Blood Pressure Management in CKD
KDIGO Guideline

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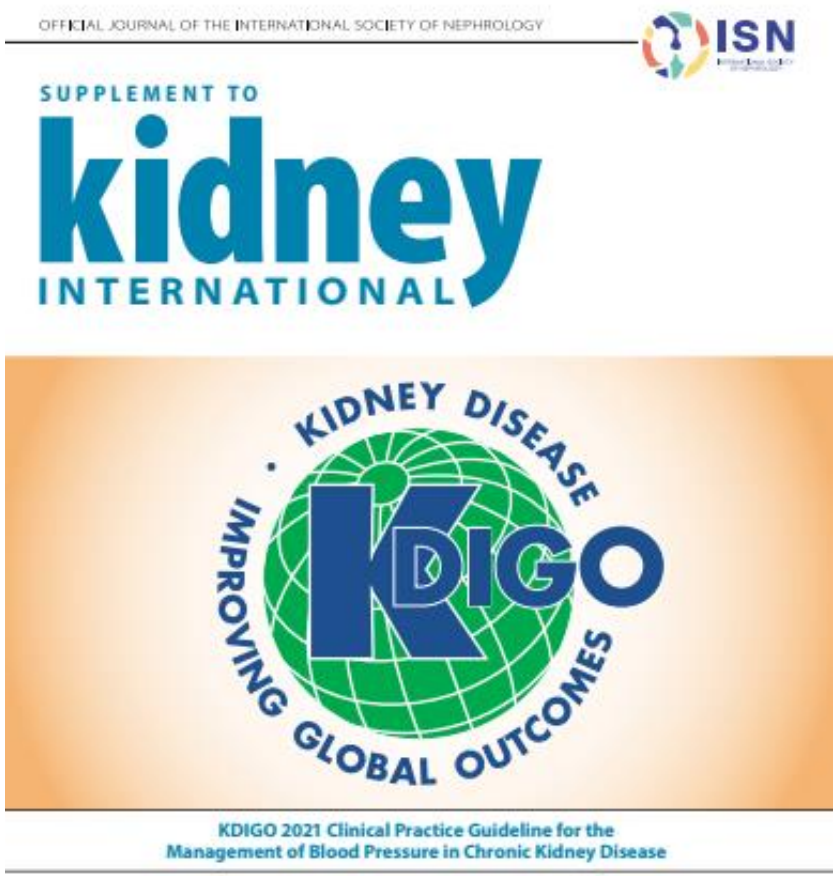
KDIGO 2021 Clinical Practice Guideline for the Management of Blood Pressure in Chronic Kidney Disease



Starting Guideline

- The original KDIGO Guideline for the Management of Blood Pressure CKD not receiving dialysis was published in 2012.

- The Work Group guideline update has identified 2 major areas
  - BP measurement
  - BP targets
    - SBP target of <120 mm Hg

BP measurement

Blood pressure measurement

- Standardized office BP measurement in preference to routine office BP measurement for the management of high BP in adults

PREPARATION BEFORE TAKING BP

The patient should be resting comfortably in a **quiet environment for 5 minutes** in a chair. The patient should have an **empty bladder** and **not** have **eaten, ingested caffeine, smoked,** or engaged in **physical activity** at least **30 minutes prior** to the measurement. There should be **no talking** during the procedure by the patient or observer.

Inflatable bladder width should be about 40% of arm circumference and bladder length should be about 80-100% of the individual's arm circumference.

For auscultation, the lower edge of the cuff should be 2-3 cm above the elbow crease and the bladder should be centered over the brachial artery.

Ideally, use validated upper-arm electronic devices.

For electronic devices, apply the cuff as recommended by the manufacturer and record the BP exactly as displayed on the automated device.

Checklist for standardized office blood pressure measurement

Properly prepare the patient

1. Have the patient relax, sitting in a chair (feet on floor, back supported) for > 5 min
2. The patient should avoid caffeine, exercise, and smoking for at least 30 min before measurement
3. Ensure patient has emptied his/her bladder
4. Neither the patient nor the observer should talk during the rest period or during the measurement
5. Remove all clothing covering the location of cuff placement
6. Measurements made while the patient is sitting or lying on an examining table do not fulfill these criteria

Proper technique for BP measurement

1. Use a BP measurement device that has been validated, and ensure that the device is calibrated periodically
2. Support the patient's arm (e.g., resting on a desk)
3. Position the middle of the cuff on the patient's upper arm at the level of the right atrium (the midpoint of the sternum)
4. Use the correct cuff size, such that the bladder encircles 80% of the arm, and note if a larger- or smaller-than-normal cuff size is used
5. Either the stethoscope diaphragm or bell may be used for auscultatory readings

Proper measurement need for dignosis

1. At the first visit, record BP in both arms. Use the arm that gives the higher reading for subsequent readings
2. Separate repeated measurements by 1–2 min
3. For auscultatory determinations, use a palpated estimate of radial pulse obliteration pressure to estimate SBP. Inflate the cuff 20–30 mm Hg above this level for an auscultatory determination of the BP level
4. For auscultatory readings, deflate the cuff pressure 2 mm Hg per second, and listen for Korotkoff sounds

