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Research Article

Blood Pressure Measurement Skills among Thamar University Medical Students, Yemen

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Abstract

Background:

Blood pressure (BP) measurement is the most common procedure in clinical practice. It is an essential skill must be done in an accurate way to optimize the readings to diagnose and follow up patient. Correct measurement skills determine that accuracy.

Objectives:

This study estimated to evaluate BP measuring performance of medical student at Thamar University, faculty of medicine and health sciences, Thamar Government, Yemen.

Methods:

Using observation direct study, medical students of 4th, 5th, 6th and house officers in TUFMHS were involved. 243 students participated in this study. using adopted checklist data was collected. Results; Majority of medical student were unable to measure blood pressure in an accurate way. Seven of the 16 skills to measure blood pressure were done correctly by < 20 % of students.

Conclusion:

Medical students do not have enough skills required to measure BP accurately. Medical school training in these skills should be revised and studied to ensure it is effective. Refresher training should be placed to ensure retention of the clinical skills before real life applications. Physicians should undergo competency testing at similar intervals after achieving mastery in these skills.

Keywords: blood pressure; skills; medical students

1. Introduction

1.1: Background

Hypertension is a long-term medical condition in which the blood pressure in the arteries is persistently elevated[1]. High blood pressure typically does not cause symptoms [2]. Long-term high blood pressure is a major risk factor for coronary artery disease, stroke, heart failure, atrial fibrillation, peripheral arterial disease, vision loss, chronic kidney disease and dementia[3][4][5][6].

Classification:

Primary or secondary high blood pressure. About 90–95% of cases are primary which is defined as high blood pressure due to nonspecific lifestyle and genetic factors [5][6]. Lifestyle factors that increase the risk include excess salt in the diet, excess body weight, smoking, and alcohol use [2][7]. The remaining 5–10% of cases are categorized as secondary high blood pressure, defined as high blood pressure due to an identifiable cause, such as chronic kidney disease, an endocrine disorder, or the use of birth control pills [7].

Blood pressure readings are classified to different categories according to systolic and diastolic one. Normal readings are 90-129 for systolic and 60-79 for diastolic pressure. Stage one hypertension is considered when systolic between 130-139 and diastolic 80-89 mmHg. Stage two systolic 140-179 and diastolic 90-109 mmHg. Far away critical blood pressure when systolic readings are over 180 and diastolic one over 110 mmHg [2].

Risk factors:

Family history if your parents or other close blood relatives have high blood pressure, there's an increased chance that you'll get it, too. Age The older you are, the more likely you are risky to get high blood pressure. Gender Until age 64, men are more likely to get high blood pressure than women. Race African-Americans tend to develop high blood pressure more often than people of any other racial background in the United States. Chronic kidney disease (CKD) high blood pressure may occur as a result of kidney disease. And, having high blood pressure may also causes further kidney damage [8,9].

Modifiable risk factors: Lack of physical activity, unhealthy diet especially which has high sodium, being overweight or obese, drinking too much alcohol, sleep apnea, high cholesterol, diabetes, smoking and tobacco use and stress [7].

Complications:

Complications affecting the heart (Left ventricular hypertrophy, Hypertensive cardiomyopathy and Myocardial infarction). Complications affecting the brain (Hypertensive encephalopathy and Cerebrovascular accident). Hypertension is an important risk factor for brain infarction and hemorrhage. Complications affecting the eye as hypertensive retinopathy. Complications affecting the kidneys such as hypertensive nephropathy. Hypertension is a risk factor for chronic kidney disease and end-stage kidney disease [7]. High blood pressure affects between 16% and 37% of the population globally. In 2010 hypertension was believed to have been a factor in 18% of all deaths (9.4 million globally [8]. For an accurate diagnosis of hypertension to be made, it is essential for proper blood pressure measurement technique to be used. Improper measurement of blood pressure is common and can change the blood pressure reading by up to 10 mmHg, which can lead to misdiagnosis and misclassification of hypertension [1].

