REME • Rev Min Enferm. 2017;21:e-995
DOI: 10.5935/1415-2762.20170005

RESEARCH

PRACTICES ADOPTED BY NURSING PROFESSIONALS FOR INDIRECT MEASUREMENT AND RECORDING OF BLOOD PRESSURE

PRÁTICAS ADOTADAS POR PROFISSIONAIS DE ENFERMAGEM PARA MEDIDA INDIRETA E REGISTRO DA PRESSÃO ARTERIAL

PRÁCTICAS ADOPTADAS POR PROFESIONALES DE ENFERMERIA PARA LA MEDICIÓN INDIRECTA Y REGISTRO DE LA PRESIÓN ARTERIAL

Douglas Lima Mouro [1]
Simone de Godoy [2]
Eugenia Velludo Veiga [3]
Robson Cristiano Zandomenighi [4]
Leila Maria Marchi-Alves [5]

[1] RN. MS in Sciences. Health Secretary of Paraná; Londrina Regional Emergency Mobile Assistance Service, Nucleus of Education in Emergencies. Londrina, PR – Brazil.
[2] RN. PhD in Sciences. Professor. University of São Paulo – USP, Nursing School of Ribeirão Preto-EERP, Department of General and Specialized Nursing. Ribeirão Preto, SP – Brazil.
[3] RN. PhD in Nursing. Associate Professor. USP, EERP, Department of General and Specialized Nursing. Ribeirão Preto, SP – Brazil.
[4] RN. MS student in Nursing. State University of Londrina. Hospital do Coração of Londrina, Department of Nursing. Londrina, PR – Brazil.
[5] RN. PhD in Nursing. Associate Professor I. USP, EERP, Department of General and Specialized Nursing. Ribeirão Preto, SP – Brazil.

Corresponding author: Leila Maria Marchi-Alves. E-mail: lmarchi@eerp.usp.br
Submitted on: 2016/08/29 Approved on: 2017/02/07

ABSTRACT

The aim of this study was to identify how the procedure for indirect measurement and recording of blood pressure by nursing professionals is performed and the technical conditions of the devices used. It is a quantitative, observational, cross-sectional study. The sample consisted of 80 servers, observed from August 2013 to January 2014, in five health units in Londrina, Paraná. In the data collection, it was used as a reference to measure an instrument made from the steps described in the VI Brazilian Guidelines on Hypertension and, for the record of the proceeding, a tool built according to the recommendations of the COREn, São Paulo. For data analysis, we used the Program Statistical Package for Social Science version 1.6. The results showed high rates of "non-performance" (93.8% to 100%) of the steps for preparing the patient for measurement of pressure. The calibration of the equipment is not measured, and there are not cuffs of varied sizes. It is concluded that there are important gaps related to the practice adopted by nurses to measure blood pressure, indicating the need for implementation of educational measures.

Keywords: Hypertension; Blood Pressure Measurement; Nursing; Nursing Records.

RESUMO

Objetivou-se identificar como é realizado o procedimento de medida indireta e registro da pressão arterial por profissionais de enfermagem e as condições técnicas dos dispositivos utilizados. Trata-se de estudo quantitativo, observacional, de delineamento transversal. A amostra compôs-se de 80 servidores observados no período de agosto de 2013 a janeiro de 2014, em cinco unidades de saúde de Londrina, Paraná. Na coleta de dados utilizou-se instrumento fundamentado nas VI Diretrizes Brasileiras de Hipertensão e, para o registro do procedimento, instrumento construído conforme recomendações do COREn-SP.Na análise dos dados usou-se o Programa Statistical Package for the Social Science *versão 1.6. Os resultados mostraram altos índices de "não realização" (93,8 a 100%) das etapas de preparo do paciente para a medida da pressão. A calibração dos equipamentos não era aferida e não havia manguitos disponíveis de tamanhos variados. Concluiu-se que há importantes lacunas nos procedimentos adotados pela enfermagem para a medida da pressão arterial, indicando a necessidade de medidas educativas.*

Palavras-chave: *Hipertensão; Determinação da Pressão Arterial; Enfermagem; Registros de Enfermagem.*