Checklist for standardized office blood pressure measurement

4 Properly document accurate BP readings	1 Record SBP and DBP. If using the auscultatory technique, record SBP and DBP as onset of the first Korotkoff sound and disappearance of all Korotkoff sounds, respectively, using the nearest even number 2 Note the time of most recent BP medication taken before measurements
5 Average the readings	Use an average of ≥ 2 readings obtained on ≥ 2 occasions to estimate the individual's level of BP
6 Provide BP readings to patient	Provide patients with the SBP/DBP readings verbally and in writing

Standard Versus Routine office BP measurements

- Routine office BP measurements are generally higher than standardized office BP measurements
  - overtreatment of BP
  - Higher incidence of hypotension-related adverse events.
- Conversely, for some persons for whom routine office BP is lower than standardized office BP

Routine and standardized BP measurements have poor agreement, including those in the CKD population

Practice Point

- An oscillometric BP device may be preferable to a manual BP device for standardized office BP measurement; however
- Standardization emphasizes adequate preparations for BP measurement, not the type of equipment.

- Automated office BP (AOBP), either attended or unattended, may be the preferred method of standardized office BP measurement.

- Oscillometric devices can be used to measure BP among patients with atrial fibrillation.

BP targets and practice

Lifestyle interventions

- Sodium intake <2 g of sodium per day (or <90 mmol of sodium per day, or <5 g of sodium chloride per day) in patients with high BP and CKD
- Moderate intensity physical activity
  - Cumulative duration of at least 150 minutes per week
  - A level compatible with their cardiovascular and physical tolerance

Benefits of targeting SBP <120 mm Hg

- Cardio protective Survival
- Potential cognitive
- No new data supporting the reno protective benefits

The target SBP

- For most patients with CKD not receiving dialysis, the target is SBP <120 mm Hg
- For kidney transplant recipients the target SBP is <130 mm Hg
- Target diastolic BP (DBP) is <80 mm Hg.

Blood pressure management in patients with CKD

- Balance of benefits and harms.
  CKD G4 and G5:
  - There is less certainty around the benefit
- Diabetes:
  - Benefits of intensive BP lowering are less certain
- Individuals with SBP of 120–129 mm Hg
  - However, RCTs in CKD targeting SBP <120 mm Hg have not included individuals
- Etiology of CKD:
  - There is no evidence that CV benefits
- Older age:
  - The ratio of benefits to harms is less certain

Treatment with antihypertensive drugs

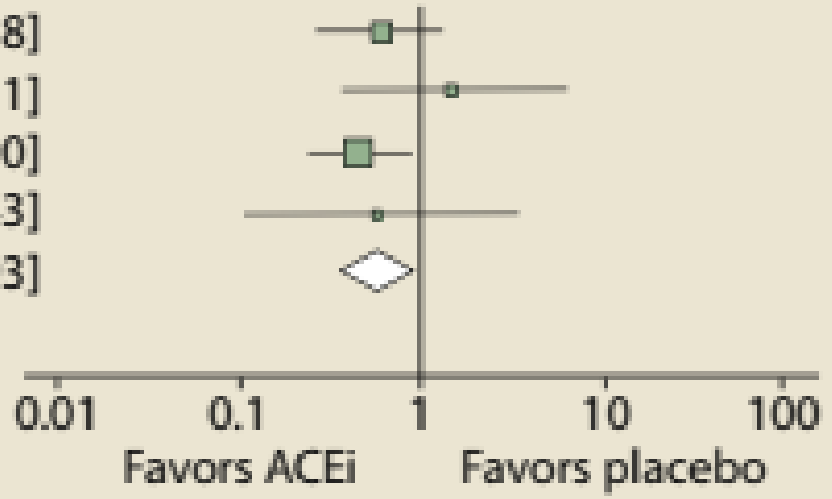
- People severe albuminuria (G1–G4, A3) without OR with diabetes
- Starting renin-angiotensin-system inhibitors (RASi) ACEi or ARB
- ACEi or ARB should be using the highest approved dose that is tolerated

Cardiovascular events in patients with CKD G3–G4, A3 without diabetes.

Study or subgroup	ACEi Events	ACEi Total	Placebo/ no treatment Events	Placebo/ no treatment Total	Weight	Risk ratio M–H, random, 95% CI
Albuminuria/proteinuria						
AIPRI 1996	9	300	14	283	33.4%	0.61 [0.27, 1.38]
GISEN 1997	4	78	3	88	10.5%	1.50 [0.35, 6.51]
Hou 2006	14	216	16	112	48.8%	0.45 [0.23, 0.90]
REIN Stratum-1 1999	2	99	3	87	7.3%	0.59 [0.10, 3.43]
Subtotal (95% CI)		693		570	100.0%	0.58 [0.36, 0.93]
Total events	**29**		**36**			

Heterogeneity: $Tau^2 = 0.00$; $\chi^2 = 2.14$, df = 3 ($P = 0.54$); $I^2 = 0\%$

Test for overall effect: $Z = 2.26$ ($P = 0.02$)



Next visit?