Blood pressure (BP) measurement is the most common procedure performed in clinical practice which is refers to noninvasive techniques that estimate BP. Accurate BP measurement is critical if patient care is to be delivered with the highest quality, as stressed in published guidelines. Physician training in BP measurement is often limited to a brief demonstration during starting years in medical school. Medical students start to learn clinical skills such as blood pressure measurement, taking pulse and taking body temperature. However, due to structure of the curriculum in the most of medical schools, there is no opportunity for the students to apply these three skills on real patients until the fourth year of medical school when clinical courses start. Considering that this may lead to loss of competence throughout those years [10]. BP measurement are needed for medical students to become and remain proficient. Measuring BP correctly should be taught and reinforced throughout medical school, residency, and the entire career of clinicians [11].

1.2: Justifications of the study:

The justifications of this study include:

1. Lack of studies about Medical Students and Measuring Blood Pressure Measurement.

2. Worldwide, medical students and studying their ability to measure blood pressure correctly is a big issue should be studied.

1.3 Objectives

General objective:

This study estimated to evaluate BP measuring performance of medical student at Thamar University, faculty of medicine and health sciences.

Specific objective:

To determine the skills required to obtain an accurate BP measurement in faculty of medicine at Thamar University.

To identify the defective points in blood pressure measurement in faculty of medicine at Thamar University.

Literature Review

Hypertension is a long-term medical condition in which the blood pressure in the arteries is persistently elevated [1]. High blood pressure typically does not cause symptoms [1]. Long-term high blood pressure is a major risk factor for coronary artery disease, stroke, heart failure, atrial fibrillation, peripheral arterial disease, vision loss, chronic kidney disease and dementia [3][4][5][6]. High blood pressure is classified as primary (essential) hypertension or secondary hypertension[5]. Blood pressure is expressed by two measurements, the systolic and diastolic pressures, which are the maximum and minimum pressures, respectively. For most adults, normal blood pressure at rest is within the range of 100–130 millimeters mercury(mmHg) systolic and 60–80 mmHg diastolic. For most adults, high blood pressure is present if the resting blood pressure is persistently at or above 130/80 or 140/90 mmHg [8]. For an accurate diagnosis of hypertension to be made, it is essential for proper blood pressure measurement technique to be used. Improper measurement of blood pressure is common and can change the blood pressure reading by up to 10 mmHg, which can lead to misdiagnosis and misclassification of hypertension [1].

Different types of devices used to measure BP as shown below

- Digital portable automated unit.
- Mercury sphygmomanometers.
- Aneroid sphygmomanometers.

Figure 2:1 Types of sphygmomanometer devices.

Many studies were done around the world to estimate the knowledge or the clinical practice of blood pressure measurement:
A study was done in USA and was aimed to assess the skills of medical students to measure blood pressure. That study was undertaken by American Medical Association in Chicago and take place in University of Pennsylvania Philadelphia June 2015.

Results to assess 11 skills required to measure BP accurately, was disappointing. Main results of that study were as following:

Measuring BP correctly should be taught and reinforced throughout medical school, residency, and the entire career of clinicians. Only one student demonstrated proficiency on all 11 skills. The mean number of elements performed properly was 4.1. The average student failed to perform more than one half of the skills correctly. Very poor performance occurred in several skills. Researchers suggest that changes in medical school curriculum emphasizing BP measurement are needed for medical students to become and remain proficient in BP measurement [11]. Another cohort study was done in Turkey named by " Medical Students Loose Their Competence in Clinical Skills if not Applied on Real Patients ". It was done in 2009. Its goal was to Investigate loss of competence (LoC) in clinical skills of medical students over time, predictive factors on competency loss, and determining efficiency of refers her training on skill retention. The study found that LoC was significant in all skills. Multiple regression analysis revealed that "performing the skills in real life" was the unique predictor of LoC for all skills. "Gaining the skill before medical school" predicted LoC in blood pressure measurement and taking body temperature. "Time" and "gender" were predictors for loss of blood measurement skills. "Restudying the same year" predicted LoC in taking body temperature. Third-year students' OSCE scores were higher than their performance scores attained one year ago.