How to cite this article:
Mouro DL, Godoy S, Veiga EV, Zandomenighi RC, Marchi-Alves LM. Practices adopted by nursing professionals for indirect measurement and recording of blood pressure. REME – Rev Min Enferm. 2017 [cited _____ ___ ___];21:e-995. Available from: _____ DOI: 10.5935/1415-2762.20170005

RESUMEN

El objetivo del presente estudio fue identificar cómo el personal de enfermería realiza el procedimiento de medición indirecta y registro de la presión arterial y cuáles son las condiciones técnicas de los dispositivos utilizados. Se trata de un estudio cuantitativo observacional transversal. La muestra estuvo formada por 80 empleados observados de agosto 2013 a enero 2014 en cinco unidades de salud en Londrina, Paraná. En la recogida de datos se utilizó un instrumento basado en las VI Directrices Brasileñas de Hipertensión y, para el registro del procedimiento, un instrumento construido según las recomendaciones del COREn - SP. Para el análisis de datos se utilizó el Programa Statistical Package for the Social Science versión 1.6. Los resultados mostraron altos índices de "no realización" (93,8% a 100%) de las etapas de preparación del paciente para la medición de la presión, que no se evaluaba la calibración de los equipos y que no había manguitos disponibles de distintos tamaños. Se llegó a la conclusión de que hay deficiencias significativas en los procedimientos llevados a cabo por enfermería para la medición de la presión arterial y que por ello habría que adoptar medidas educativas.

***Palabras clave**: Hipertensión; Medición de la Presión Arterial; Enfermería; Registros de Enfermería.*

INTRODUCTION

Systemic arterial hypertension (SAH) is one of the most important public health problems in the world.[1,2] According to the World Health Organization (WHO), there are about 330 million hypertensive patients in developed countries and about 640 million individuals in developing countries. However, estimates show that there will be 1.56 billion adults living with the disease in 2025.[3]

In Brazil, population surveys indicate that the prevalence of hypertension is above 30%, highlighting men (35.8%) and the elderly people (75% above 70 years old).[4] In the United States, 29% of population are hypertensive.[5]

Guidelines of the Brazilian Society of Cardiology, Nephrology and Hypertension, American and International Societies of Hypertension, European Society of Cardiology and Hypertension, 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults: Report from the Eighth Joint National Committee Canadian Hypertension Education Program Recommendations provide informational subsidies for the diagnosis and control of SAH, which can be diagnosed when there is high and sustained blood pressure (BP) levels.[6]

Despite the significant scientific advances in the health area, the diagnosis and treatment of hypertension continue to be based primarily on the non-invasive measurement of blood pressure (BP).[7] Accuracy in measurement is what ensures the acquisition of reliable values, an imperative condition to ensure safe and correct decision making. When BP is appropriately measured, it allows the early identification of changes in blood pressure levels, diagnosis of hypertensive disease, as well as monitoring of hypertensive patients and evaluation of therapeutic efficacy, reducing the risk of cardiovascular damage.[4]

Errors in BP measurement may be of different nature, and they are related to the patient, the measurement technique, the observer, the place or environment, the equipment and the information recording.

Failures when obtaining BP related to the patient occur due to non-indication of previous rest; full bladder; feeding and recent intake of coffee and alcoholic beverages; inadequate positioning. As for the measure, some possible errors are caused by not estimating the level of systolic pressure; non-detection of auscultatory hiatus; velocity of accelerated deflation. The observer´s errors consist of eyes not aligned to the manometer; misidentification of Korotkoff sounds; interaction with the patient. The unfavorable environment with noises or excessive circulation of people also contributes to the failures in the measurement of BP.[4]

Another important error factor is the fragility of aneroid sphygmomanometers since they are easily damaged, and decalibrated due to the shocks received in daily handling and environmental changes, leading to underestimation or overestimation of the measured values.[8] Other errors related to the equipment are due to the improper position of the cuff; the use of the diaphragm instead of the bell and excessive compression of the stethoscope. It is also mentioned that the unavailability of the cuffs with varied sizes can also lead to errors.