- Visit within 2-4 weeks of initiation or increase in the dose of a RASi
  - Changes in BP
  - Serum creatinine
  - Serum potassium
- Hyperkalemia can often be managed by measures to reduce the serum potassium levels rather than decreasing the dose or stopping RASi.

Next visit? Continue…..

- Serum creatinine rises by more than 30% within 4 weeks
  - Stop ACEi or ARB

- Symptomatic hypotension or uncontrolled hyperkalemia despite medical treatment
  - Reducing the dose or discontinuing ACEi or ARB

Avoiding any combination of ACEi, ARB, and direct renin inhibitor (DRI) therapy in patients with CKD, with or without diabetes

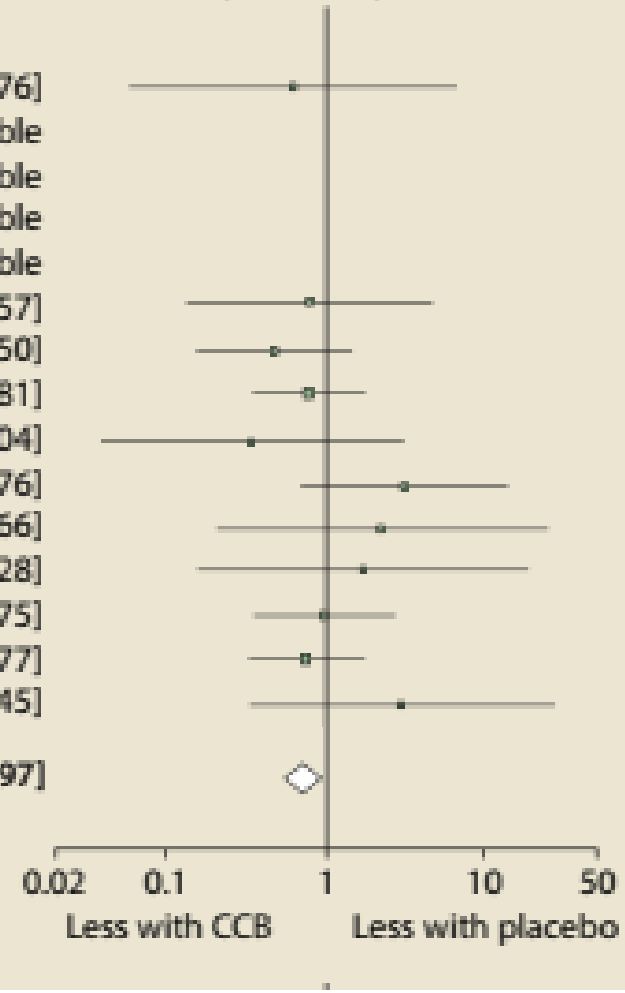
Blood pressure management in kidney transplant recipients

- Treat
  - <130 mm Hg systolic
  - <80 mm Hg diastolic
  - Recommendation as the first-line
  - Dihydropyridine calcium channel blocker (CCB)
  - ARB be use

CCB versus placebo/no treatment for the outcome of graft loss

Study or subgroup	CCB Events	CCB Total	Placebo/no treatment Events	Placebo/no treatment Total	Weight	Risk ratio M–H, Random, 95% CI
Non-dihydropyridine						
Alcaraz 1991	1	23	2	30	1.3%	0.65 [0.06, 6.76]
Campistol 1991	0	12	0	25		Not estimable
Chen 2013a CyP^{+}	0	31	0	31		Not estimable
Chen 2013a CyP^{-}	0	29	0	29		Not estimable
Chen 2013b	0	11	0	11		Not estimable
Chrysostomou 1993	2	32	3	39	2.4%	0.81 [0.14, 4.57]
Dawidson 1991	4	30	7	26	5.8%	0.50 [0.16, 1.50]
Frei 1990	9	65	11	64	10.8%	0.81 [0.36, 1.81]
Guerin 1989	1	14	3	15	1.5%	0.36 [0.04, 3.04]
Ladefoged 1994	6	19	2	20	3.3%	3.16 [0.72, 13.76]
Patton 1994	2	32	1	36	1.3%	2.25 [0.21, 23.66]
Pirsch 1993	2	32	1	28	1.3%	1.75 [0.17, 18.28]
Santos 2002	5	15	5	15	6.9%	1.00 [0.36, 2.75]
Wagner 1986	7	30	10	33	10.3%	0.77 [0.34, 1.77]
Wahlberg 1992	3	20	1	20	1.5%	3.00 [0.34, 26.45]
Total (95% CI)		**845**		**898**	**100.0%**	**0.74 [0.57, 0.97]**
Total events	**81**		**116**			

Heterogeneity: Tau^2 = 0.00; χ^2 = 13.48, df = 18 (P = 0.76); I^2 = 0%
Test for overall effect: Z = 2.20 (P = 0.03)
Test for subgroup differences: χ^2 = 1.88, df = 1 (P = 0.17); I^2 = 46.8%



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