2. Conclusion

In time, LoC occurs in clinical skills of medical students if not performed after training. This can be compensated by referring its training and real life applications [10]. Other study take place in University of Wisconsin Hospitals and Clinics, Madison, Wisconsin in 2013. It Assesses Pharmacy Students' Ability to Accurately Measure Blood Pressure Using a Blood Pressure Simulator Arm. The study found that one hundred sixteen students completed both blood pressure measurements. There was a significant difference between the accuracy of high systolic blood pressure (HSBP) measurement and normal systolic blood pressure (NSBP) measurement (mean HSBP difference 8.4 610.9 mmHg vs NSBP 3.6 6 6.4 mmHg; p,0.001). However, there was no difference between the accuracy of high diastolic blood pressure (HDBP) measurement and normal diastolic blood pressure (NDBP) measurement (mean HDBP difference 6.8 6 9.6 mmHg vs. mean NDBP difference 4.6 6 4.5 mmHg; p50.089). Conclusions. Pharmacy students may need additional instruction and experience with taking high blood pressure measurements to ensure they are able to accurately assess this important vital sign [12]. Other study took place in Department of Medicine in Salud Pública, Faculty of Medicine, Autónoma de Madrid University, Madrid, Spain in 2009, about knowledge of correct blood pressure measurement procedures among medical and nursing students. Researchers used a questionnaire based on American Heart Association recommendations for BP measurement. Results of this study reports on the level of knowledge about correct blood pressure measurement procedures among 175 third-year and 176 sixth-year students at a medical faculty, and 58 third-year students at a nursing college. Only 51.8% of all students thought that they knew how to measure BP correctly (28.6% in the third year, and 61.9% in the sixth year at the medical faculty, and 91.4% at the nursing college). Among sixth-year medical students, 12.5% knew the appropriate cuff size, 35% that the stethoscope diaphragm should not be placed under the cuff, and 43% that the cuff deflation rate affects BP measurement. Among nursing students, 33% knew the appropriate cuff size, 22% that an outpatient's BP should be measured more than once during each visit, and 55% that a diagnosis of hypertension can only be made if the BP is elevated on more than one visit [13]. Institute of Epidemiology, Faculty of Medicine, University of Belgrade, Belgrade Serbia, conducted a study in 2014 to assess, do medical students know how to measure blood pressure correctly? A total of 791 students in the fourth and the final, sixth year were recruited at the Faculty of Medicine, University of Belgrade, before the start of compulsory practical sessions in the classrooms, during the period 2–9 December 2013. Data were collected using questionnaires on the technique of BP measurement according to the existing guidelines. The study found that the least correct answers among students of both years were related to the fact that the stethoscope membrane should not be placed under the cuff (13.5% fourth year and 19.4% sixth year students). The highest proportion of correct answers (97.5%) in the fourth year was related to the fact that BP should be measured twice during patient examination. By the sixth year, however, most students (96.6%) knew that previous physical activity may cause an increase in the values of BP [14].

3. Methods

Study area:

This study was carried out in Thamar university, faculty of Medicine & Hea lth science in Al_Wihdah Hospital, Thamar Governorate, Yemen.

Study design:

Direct observation study, conducted in Thamar University medical students during the period from Aug 2019 to Dec 2019 to evaluate performance and skills when they measure BP.

Study population and sample size:

A total of 243 students participated in this study. Medical students of 4th, 5th, 6th levels and house officers in Thamar University. Sampling was with 95 % confidence level, 50% expected frequency, 5% confidence limit accordin g to standardization sampling methods.

Specialty	Academic level				
Medicine	4th	5th	6th	House officers	Total
Number	47	46	60	90	243

Table 3:1 Sample size of medical students in faculty of medicine & health science at Thamar University, Thamar, Yemen, 2019.

