



# Ambulatory Blood Pressure Monitors: A Game Changer in Managing Hypertension

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## Background

- In 2017, the ACC/AHA released new hypertension guidelines advocating the use of ambulatory blood pressure monitors (ABPM) as the gold standard for diagnosis
- ABPM is **far superior** to office blood pressure readings at predicting target-organ damage and cardiovascular events
- ABPM is a wearable device, similar to a Holter monitor, that records the blood pressure of the patient at preset intervals and transmits this data electronically for interpretation
- Hypertension with ABPM is defined as the following:
  - A 24-hour mean of 130/80 mmHg or above or
  - A daytime (awake) mean of 135/85 or above or
  - A nighttime (asleep) mean of 120/70 or above
- These readings correspond to an office blood pressure of 140/90, which is slightly less stringent than the JNC8 suggested criteria of 130/80 for hypertension
- ABPM has many indications for use, including white coat hypertension, episodic hypertension, resistant hypertension, hypotension with antihypertensives, “masked” hypertension, and early detection of pre-eclampsia in pregnant patients
- Despite these indications, ABPM were rarely used in the outpatient Internal Medicine or Family Medicine clinics at Evans Army Community Hospital

## Objectives

- The aim of our project was to:
1. Increase provider use of ABPM for
    - (a) White coat hypertension
    - (b) Hypertension despite antihypertensive therapy
    - (c) Side effects of antihypertensive medications
  2. Monitor patient medication changes following ABPM

## Methods

- Provided educational materials to providers in the Internal Medicine clinic regarding ABPM use and interpretation
- Reviewed charts of all patients who received ABPM from September 1, 2018-December 31, 2018 to determine:
  - How many patients had white coat hypertension
  - How many patients required increased or reduced doses of antihypertensives
  - How many patients were adequately managed on current antihypertensive medication regimen

## Results

Table 1: Use of Ambulatory Blood Pressure Monitors

Indication for ABPM	Number of Patients
White Coat Hypertension	34
Persistent Hypertension	17
Antihypertensive Side Effect	6
Total	57

Table 2: Patient Demographics

Demographics	Average	Variations
Age	50.7 years old	18-82 years old
Gender	58% Male	42% Female

