ACURRTE BLOOD PRESSURE RECORDING: IS IT DIFFICULT?

A. BHALLA, R. SINGH, S. D’CRUZ, S. S. LEHL, A. SACHDEV

ABSTRACT

BACKGROUND: Blood pressure (BP) measurement is a routine procedure but errors are frequently committed during BP recording. AIMS AND SETTINGS: The aim of the study was to look at the prevalent practices in the institute regarding BP recording. The study was conducted in the Medicine Department at Government Medical College, Chandigarh, a teaching institute for MBBS students. METHODS: A prospective, observational study was performed amongst the 80 doctors in a tertiary care hospital. All of them were observed by a single observer during the act of BP recording. The observer was well versed with the guidelines issued by British Hypertension Society (BHS) and the deviations from the standard set of guidelines issued by BHS were noted. The errors were defined as deviations from these guidelines. STATISTICAL METHODS: The results were recorded as percentage of doctors committing these errors. RESULTS: In our study, 90% used mercury type sphygmomanometer. Zero error of the apparatus, hand dominance was not noted by any one. Every one used the standard BP cuff for recording BP. 70% of them did not let the patient rest before recording BP. 80% did not remove the clothing from the arm. None of them recorded BP in both arms. In outpatient setting, 80% recorded blood pressure in sitting position and 14% in supine position. In all the patients where BP was recorded in sitting position BP apparatus was below the level of heart and 20% did not have their arm supported. 60% did not use palpatory method for noticing systolic BP and 70% did not raise pressure 30–40 mm Hg above the systolic level before checking the BP by auscultation. 80% lowered the BP at a rate of more than 2 mm/s and 60% rounded off the BP to nearest 5–10 mm Hg. 70% recorded BP only once and 90% of the rest re inflated the cuff without completely deflating and allowing rest before a second reading was obtained. CONCLUSION: The practice of recording BP in our hospital varies from the standard guidelines issued by the BHS.

Key words: blood pressure measurement-accuracy; blood pressure measurement-optimum technique; hypertension; observer errors.
screening of all the patients, especially high risk patients, is the only way of detecting hypertension early and initiate treatment before target organ damage becomes evident. Accurate measurement of BP is importance for labeling a patient as hypertensive. Consistently underestimating the BP by 5 mm Hg could result in two-thirds of hypertensive patients being missed and over estimating it by 5 mm Hg could more than double the number of patients being diagnosed as hypertensive. Missing the diagnosis in a hypertensive patient could result in significant morbidity and mortality due to lack of treatment. Over diagnosis results in inappropriate labeling and treatment of healthy individuals. Most of us are aware of the exact methodology of recording of BP, yet most of us commit errors frequently resulting in erroneous high or low recording.

The measurement of BP in clinical practice is done by a century old Riva-Rocci/Korotkoff technique. The accurate measurement is dependent on the accurate transmission and interpretation of a signal (Korotkoff sound or pulse wave) from a subject via a device (the sphygmomanometer) to an observer. Errors in measurement can occur at each point but the commonest fallible component is the observer. Despite the clear guidelines on BP measurement technique, there seems to be large inter-observer variations, both among nursing staff and physicians as well as between the two groups. In an article by Graves and Ships in the American Journal of Hypertension, the authors are of opinion that physicians do not measure BP well, and even if they do, the usefulness of their BP measurements is significantly compromised by the white coat effect. The general belief amongst the researchers is that Physicians dealing with diagnosis and treatment of hypertension do not follow the international society guidelines. In a study by Perloff et al., it was found that nursing staff abided by 40% of the recommended procedures while medicine teachers, physicians and residents abided by approximately 70%.

The wide gaps in the basic theoretic and practical knowledge seem to be common among interns and first-year family practice residents resulting in erroneous measurements. In an interesting observational study, carried out at the Westminster Medical School in London, showed that 33% out of 80 doctors in training grades/junior hospital doctors, acknowledged no formal education on how to measure BP, a finding confirmed further by the poor accuracy in BP measurement displayed by one-third of the study group.

SUBJECT AND METHODS

Our objective was to notice the common errors committed during routine blood pressure recording by the residents and consultants. A prospective, observational study was performed amongst the 80 doctors (10 consultants and 70 residents). The consultants belonged to the department of medicine and the residents included interns, house physicians and senior residents form the departments of medicine, surgery and orthopedics. The study was conducted over a period of 8 months. A single observer observed all of them during the act of BP recording without any one of them being aware of the fact that they were being observed. The common errors committed were noted in a Performa after having observed them (not in front of them). Some participants were observed again to note the practices that had been missed during the first observation.