3.1 Data collection:

Data was collected by using adopted checklist which is consist of the follow ing points:

- Resting the patient for 5 minute prior the measurement or express ing intent to do it.
- Legs uncrossed.
- Feet on floor.
- Arm supported.
- Correct cuff size.
- No tight clothes on arm.
- Placement of cuff above cubital fossa.
- Placement of sphygmomanometer at the level of the heart
- Brachial artery palpation.
- Stethoscope placement.
- No talking.
- No mobile phone use or reading.
- Inflate 20 – 30 mmHg above systolic pressure.
- Gradually deflation.
- Blood pressure taking in both arm.

16- Correct identifying BP from the arm with the hieger reading as being cli nically more important when asked the performance of score depend on the se.

3.2 Data analysis:

The data analyzed using IBM statistical package of social sciences (SPSS)

Software made for windows version 22,0 and displayed them in tables and figures.

Ethical consideration:

Written consents were taken from the students prior to start measuring. All of the information was collected and kept strictly confidential. The study wa s approved by Thamar University ethical committee.

4. Results

4.1: Socio-demographic characteristics:

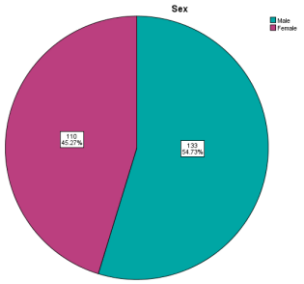

Figure 4:1:1 Percentage and frequency of gender among medical students, Faculty of Medicine, Thamar University, Yemen, 2019.

Regarding demographic characteristics of participants are presented in figure 4:1:1. 243 students participated, representing medical school students in Faculty of Medicine, Thamar University. Male gender represented majority of participated students about 133 (54.73 %). Female represent number of 110 (45.27 %) of them.

Age (Y)	Frequency	Percent	Cumulative Percent	Mean
22	3	1.2	1.2	24.69
23	53	21.8	23.0	
24	75	30.9	53.9	
25	30	12.3	66.3	
26	50	20.6	86.8	
27	31	12.8	99.6	
28	1	.4	100.0	
Total	243	100.0		

Table 4:1 frequency and percentage of students regarding their age among medical students, Faculty of Medicine, Thamar University, Yemen, 2019.

The pervious table shows the age of participants in the study sample. The mean age of participants was (24.69) years. Majority 75 (30.9%) were at age of 24 years, while there was an extreme value in age of 28 years which represents the minimum frequency.

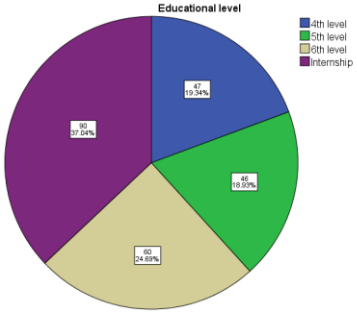

Figure 4:1:2 Percentage and frequency of participants' educational level among medical students, Faculty of Medicine, Thamar University, Yemen, 2019.

There was an average presenting number of participants according to previous figure. Internship students made up the max percentage (37%) while 5th level students present the minimum percentage (18.9%).

4.2: Blood pressure skills performance results:

Measurement Skill	Frequency and percentage	Done	Not done	Total
Rest patient for 5 min prior measurement	F	40	203	
	Pct	16.5	83.5	
Legs are uncrossed	F	9	234	
	Pct	3.7	96.3	
Feet on floor	F	23	220	
	Pct	9.5	90.5	
Arms are supported	F	128	115	
	Pct	52.7	47.3	
Correct cuff size	F	70	173	
	Pct	28.8	71.2	