Table 3: Type of Follow-Up

Patient Follow-Up	Number of Patients
Telemedicine	9
Clinic	32

Figure 1: Patient Compliance

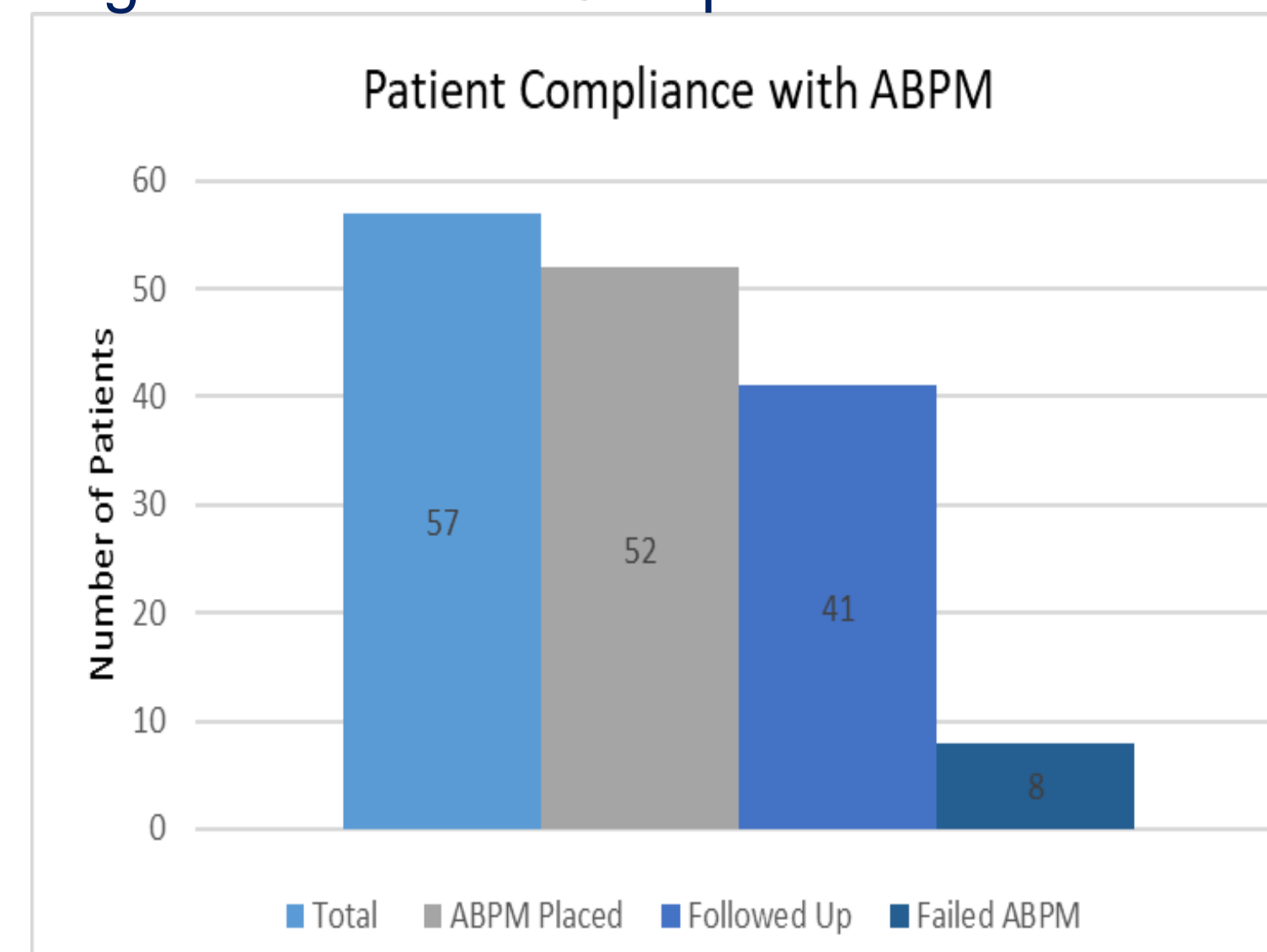


Figure 2: Medication Changes

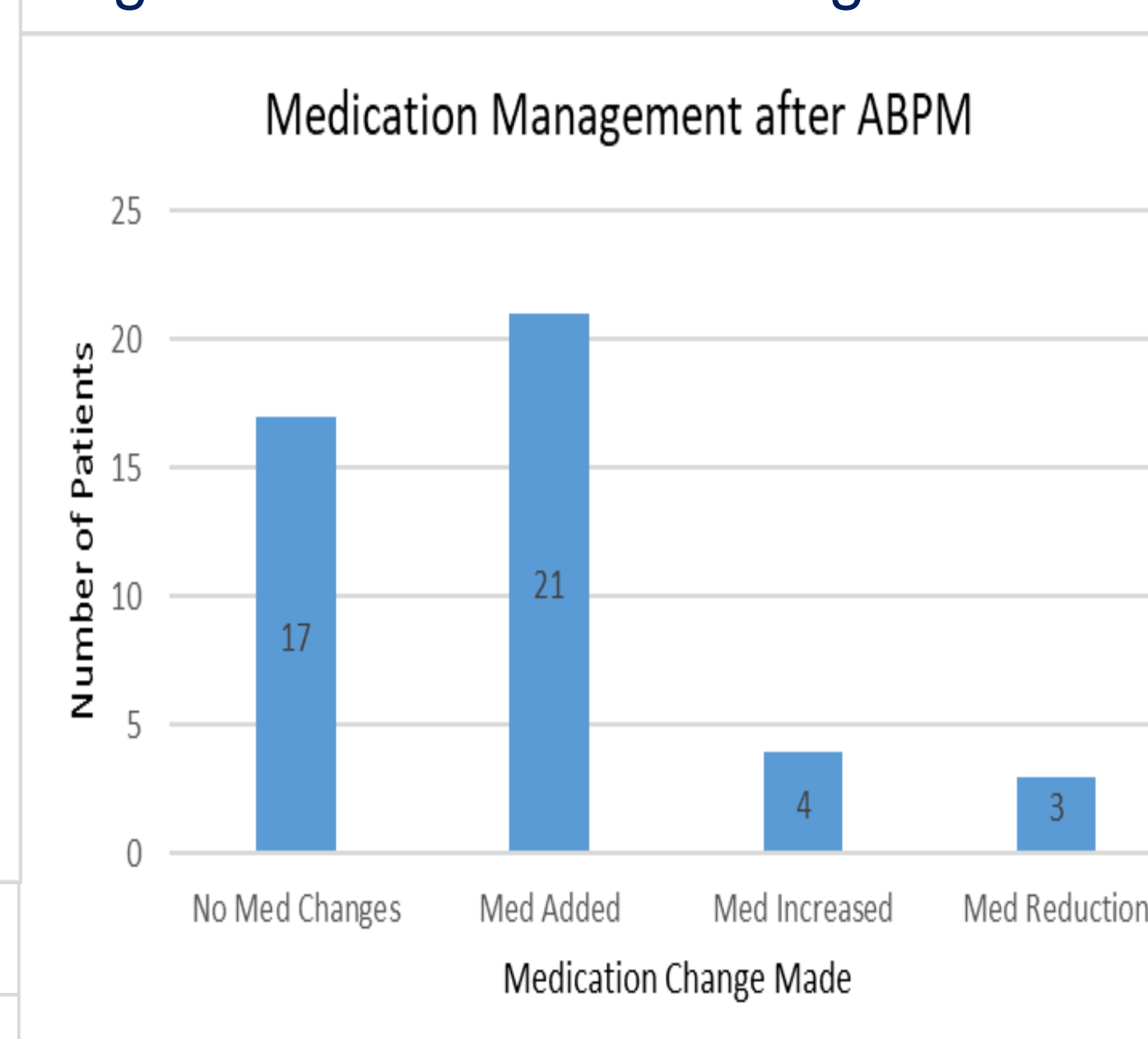


Figure 3: Is It White Coat Hypertension?