The errors were defined as variations from the standard set of instructions issued by BHS. This variation from the standard guidelines were further analyzed and recorded as percentage of doctors committing these individual errors. At the end of the study the erring doctors were apprised of the results of the study and were told about the standard guidelines. The follow-up study after was planned but could not be carried out as majority of the residents had change of duties or had left the institute.

RESULTS

A single observer observed 80 doctors (10 consultants and 70 residents) during the act of BP measurement. The majority of the residents belonged to the medicine department and the rest were working in the emergency area in orthopedics and surgery emergency at the hospital. The details of their qualifications and department are given in [Table 1]. All the consultants were observed while recording BP in the OPD while 30 residents were observed in the OPD. The rest were observed during the act by the observer during routine rounds in the wards or while attending a call to examine a patient in the surgical emergencies. They were asked to record the BP and were observed for the practices they follow during the act of BP recording. The rate of inflation and deflation of the cuff were observed carefully using a stopwatch in the wrist watch of the observer. Some participants had to be observed again to note the practices that had been missed during the first observation.

It was noted that 90% of the doctors used mercury type sphygmomanometer and 10% used the aneroid sphygmomanometer for recording BP. Zero error of the apparatus and hand dominance of the patient were not noted and recorded by any one. The time of recording BP was recorded in the case files by 60% doctors only (while recording BP in the wards). The time of last dose of antihypertensive medication taken by the patient was not noted by any one. Everybody used diaphragm of the stethoscope for listening Korotkoff sounds. Every one used the standard BP cuff for recording BP

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<th>Observed in OPD</th>
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<td>Senior residents</td>
<td>MD (16)</td>
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<td>Junior residents</td>
<td>MBBS (12)</td>
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irrespective of the arm circumference of the patient but this fact was not recorded by any one of them in the case sheet. During recording of BP in the OPD, 70% of them did not wait and let the patient rest for some time before recording BP. 80% of all did not remove the clothing i.e., shirt sleeve, from the arm before recording BP. None of them recorded BP in both arms; 75% preferred right arm while 25% preferred left arm. Even this fact was not recorded by any of them in the case sheet. In the OPD, 80% recorded BP in sitting position and only 14% in supine position only. 6% recorded BP in both the positions. The position of the patient while recording BP was not recorded on the case sheet. In all the patients where BP was recorded in sitting position BP apparatus was below the level of heart and 20% did not have their arm supported. While recording BP in the ward 100% recordings were made in the supine position.

About 60% did not use palpatory method for noticing systolic BP and Seventy percent did not raise pressure 30–40 mm Hg above the systolic level before checking the BP by auscultation. About 80% lowered the BP at a rate of more than 2 mm/s and 60% rounded off the BP to nearest 5–10 mm Hg. 70% recorded BP only once and 90% of the rest (remaining 30%) re-inflated the cuff without completely deflating and allowing rest before a second reading was obtained.

**DISCUSSION**

The blood pressure in all the individuals varies considerably throughout the day. A variety of activities affects the BP and causes it to increase. Simple activities of daily routine like eating, dressing, commuting to work, talking on telephone and attending a meeting raises systolic BP by an average 10–20 mm Hg and diastolic BP by 8–15 mm Hg. Numerous studies have proven time and again that the various exogenous factors also interfere with the accurate measurement of BP. The important factors being talking, exposure to cold, ingestion of alcohol and medications especially antihypertensive drugs. Errors during the process of BP measurement also contribute to the erroneous reading.

There are only three sources of errors while BP is being recorded. These are observer bias, faulty equipment and failure to standardize techniques of measurement. It is known that if the cuff is too small as in the case of a fat patient the systolic BP will be recorded falsely low by up to 8 mm Hg and diastolic BP will be recorded high by up to 8 mm Hg. Our findings are not different from these observations. The failure to remove the clothing further adds to the arm circumference, hence erroneous recording. A number of studies have shown that measurement of BP in obese and large muscular arms requires adjustments. Monograms for adjusting BP recording in the obese are inadequate. The most important factor is choosing the correct cuff width-arm circumference (CW/AC) ratio. Such action reduces the intersubject variability of BP measurement in clinical settings.