No tight clothing constriction upper arm	F	161	82	243 100%
	Pct	66.3	33.7	
Cuff placement above cubital fossa	F	154	89	
	Pct	63.4	36.6	
Placement of sphygmomanometer at level of heart	F	88	155	
	Pct	36.2	63.8	
Palpate brachial artery	F	86	157	
	Pct	35.4	64.6	
Stethoscope placement	F	174	69	
	Pct	71.6	28.4	
No talk	F	20	223	
	Pct	8.2	91.8	
No mobile phone use or reading	F	11	232	
	Pct	4.5	95.5	
Inflate the cuff 20 - 30 mmHg above the systolic BP	F	73	170	
	Pct	30	70	
Gradual cuff deflation	F	143	100	
	Pct	58.8	41.2	
BP measurement taken in both arms	F	10	233	
	Pct	4.1	95.9	
Correctly identifying BP from the arm with higher reading	F	8	235	
	Pct	3.3	96.7	

Table 4:2 frequency and percentage of blood pressure measurement skill among medical students, Faculty of Medicine, Thamar University, Yemen, 2019.

Previous table summarizes the results that were analyzed about performing clinical skills of blood pressure measurement. There were skills which students did not were oriented about them and scored minimal performance as measurement in both arms (4.1%) and take the higher reading (3.3%). On the other hand, many skills done in higher rate as well stethoscope placement which done by (71.6%) of participants.

5. Discussion

Teaching some basic clinical skills in early phase of medical education is seen among medical schools, since the students find no opportunity to perform these skills on real patients until the clinical phase of medical education. Common argument is that if the students can't transfer the gained skills to real life in a short time period or they will lose their competencies to some extent [10]. Medical student performance on the BP measurement skills, which assessed 16 skills required to measure BP accurately, was disappointing. The results suggest it is unlikely that current medical students are able to perform reliably the skills necessary to measure BP accurately. The average student failed to perform more than two thirds of the skills correctly. Very poor performance occurred in several skills, including rest prior to measurement, ensuring the patients' feet were flat on the floor, ensuring the patient was not actively using a cell phone during measurement, and checking BP in both arms for a new patient visit and taking the higher reading. Our findings indicate that medical students were not sufficiently familiar with BP measurement procedure. Those findings consistent with existing studies performed outside in United States [11] and Turkey [10], making it likely that this is an international problem in need of a solution and not only a domestic one. Each error in technique typically gives higher values for BP, and the errors tend to compound one another. A 5-to 10-mm Hg error can result in an incorrect up classification of BP category from prehypertension to stage 1 hypertension, resulting in unnecessary and potentially harmful therapy for a significant number of patients [15]. Poor technique can also cause patients with hypertension that is controlled to appear uncontrolled, which can lead to inappropriate escalation of therapy, also leading to potential harm to the patient. Assuming that physicians will continue to measure BPs in clinical practice, the future physician workforce will need to master the skills required to measure BP accurately. Without accurate BP readings, improving BP control is unlikely because physicians would not reliably know which patients need to be more aggressively treated and which do not. For physicians to attain and maintain this critical skill, medical schools must improve methods used to teach students how to master skills required to measure BP accurately during medical school. In addition, it is critical that a system must be put in place to ensure that physicians maintain mastery throughout their careers [11]. After refresher training and performing the skills on real patients, loss of competence among students substantially decreased. This can be obtained by allowing students to gain exposure to a variety of situations that may require unique approaches [10]. The positive effect of refresher training will be permanent if it is combined with real life opportunities for medical students. Otherwise, some retention problems appear again over time. Curricula of medical schools should be structured by taking this reality in to account [10].

6. Conclusion

The study shows that medical students do not have enough skills required to measure BP accurately. Medical school training in these skills should be revised and studied to ensure it is effective. If there is a long paucity between the training time and practice opportunities, then refresher training should be placed to ensure retention of the clinical skills before real life applications. As also expected that physicians, after achieving mastery in these skills, should undergo competency testing at similar intervals, a minimum of every 6 months throughout their careers, as is recommended for other healthcare professionals [14].

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List of abbreviations

TUFMMS	Thamar University, Faculty of Medicine and Health Sciences.
BP	Blood pressure.
LoC	Loss of competence.
Pct	Percentage.
F	Frequency.