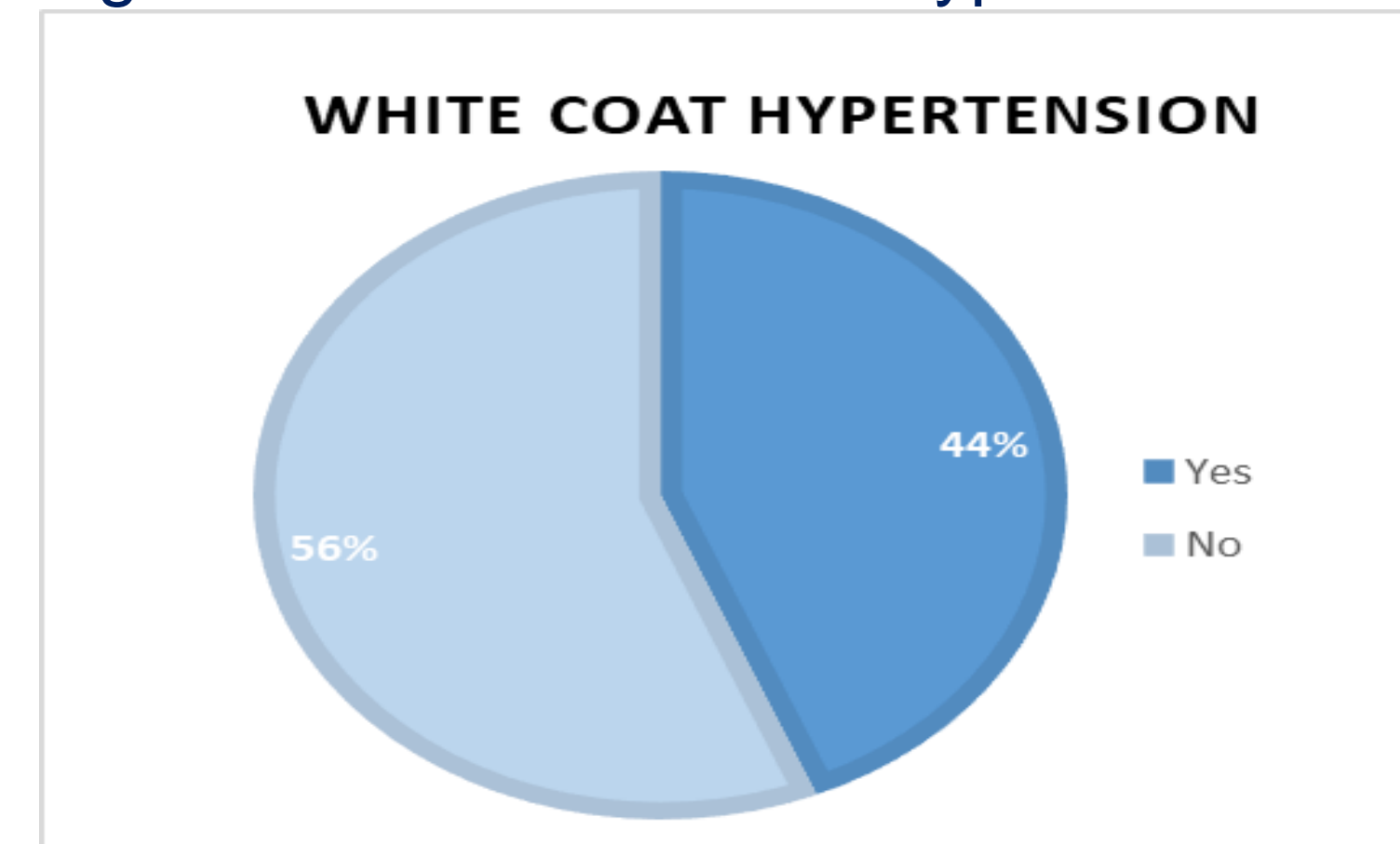
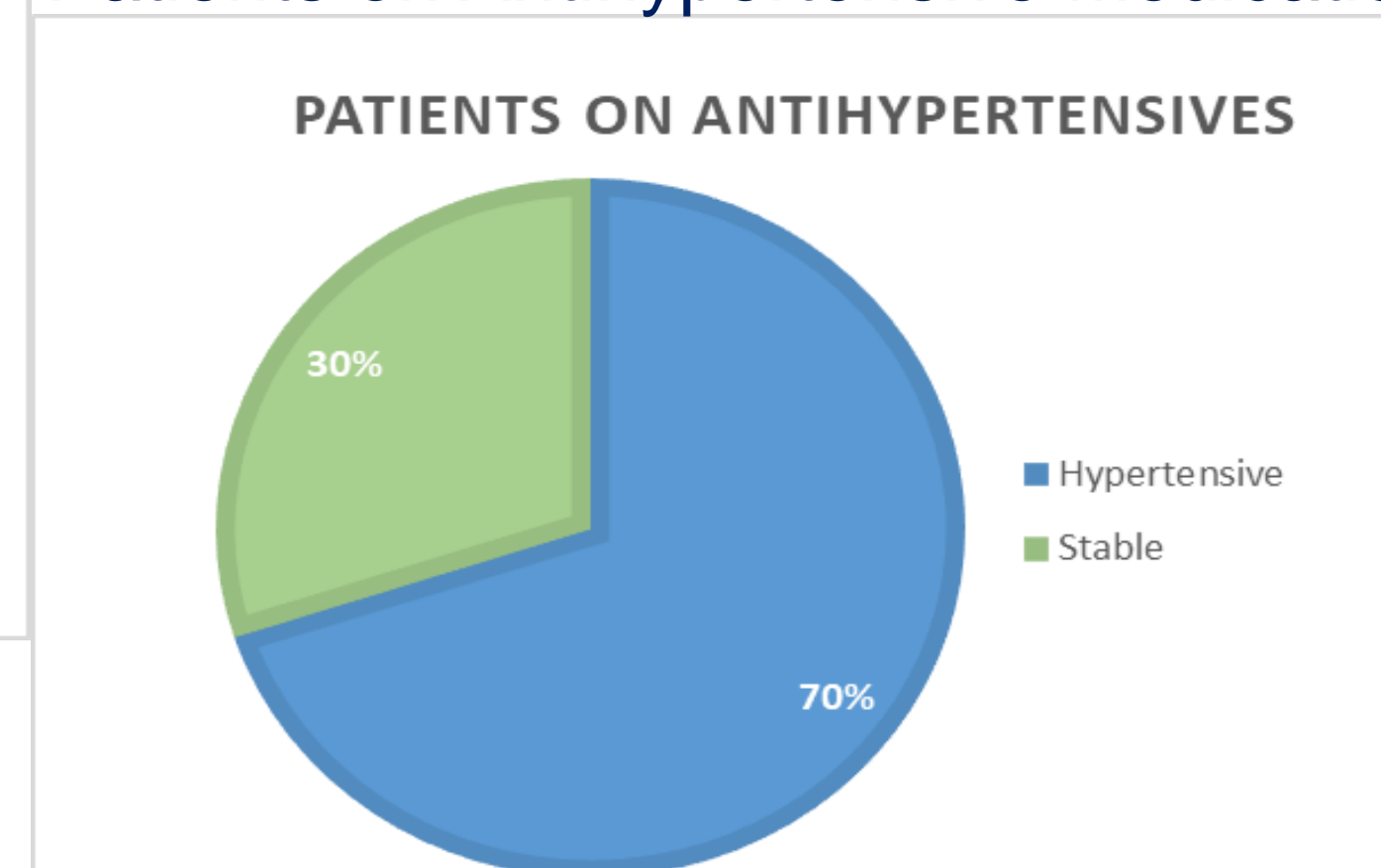


