Improving Accurate Blood Pressure Measurement to Ensure Better Hypertension Control

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Introduction

Essential hypertension is a highly prevalent disease that is not well controlled. United States National Health and Nutrition Examination Surveys from 2011 to 2014 reveal that 46% of adults 20 years and older have hypertension (defined as systolic pressure ≥130mm Hg and/or diastolic pressure ≥ 80mm Hg) (5). It is estimated that 53% of patients who have essential hypertension have a blood pressure that is not within goal (7). Lewington et al reveal that between ages 40-69, untreated systolic BP of at least 20mmHg is associated with more than two fold difference in stroke death rate (3). Due to high risk of poorly treated hypertension, primary care physicians need to accurately measure and treat blood pressure and errors in accurately measuring blood pressure include the inherent biological variability of blood pressure, the white coat effect, and inaccuracies related to suboptimal technique (2). Suboptimal techniques are mainly attributed to human errors in which measurers are not following guidelines on how to accurately measure blood pressure (1, 2, 5). Incorrectly implemented guidelines falsely elevate blood pressure by at least several mm of mercury. (Table 1, (4)). Underestimating blood pressure by 5mm Hg would result in 21 million people being falsely labeled as high normal blood pressure rather than hypertension in which they could have benefited from pharmacological treatment (2). Our primary care practice found that only 60% of our patients had controlled hypertension and it was hypothesized that proper blood measurement techniques were not implemented. We wanted to identify the techniques that were not implemented and educate on a grand scale the proper ways to measure accurate blood pressures which is the first step to improve blood pressure management.

Table 1

When the patient has…	Blood pressure can appear higher by…
A full bladder	10-15 mm Hg
An Unsupported back	5-10 mm Hg
Unsupported feet	5-10 mm Hg
Crossed Legs	2-8 mm Hg
Cuff over Clothing	10-40 mm Hg
Unsupported Arm	10 mm Hg
A conversation or is talking	10-15 mm Hg

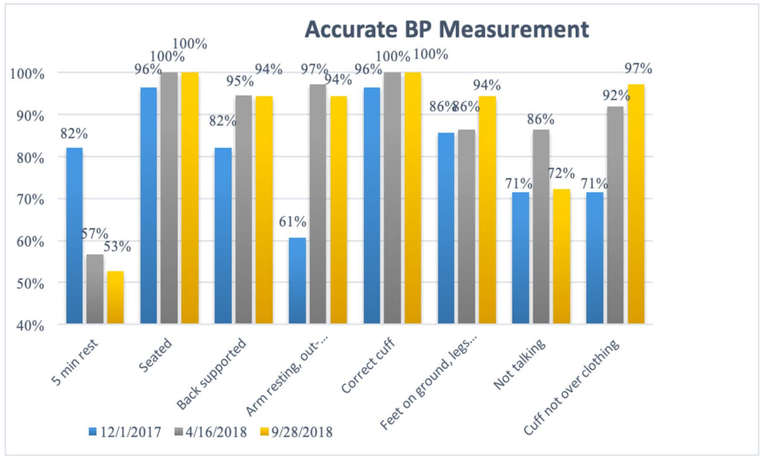
Materials and Methods

The Plan-Do-Study-Act (PDSA) quality improvement methodology was used to improve hypertension control. We compared accurate blood pressure measurement techniques pre and post intervention based on blood pressure measuring guidelines from the New England Journal of Medicine (6). Pre-intervention included observing nursing staff on cameras and documenting if they followed the 8 documented guidelines; nursing staff did not have prior knowledge they were being observed. The eight guidelines include 1) allowing patient to rest for 5 minutes prior to blood pressure measurement, 2) patient is seated, 3) patient has back supported, 4) patient's arm is supported, 5) correct sized cuff is utilized, 6) patient's feet are both on the ground, 7) neither patient nor staff is talking, 8) blood pressure cuff is not over clothing. An instructional video designed to appeal to modern audiences was made to teach how to appropriately measure blood pressure with the above 8 guidelines (Figure 3). Pre and post testing were used to ensure all participants comprehended the recommendations. Nursing staff watched the video as an intervention to improve accurate blood pressure measurements. After 4 months, nursing staff were observed on cameras post intervention to see if there were improvements on following blood pressure measuring guidelines. A follow up observation was performed at 9 months to see if improvements were maintained. An in-depth interview was also performed to understand why any guideline was not successful based on results.

