Knowledge of Correct Blood Pressure Measurement Procedures Among Medical and Nursing Students

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This study reports on the level of knowledge about correct blood pressure (BP) 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.

Key words: *Blood pressure. Measurement. Medical students. Nursing students.*

Conocimientos sobre los procedimientos correctos de medición de la presión arterial entre estudiantes universitarios de ciencias de la salud

Este trabajo describe los conocimientos sobre los procedimientos correctos de medición de la presión arterial (PA) entre 175 estudiantes de tercer curso y 176 de sexto curso de una facultad de medicina y 58 de tercer curso de una escuela de enfermería. Sólo el 51,8% de los estudiantes consideraban que sabían medir correctamente la PA (el 28,6% en tercero de medicina, el 61,9% en sexto y el 91,4% en enfermería). En sexto de medicina, el 12,5% conocía el tamaño apropiado del manguito; el 35%, que el diafragma del estetoscopio no debe introducirse debajo del manguito, y el 43%, que la velocidad de desinflado del manguito influye en la PA. En enfermería, el 33% conocía el tamaño adecuado del manguito; el 22%, que la PA ambulatoria debe medirse más de una vez en cada visita, y el 55%, que el diagnóstico de hipertensión requiere tener la PA elevada en más de una visita.

Palabras clave: *Presión arterial. Medición. Estudiantes de medicina. Estudiantes de enfermería.*

INTRODUCTION

Blood pressure (BP) measurement is a frequent, basic clinical procedure. However, studies have shown measurement errors derive from problems with the instruments used (inadequate calibration, unvalidated devices, etc) as much as from inappropriate procedures.[1-3] Among the latter, the use of an inadequate cuff size is the most frequent.[4,5] Most BP measurement errors lead to overestimation. This can bring about unnecessary treatment, with exposure to the adverse effects of the drugs. Moreover, diagnosis of hypertension, and the consequent labeling of patients as hypertensive, in associated with lower quality of life and greater absenteeism at work.[6,7] In some cases, however, inadequate measurement underestimates BP, making continuous control of pressure difficult to maintain. This is important because BP is the gateway to managing cardiovascular risk, the primary cause of death in Spain after tobacco use.[8] The frequency of errors is high: one study reports incorrect measurement of systolic BP in 63% of patients and of diastolic BP in 53%.[9]

One requirement for correct BP measurement is that healthcare professionals should know the

appropriate procedures. However, studies outside of Spain show knowledge alone is insufficient.[9-15]

The present study describes university students of health sciences and their knowledge of correct BP measurement procedures. We believe it is the first study of its kind conducted in Spain.

METHODS

We collected data from third- and sixth-year students at the Universidad Autónoma de Madrid (UAM) Faculty of Medicine, and third-year students at the Fundación Jiménez Díaz School of Nursing, a UAM associate center. Students completed a questionnaire based on American Heart Association recommendations for BP measurement.[16] Data were gathered in April 2008.

Two of the authors independently processed questionnaire responses and a third adjusted for unclear data in the original questionnaires. Results are given as percentages with 95% confidence intervals (CI). We tested differences in percentages between student groups with χ^2. Correlation between ordinal qualitative variables was summarized using Spearman's coefficient (ρ). A P value less than .05 was considered significant. Statistical analysis was with SPSS 16.0.

Student delegates from each year group approved publication of results on behalf of the students they represented.

RESULTS

We obtained data on 409 students: 175 third-year and 176 sixth-year medical students, and 58 third-year nursing students. The sample corresponds to 73.5%, 86.7% and 81.7% of students registered in each year group, respectively.

Only 51.8% thought they knew how to measure BP correctly: 28.6% of third-year and 61.9% of sixth-year medical students, and 91.4% of third-year nursing students (P<.001 for third-year vs sixth-year medical students; P<.001 for sixth-year medical vs third-year nursing students). Moreover, 71.1% reported having received formal training in BP measurement procedures during their university studies: 64% of third-year and 71% of sixth-year medical students, and 100% of nursing students (P=.16 for third-year vs sixth-year medical students; P<.001 for sixth-year medical vs third-year nursing students). Among medical students, 51.7% had received this training on physiology courses.

Only 14.2% of sixth-year medical students reported measuring BP 1-2 times a week, versus 94.8% of nursing students (P<.001). We found a statistically significant correlation between frequency of measuring BP and perception of measuring BP correctly (ρ=0.522; P<.001). The use of automatic BP measurement devices (oscillometric method) was reported by 15.9% of students. Of these, 49.2% did not know whether the instruments used had been validated.

Table summarizes questionnaire responses on knowledge of correct BP measurement. In general, medical students' knowledge of BP measurement improved between third and sixth year. Nursing students more often knew which variables influence BP values: appropriate cuff size and correct cuff deflation rate, and stethoscope diaphragm position. In contrast, a higher percentage of medical students knew how often BP should be measured on each visit.

DISCUSSION

The present study has identified numerous areas for improvement in BP measurement training —a basic, frequently-used procedure of great importance in cardiovascular risk control. Some of these key issues—eg, ignorance of appropriate cuff size—have been observed elsewhere.[9-12,14] This particular deficiency is increasingly important as arm circumference is growing with the obesity epidemic. And the lack of a range of cuff sizes in most outpatient clinics in Spain makes it more important still.

