# AF and Hypertension: Is My Home Monitor Fibbing?

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## CardioCase presentation

### Doug’s Case

Doug, 70, is a retired foreman and father of 3 from rural Saskatchewan with long-standing hypertension (HTN) who subsequently developed atrial fibrillation (AF). Office BP readings have been “high.” His home BP monitor readings range from 116/69 mmHg to 202/102 mmHg with about half of the readings < 135/85 mmHg.

**Past medical history**
- No known MI, stroke, transient ischemic attack or intermittent claudication
- No history of asthma

**Family and social history**
Doug’s family and social history is unremarkable save HTN in his mother. He is a non-smoker with minimal alcohol intake.

**Functional inquiry**
- Recent onset of shortness of breath on exertion with walking less than one city block
- Chest discomfort with variable threshold
- Nocturia 1-2 times

**Physical examination**
Doug’s exam revealed the following:
- Weight: 83 kg
- BMI: 27.3
- Waist circumference: 95 cm
- Supine apex rate: 84 bpm
- BP: 172/86 mmHg supine, 164/84 mmHg standing
- Chest clear to auscultation
- Cardiac apex not palpable
- Heart sounds are normal (*i.e.*, no extra sounds or murmurs)
- Jugular venous pressure: 2 cm above sternal angle
- Positive hepatojugular reflux
- Ankle edema

**Home monitor reading**
- Pulse: 77
- BP: 152/78 mmHg, a second reading resulted in “error”

For more on Doug, see page 21.
What is atrial fibrillation (AF) and why does it occur?

AF is characterized by rapid, uncoordinated atrial contractions that occur at rates of 350 to 900 per minute. Most impulses are blocked by the atrioventricular (AV) node, so that the ventricles contract 90 to 170 bpm. Triggers of AF include premature ectopic atrial beats and atrial flutter. Diseases or substrates predisposing to AF include:
- diabetes,
- hypertension (HTN),
- congestive heart failure (CHF),
- ischemic heart disease,
- valvular disease,
- MI,
- pulmonary embolism and
- hyperthyroidism.

HTN is the most common underlying etiology, being found in 35% of cases of AF. Pathophysiologically, AF develops due to raised atrial pressure causing:
- enlargement,
- atrial hypertrophy,
- myocardial ischemia,
- fibrosis,
- inflammation and
- infiltration.

Epidemiology and significance of AF

AF is the most common arrhythmia in adults. Its prevalence increases with age—the median age at onset being 75. Men are affected more commonly than women so that 9% of men and 5% of women over 65-years-of-age have AF. These figures are likely an underestimate due to exclusion of unrecognized, asymptomatic AF. Race also appears to be a predictor of AF; one group of investigators showed Caucasians to be affected approximately four times more often than Asians in a particular geographic region. The presence of AF doubles a patient’s risk of CV events. The most significant danger is a five-fold increased risk of stroke. This risk is further increased in those with:
- prior stroke,
- HTN,
- diabetes,
- heart failure and
- advancing age.

Measurement of BP in patients with AF

It is well recognized that attaining accurate, indirect (cuff) BP readings in patients with AF is
It is important to note that the reliability and accuracy of automated BP devices have not been validated in patients with AF. It is important to note that the reliability and accuracy of automated BP devices have not been validated in patients with AF. As such, it is important to interpret automated readings in AF with caution. Oscillometric systems, now most common, sense the oscillations in arm circumference. It was found empirically that oscillations change in amplitude with changes in cuff pressure. Moreover, the point of maximal oscillation corresponds to mean arterial pressure. The monitor notes this, then calculates systolic and diastolic BP using proprietary algorithms. When the RR interval is variable, the monitor has difficulty finding the point of maximum oscillation. It may give an “error” message or a false reading. We have found that commonly used home and hospital oscillometric BP monitor readings differ from those obtained by a reliable observer using a mercury sphygmomanometer by up to 40 mmHg (unpublished observations). Clinicians should be mindful of this when interpreting home monitor readings such as those reported by AF patients like Doug.

Multiple auscultatory readings should be taken in these patients, especially in a hypertensive such as Doug where accurate BP readings are essential to proper patient management.

**Management of AF in hypertensive patients**

Many studies have shown rate control to be as effective as rhythm control in reducing mortality and morbidity in patients with AF. Usually
β-blockers, with or without digoxin and calcium antagonists, are used. As mentioned above, HTN is the leading cause for the development of AF in the US. There are four main areas which need to be addressed in treating anyone with AF. These include:

- conversion to sinus rhythm,
- prevention of recurrence of AF,
- control of the ventricular response and
- anticoagulation.

Since Doug is also hypertensive, it is important to be mindful of certain complications which are more likely to occur in AF with superimposed HTN. These include:

- thromboembolism,
- left atrial hypertrophy,
- left ventricular dysfunction (LVD) and
- CHF.

In the case of thromboembolism, hypertensives may be three to five times more likely to suffer from this complication than those with AF and normal BP. As such, warfarin should be strongly considered in these patients.

Doug also has clinical findings compatible with CHF, such as:

- dyspnea on moderate exertion,
- positive hepatojugular reflux and
- ankle edema.

Patients on minoxidil usually retain fluid and require a potent diuretic to prevent it. The non-selective β-blocker timolol is useful for controlling Doug’s ventricular rate and reducing consequences of heart failure. Often digoxin is necessary as well. To control BP, the potent vasodilator minoxidil and furosemide were used.

**Conclusion**

Both HTN and AF are common disorders. It is therefore imperative that clinicians are well-versed in the pathophysiology, diagnosis and management of these conditions. Since HTN can predispose one to developing AF, it is important to be mindful of this arrhythmia in those with elevated BP. It is also important to understand the special risks that accompany the coexistence of these two conditions in the same individual. These include:

- an even greater risk of thromboembolism than in AF alone,
- left atrial hypertrophy,
- LVD and
- CHF.

Of particular importance is accurate BP recording using mercury or validated aneroid sphygmomanometers. For the moment, automated monitors would seem less useful.

**References**