Results

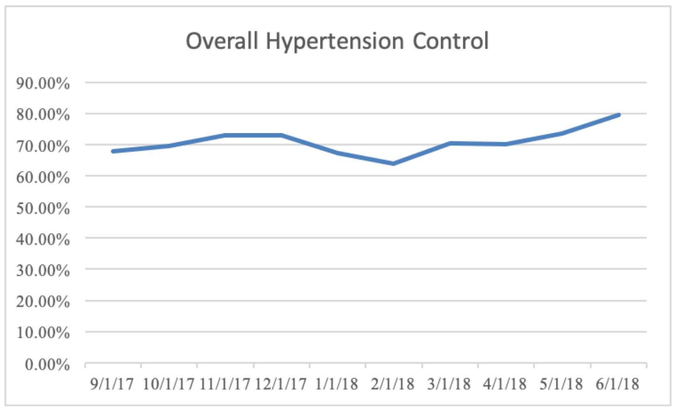
Post intervention, there was improvement observed in 7 out of 8 guidelines. Most improvement was seen in patients having their arm supported which improved from 61% to 97% post intervention. There was significant improvement in the guideline of not having the blood pressure cuff over clothing from 71% to 97% post intervention. Notably at 9 months, these improvements were maintained. Guideline 7 of not talking showed a sharp decline after initial improvement. We also observed worsening in the 5 minute rest period guideline over time which did not improve despite addressing with nursing staff (Figure 1). P value is 0.2. Three nurses answered an in-depth interview to understand why the not talking and 5 minute rest guidelines were issues. There was a consensus that nurses always felt rushed by doctors to finish rooming a patient and they considered it rude to tell patient to not talk. Overall, there was an improvement in our practice's hypertension control (Figure 2).

Figure 1



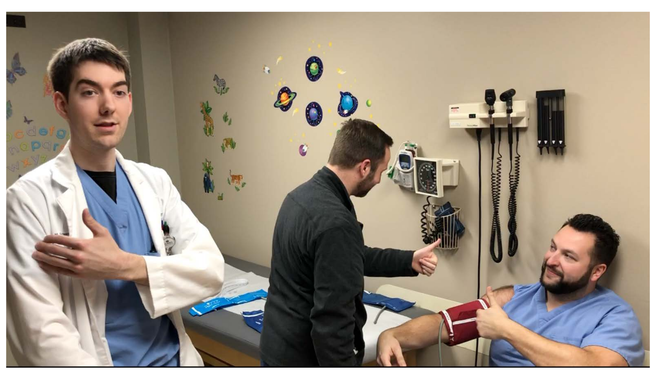
Adherence to 8 guidelines of blood pressure measuring by the New England Journal of Medicine. Pre-intervention observations were done 12/1/2017; 4 month post-intervention observations were done 4/16/2018; 9 month post intervention observations were done 9/28/2018.

Figure 2



From Sept 2017 to June 2018, the percentage of controlled hypertension increased from 68% to 79%

Figure 3



Screenshot from instructional video

Discussion

The modernized video demonstrated that it is a useful tool to educate medical professionals on how to accurately measure blood pressure. Results illustrated an improvement in 7 out of 8 guidelines with the exception being resting for 5 minutes. In the 8th guideline of 5 minutes rest, there are external factors such as rooming time that made it hard for nurses implement 5 minutes rest before measuring blood pressure. In addition, initial improvement with no talking when taking blood pressure declined. Nurses explained that they were unwilling to quiet patients due to patient relations as it was perceived to rude to stop patients from talking. However, overall hypertension control was better in the office post intervention. Although the p-value is 0.2 which is not significant but given the small sample size, there appears to be a correlation in improvement of implementing the guidelines after watching the intervention. Increasing sample size will ultimately improve the p-value. Further observations are required to determine if overall improvement was from more accurate blood pressure measurements or from patient acclimatization to the measuring process. Also, further observations will need to determine if improved adherence to measuring guidelines result in better blood pressure management. Changes in medication dosages and treatments will need to be monitored to determine the effectiveness of additional training as there is room to explore if we are over vs undertreating patients.

Conclusions

The first step in any hypertension management regime are accurate blood pressure readings. The intervention through a modernized instructional video resulted in improvements in adherence to the eight guidelines of blood pressure measurements. However, further analysis is needed to isolate the effectiveness of the intervention. This preliminary study has demonstrated that the instructional video may be an effective tool for continued training for healthcare providers to improve blood pressure management in patients.

References

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