**MENDS Hypertension Indicator Documentation**

**Summary**

The purpose of this document is to describe the criteria used to identify Hypertension, Diagnosed Hypertension and Controlled Hypertension in MENDS. Originally excerpted from ESP Algorithm documentation[[1]](#footnote-1) but later updated to reflect algorhtium changes made by the MENDS project team in 2022.

**Hypertension (Clinical Hypertension)**

1. CASE CRITERTIA

Any of the following:

* Systolic blood pressure ≥140mmHg[[2]](#footnote-2) or diastolic blood pressure ≥90 mmHg or both on 2 or more calendar days within a one-year period
* Diagnosis code for hypertension
* Prescription order or refill for at least one antihypertensive medication
1. ICD-9/ICD-10 CODES FOR CASE CRITERIA

|  |  |  |
| --- | --- | --- |
| ICD-9 | 401.x | Essential Hypertension  |
| 405.x | Secondary Hypertension  |
| ICD-10 | I10 | Essential Hypertension  |
| I15 | Secondary Hypertension  |

1. MEDICATIONS FOR CASE CRITERIA

|  |  |
| --- | --- |
| Diuretics | hydrochlorothiazide |
| chlorthalidone |
| indapamide |
| Calcium channel antagonists | amlodipine |
| clevidipine |
| diltiazem |
| felodipine |
| isradipine |
| nicardipine |
| nifedipine |
| nisoldipine |
| verapamil |
| Beta-blockers | acebutolol |
| atenolol |
| betaxolol |
| bisoprolol |
| carvedilol |
| labetolol |
| metoprolol |
| nadolol |
| nebivolol |
| pindolol |
| propranolol |
| ACE inhibitors | benazepril |
| captopril |
| enalapril |
| fosinopril |
| lisinopril |
| moexipril |
| perindopril |
| quinapril |
| ramipril |
| trandolapril |
| Angiotensin receptor blockers | candesartan |
| eprosartan |
| irbesartan |
| losartan |
| olmesartan |
| telmisartan |
| valsartan |
| Alpha antagonists | clonidine |
| doxazosin |
| guanfacine |
| methyldopa |
| prazosin |
| terazosin |

1. ADDITIONAL INCLUSION/EXCLUSION CRITERIA & NOTES
* The population to assess hypertension on must have a least 1 measured blood pressure in the past 2 years
* All available blood pressure readings from a day are averaged
* Biologically implausible values of systolic blood pressure (<30 or >300) and diastolic blood pressure (<20 or >150) are excluded.
* Incomplete blood pressure readings with only a systolic or diastolic measure are excluded
* Only outpatient data are used
1. TIME WINDOW

Classification of hypertension persists so long as patient has any of the following indicators:

* Measured systolic blood pressure ≥140 mmHg
* Measured diastolic blood pressure ≥90 mmHg
* ICD9 or ICD10 code for hypertension
* Prescription for an antihypertensive medication

If a patient has none of the above for ≥2 years, then at the next encounter reclassify as non-hypertensive (i.e., hypertension end-date is at the next encounter ≥730 days from the last encounter with evidence of ongoing hypertension). Note, however, that if the patient’s ONLY hypertension indicators have been high systolic or diastolic blood pressure values but they have NEVER had a hypertension diagnosis or prescription for antihypertensive medication then reclassify as non-hypertensive at the next encounter ≥365 days from the last recorded elevated systolic or diastolic blood pressure.

**Diagnosed Hypertension**

1. CASE CRITERTIA

Cases of diagnosed hypertension are indicated by the following:

* Diagnosis code for hypertension
1. ICD-9/ICD-10 CODES FOR CASE CRITERIA

|  |  |  |
| --- | --- | --- |
| ICD-9 | 401.x | Essential Hypertension  |
| ICD-10 | I10 | Essential Hypertension  |

1. ADDITIONAL INCLUSION/EXCLUSION CRITERIA & NOTES
* The population to assess diagnosed hypertension on must have a least 1 blood pressure measure in the past 2 years
* Include only patients between the ages of 18 and 85 years at the index date.
* Exclude hypertension diagnoses for patients with a diagnosis of pregnancy within one year of the diagnosis of hypertension.
* ICD-9: V22 (Normal pregnancy), V23 (Supervision of high-risk pregnancy)
* ICD-10: Z33 (Pregnant state), Z34 (Encounter for supervision of normal pregnancy), O09(Supervision of high-risk pregnancy)
* Exclude hypertension diagnoses for patients with prior diagnoses for end stage renal disease.
	+ ICD-9: 585.6 (End stage renal disease)
	+ ICD-10: N18.6 (End stage renal disease)
* Only outpatient data are used
1. TIME WINDOW

Classification of hypertension persists so long as patient has any of the following indicators:

* ICD-9 or ICD-10 code for essential hypertension.

Revert classification to no hypertension if ≥2 years since last hypertension diagnosis, ≥2 encounters without a hypertension diagnosis, ≥2 years without hypertension medication, and last measured systolic blood pressure was below 140 mmHg and diastolic blood pressure was below 90 mmHg.

**Diagnosed Hypertension Control Status**

Among patients with diagnosed essential hypertension defined above (i.e., active diagnosed hypertension), status value assigned depending on their most recent blood pressure measure, starting the day of diagnosis.

1. STATUS DEFINATIONS

Controlled

Identify those whose last systolic blood pressure is <140 mmHg and diastolic blood pressure <90 mmHg. The last measured blood pressure must be on or after the date hypertension was first diagnosed.

Uncontrolled

Identify those whose last systolic blood pressure is >=140 mmHg or diastolic blood pressure >=90 mmHg. The last measured blood pressure must be on or after the date hypertension was first diagnosed

Unknown

If the initial diagnosis is not accompanied by a blood pressure measure, or if the patient has no encounter with measured blood pressure for 2 years from the last blood pressure measure, control status is set to “Unknown”.

1. ADDITIONAL INCLUSION/EXCLUSION CRITERIA & NOTES
* All available blood pressure readings from a day are averaged
* Biologically implausible values of systolic blood pressure (<30 or >300) and diastolic blood pressure (<20 or >150) are excluded
* Incomplete blood pressure readings with only a systolic or diastolic measure are excluded
* Only outpatient data are used

**CONSIDERATIONS**

Hypertension algorithms were originally specified by Department of Population Medicine at Harvard Medical School and Harvard Pilgrim Health Care Institute based on clinical practice, clinical guidelines, and CMS’s electronic clinical quality measures (eCQMs) between 2016 -2019. Updates to the algorithm were made by the MENDS project team in 2022 and implemented in MENDS. These changes include limiting the algorithm to use data from ambulatory encounters only, defining the population for which hypertension is assessed to those patients with encounters with the healthcare system in the preceding two years with at least one measured blood pressure, expanding the criteria for hypertension case identification, and updating the method for dealing with multiple blood pressures on a single day.

Changes to clinical guidelines related to screening, diagnosis, and treatment may not yet be reflective and could impact the specificity of the algorithm.

1. https://espnet.atlassian.net/wiki/spaces/EP/pages/93585410/ESP+Algorithms [↑](#footnote-ref-1)
2. If patient age ≥80 then the eligible systolic threshold for hypertension is ≥150 mmHg [↑](#footnote-ref-2)