It is known that a number of activities of daily living raise the BP and a period of rest before measuring BP may return it to normal level. Failure to do so may result in falsely high BP recording. Still 70% of our study group doctors did not wait and let the patient rest for some time before recording BP in the ward.
It is well established that if the BP is only measured in the supine position the systolic BP may increase by 3 mm Hg and the diastolic BP will be recorded lower by 3–5 mm Hg. It would be worthwhile to record BP in both supine and sitting position if possible or at least the position in which the BP is recorded should be mentioned in the records. This would be helpful in follow-up visits by the patient. Unfortunately this fact is taught in the clinics but not followed by majority of us while recording BP, especially in the outpatient department.

If the position of the arm is either above or below the heart level the BP may be recorded false high or low. For every 10 cm above or below the heart level the systolic BP decreases (if above) by 8 mm Hg and increases (if below). Similar changes are seen in the diastolic BP with change in the position of arm in relation to the heart level. If the arm is not supported the systolic and diastolic pressures will be recorded high by 2 mm Hg. British study carried out in 18 practices and 67 GP offices showed digit bias in systolic and diastolic readings to the nearest 10 mm Hg.

There is tendency by physicians to expect either a high or low BP. This results in rounding off the systolic and diastolic BP to the nearest 5–10 mm Hg, which may result in erroneous high or low BP recording. A British study carried out in 18 practices and 67 GP offices showed digit bias in systolic and diastolic readings to the nearest 10 mm Hg. Also 60% of the doctors in our study group had a digit preference to the nearest 5–10 mm Hg. Both under estimation or overestimation of BP due to this bias, could have enormous reflection on the sheer numbers of the patients either missed or over diagnosed.

The most recent recommendations of AHA suggest that the auscultatory technique with a trained observer and mercury sphygmomanometer to be the method of choice for measurement of BP. Proper training of observers, positioning of the patient, and selection of appropriate cuff size are all essential. However, training can reduce, but not abolish, these inaccuracies. Taking multiple BP measurements before making clinical decisions can limit the effect of these inaccuracies.

Reeves points out that ‘The efficient practitioner can reserve the proper method for 10–20% of patients who have known or newly detected elevated BP, cardiovascular damage, other risk factors or are receiving antihypertensive therapy.’ This would go a long way in preventing the errors in patients where it matters the most.

CONCLUSION

Accurate measurement of the BP is very important in the clinical setting. It is a vital parameter to access and modify cardiovascular risk factors. Very commonly errors are committed during these simple procedures and efforts should be made to minimize them by following the international guidelines. This study looks at the practices prevalent in a teaching hospital and proves that accurate measurement of BP is not difficult provided we know the exact methodology and follow it too. The tendency to create shortcuts is likely to result in erroneous high or low recording. We can correct our mistakes only if we are made aware of them.

REFERENCES

ABSTRACT

RESEARCH QUESTIONS: How much human loss would have caused by the earthquake in Bhuj block? What is the environmental sanitation status? OBJECTIVES: (1) To assess human loss and injuries after the earthquake in Bhuj block. (2) To study the status of some relief activities. (3) To study the environmental sanitation status of the earthquake affected Bhuj block.

STUDY DESIGN: Cross-sectional study. SETTINGS: Bhuj block. PARTICIPANTS: All villages excluding Bhuj city of Bhuj block. STATISTICAL ANALYSIS: Proportions, chi-square test, chi-square for trend. RESULTS: Survey was done in 144 villages; there were total 541 deaths with death rate of 3.18 per 1000 population. Death rate was significantly associated with distance of village from epicenter (chi-square for trend significant, P < 0.001). Among victims, majority were children 171 (45.4%) and women 107 (28.4%). Relief work was significantly associated with accessibility of village (P < 0.001) and few interior pockets were deprived of help. Total 56 (38.9%) villages were entirely dependent on water tanker for water supply and in 61 (42.4%) villages drinking water was used without chlorination. In 142 (98.6%) villages open-air defecation was practiced. Diseases such as URTIs, diarrheal diseases, fever and conjunctivitis were commonly observed in the field area.

Key words: Bhuj block; earthquake; rapid assessment

On Friday, 26 January 2001, around 8.46 a.m., when Indian Republic Day celebration was underway, one of the most devastating natural calamities of our time ravaged the state of Gujarat. The earthquake of intensity 6.9 Richter scale flattened Bhuj city and badly struck Bhachau, Anjar, Rapar and Gandhidham blocks of Kachchh district and spread over radius of 200 km.

Bhuj, once a historical town and vibrant market, became a death trap, neither the military station nor the air force camp escaped quakes fury. Hundreds of NGOs and thousands of volunteers from India and abroad traveled a great distance to help victims and assisted thousands of people in rebuilding their lives.