<10%
Lisinopril	54 hours	2.5–10 mg q24–48 hrs	50%
Ramipril	prolonged	2.5–10 mg q24 hours	<30%
Angiotensin receptor blockers			
Losartan	4 hours	50–100 mg q24	None
Candesartan	5–9 hours	4–32 mg q24	None
Eprosartan	?	400–600 mg q24	None
Telmisartan	24 hours	40–80 mg q24	None
Valsartan	6 hours	80–160 mg q24	None
Irbesartan	11–15 hours	75–300 mg q24	None
Aldosterone antagonists			
Spironolacton	?	25–50 mg qd	None
Eplerenone	?	50–100 mg qd	None
Renin inhibitor			
Aliskiren	?	150–300 mg qd	?

Drug class	T1/2 in ESRD	Dosing range	Removal during Hemodialysis
β-Blockers			
Atenolol	<120 hours	25–50 mg q48	75%
Metoprolol	3–8 hours	50–200 mg bid	High
Metoprolol XL	?	50–400 mg qd	High
Propranolol	3–6 hours	40–120 mg bid	<5%
Carvedilol	7–10 hours	6.25–25 mg bid	None
Carvedilol CR	?	20–80 mg qd	None
Labetalol	6–8 hours	100–1200 mg bid	<1%
Calcium channel blockers			
Amlodipine	?	2.5–10 mg qd	None
Diltiazem	Prolonged	Varies with formulation	<30%
Nifedipine	~5 hours	30–180 mg qd	Low
Nicardipine	Prolonged	30–60 mg bid	?
Felodipine	11–16	2.5–10 mg qd	No
Verapamil	Prolonged	Varies with formulation	Low
Alpha blockers			
Doxazosin	15–22 hours	1–8 mg qhs	None
Terazosin	9–12 hours	1–20 mg qhs	None
Prazosin	2–4 hours	1–5 mg bid to tid	?
Others			
Clonidine	18–41 hours	0.1–0.4 mg bid-tid	<5%
Hydralazine	7–16 hours	10–100 mg q8 hour	None
Isosorbide dinitrate	?	5–40 mg tid	Yes

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