Given that most learning of clinical skills occurs in practical classes with patients, our results illustrate frequent errors in routine clinical practice, such as putting the stethoscope diaphragm under the pressure cuff or only measuring BP once on each ambulatory visit. This demonstrates the close relation between quality in the healthcare system and student training.

Inadequate knowledge of correct BP measurement procedures is unlikely to improve during specialized postgraduate training or in-service courses because it is a basic clinical procedure students are assumed to have learned in Health Science faculties. Surprisingly, as in studies published more than fifteen years ago,[11] only 71% of sixth-year medical students report having received formal BP measurement training. Given that the sixth-year medical and third-year nursing students who participated in the present study joined the healthcare system within a few months of data collection, and that future students' learning partly depends on the knowledge and example of younger professionals, errors in training new students can perpetuate themselves. It is not surprising that many of these should coincide with errors reported worldwide in the last 20 years.[9-15] Consequently, because they highlight issues of quality affecting the entire healthcare system, our results may well be partly applicable to students

Students of Medicine and Nursing Who Know Correct Blood Pressure Measurement Procedures

	Third-Year Medical Students (n=175)	Sixth-Year Medical Students (n=176)	Third-Year Nursing Students (n=58)	P[a]	P[b]
The most precise sphygmomanometers use mercury	6.3 (3.8-11)	24.4 (18.3-31.5)	84.5 (72.6-92.7)	<.001	<.001
BP readings should be to the nearest 2 mm Hg	4.6 (0.2-8.8)	8 (4.4-13)	12.1 (5-23.3)	.191	.342
Variables that influence BP					
Cuff deflation rate	42.3 (34.9-50)	43.2 (35.8-50.8)	79.3 (66.6-88.8)	.865	<.001
Having eaten recently	65.1 (57.6-72.2)	71 (63.7-77.6)	89.7 (78.8-96.1)	.237	.004
Having smoked recently	70.9 (63.5-77.5)	77.8 (71-83.7)	94.8 (85.6-98.9)	.134	.003
Recent physical activity	88.6 (82.9-92.9)	96 (92-98.4)	98.3 (90.8-99.9)	.009	.413
Bladder distension	20 (14.3-26.7)	39.8 (32.5-47.4)	36.2 (24-49.9)	<.001	.629
Cuff bladder length should be at least 80% of arm circumference	9.7 (5.8-15.1)	12.5 (8-18.3)	32.8 (21-46.3)	.406	<.001
The arm should be level with the heart	88.6 (82.9-92.9)	92.6 (87.7-96)	84.5 (72.6-92.7)	.194	.066
Diastolic pressure corresponds to BP at the point when the auscultatory gap occurs	32 (25.2-39.5)	51.7 (44.1-59.3)	72.4 (59.1-83.3)	<.001	.006
The stethoscope diaphragm should not be put under the cuff	16 (10.9-22.3)	35.2 (28.2-42.8)	74.1 (61-84.7)	<.001	<.001
The cuff should be inflated to more than 20 mm Hg above the disappearance of brachial pulse	30.9 (24.1-38.3)	67.6 (60.2-74.5)	75.9 (62.8-86.1)	<.001	.236
Room temperature should be 20-25°C	37.7 (30.5-45.3)	68.8 (61.3-75.5)	51.7 (38.2-65)	<.001	.019
First measurement of BP should be in both arms	38.9 (31.6-46.5)	49.4 (41.8-57.1)	74.1 (61-84.7)	.046	<.001
Crossing your legs can raise BP	62.9 (54.1-68.9)	52.3 (45.8-60.9)	65.5 (51.9-77.5)	.115	.107
The patient should be at rest for 5 min before BP measurement	54.3 (46.6-61.8)	65.9 (58.4-72.9)	69 (55.5-80.5)	.026	.668
BP should be measured at least twice in each session	71.4 (64.1-78)	84.1 (77.8-89.1)	22.4 (12.5-35.3)	.004	<.001
Diagnosis of hypertension requires having elevated BP on at least 2 measurements on 2 or more visits	24 (17.9-31)	67 (59.6-73.9)	55.2 (41.5-68.3)	<.001	.102

[a]Third-year versus sixth-year medical students.
[b]Sixth-year medical students versus third-year nursing students.
Data are given as percentages of participants (95% confidence interval).

at other centers. However, because our data were collected at just 2 UAM centers, this assumption needs to be confirmed in future research.

New Health Science curricula currently being prepared in the Spanish university system are principally aimed at the acquisition of clinical competences. Therefore, they represent a good opportunity to improve some practical aspects of training. Although BP measurement will be simplified by the progressive use of automatic devices, this does not mean that healthcare professionals can cease to pay attention to patients' posture (arm resting and slightly bent, cuff level with the heart, patient seated on a chair with the back supported by the chair, legs uncrossed), appropriate cuff choice, the conditions under which BP is measured (absence of noise and stress, not having smoked, consumed alcohol or eaten recently, not talking while BP is measured), and measuring BP several times on each visit.

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