Figure 4: Hypertension Control in Patients on Antihypertensive Medication



**Patient Case 1:**  
82 yo F with no history of hypertension started on atenolol before ABPM results back. ABPM showed white coat hypertension, and atenolol was discontinued.

**Patient Case 2:**  
77 yo M with dizziness on antihypertensives wanted to stop medications. He was placed on ABPM, and found to be hypertensive. This allowed for a change in medication to help reduce side effects.

**Patient Case 3:**  
47 yo M with hypertension on lisinopril found to be continuously hypertensive on ABPM. His dose of lisinopril was then increased.

**Patient Case 4:**  
38 yo M with no history of hypertension was placed on ABPM. The patient removed the monitor after 3 readings, and failed to follow-up.

## Discussion

- The number of patients who had hypertension that was not well-controlled on their current medication regimen was higher than expected.
  - This data suggests that many patients who are currently on antihypertensives may benefit from ABPM for medication management.
- As predicted, a large proportion of patients who were hypertensive in clinic had true hypertension, but a significant portion did not, suggesting hypertension may be over-diagnosed if using only clinical measurements
- A significant number of patients who completed the ABPM did not receive a follow-up appointment to review their results
  - The majority of follow-ups were in clinic
- Very few patients were referred for ABPM due to antihypertensive side effects, suggesting that patients are either not discussing side effects with their provider, or providers were unaware of this indication for ABPM
- All ABPM's were placed by the cardiology tech team, as the internal medicine clinic did not have any in-house ABPM's
- ABPM raw data was subject to some variation in interpretation dependent on cardiologist
  - For example, one cardiologist did not transmit the daytime and nighttime average BP, but only the overall averages – this makes it difficult to truly diagnose or exclude hypertension

## Conclusions

- Patients who are diagnosed with hypertension and treated with antihypertensives based on blood pressure readings in clinic are likely overtreated
- Patients on antihypertensive medications may benefit from ABPM for medication management

## Future Directions

- The clinic has purchased ABPM's to begin in-house monitoring to increase patient access to ABPM
- More providers are referring patients for ABPM – this will likely continue on an upward trend

## References

Whelton, P. K., et. al. ACC/AHA/AAPA/etc. Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Hypertension*, 71(6).