Concerning the errors in the BP record, the rounding off of the values found for numbers ending in zero or five, with a zero-digit preference, in both the SBP and the DBP record.[9] Another worrying factor is the frequency the professionals are limited to the recording of very brief observations and with important faults, such as erasures in writing, illegible handwriting, lack of correct identification of the professional at the end of each annotation, lack of checking or incorrect checking; incomplete annotation of vital parameters; lacking forms, among others.

In this perspective, the objective of this study is to identify the practices adopted by nursing professionals in the measurement of blood pressure, due to the diagnostic and prognostic implications of this procedure in the control of SAH.

OBJECTIVE

To identify how the procedure of indirect measurement and recording of blood pressure by nursing professionals is performed and the technical conditions of the devices used.

MATERIAL AND METHOD

This research comes from a master´s thesis on the practice of indirect measurement of BP in health units in the city of Londrina-PR.[10] This is a cross-sectional, observational and quantitative study. First appreciated by the Research Ethics Committee, linked to the researchers´ teaching institution, this study complied with Resolution 466 of December 12, 2012, of the National Health Council, and its development was approved under the protocol 259,620.

The study sample was composed of 80 professionals from the nursing team, obtained from information on the National Register of Health Establishments (CNES) NET of DATASUS.[11] The inclusion criterion was the components of the nursing team (nurses, assistants, and technicians) who performed the BP measurement procedure in their routine practice. The exclusion criteria were those servers absent from the unit during the data collection period and those that did not perform the BP measurement procedures.

The instrument used for observation was composed of three parts: questions of socio-demographic characterization of professionals; checklist related to patient preparation for BP measurement; description of the steps for BP measurement and procedure record, according to the recommendations of COREn-SP and VI Brazilian Hypertension Guidelines, using the instrument formulated from the recommendations of the mentioned institutions and the Tognoli instrument as reference, use previously authorized, as well as their adaptation.[4,12,13]

It was also evaluated the quality of the devices used for the detection of pressure values regarding their aspect of calibration control, INMETRO validation certification and physical integrity, based on the recommendations of the Blood Pressure Measurement Toolkt and the guidelines provided by the National Institute of Metrology (INMETRO).[14]

A data spreadsheet was prepared using the Microsoft Office Excel Program, containing a dictionary (codebook) and two spreadsheets for double-entry validation (typing) for the analysis of the blood bank's internal consistency, until the final data management phase. After typing and validation, the data were compiled, processed with the help of the Statistical Package for the Social Science (SPSS), version 16.0 and submitted to simple descriptive statistical analysis with absolute and relative frequency calculations.

RESULTS

The distribution of participants according to socio-demographic characteristics is presented in Table 1.

Table 2 shows the results of the participants´ performance in the compliance with the steps of BP measurement carried out in a "correct," "incorrect" or "not performed" way.

Table 1 - Distribution of study participants (n=80) according to socio-demographic characteristics, Londrina, 2013

Variables	n	%
Gender		
Female	73	91.3
Male	7	8.7
Age		
21 |– 30	37	46.2
30 |– 40	34	42.5
40 |– 50	8	10
50 |–	1	1.3
Academic education		
Nursing Assistant	31	38.8
Nursing Technician	24	30
Nurse	25	31.2
Function exercised		
Nursing Assistant	36	45
Nursing Technician	27	33.8
Nurse	17	21.2
Time of professional exercise (months)		
12 |– 120	44	55.5%
120 |– 220	22	27.8%
220 |– 248	14	17.5%
Time in the function (months)		
12 |–120	53	66.3
120 |– 240	27	33.7

Source: Primary data collected in the research.

Although the description of the steps in the VI Brazilian Hypertension Guidelines (2010) has the steps described below, these steps were not evaluated in our study because we chose to collect the data from the direct observation. To identify if the professionals performed these steps correctly, it would be necessary for the researcher to perform the procedure with the participant, but this was not the method adopted in this work.

> *[...] to determine systolic pressure by auscultation of the first sound (Korotkoff phase I), generally weak, followed by regular beats, and then slightly increasing the deflation rate;*

> *[...] to determine the diastolic pressure on the disappearance of sounds (Korotkoff phase V);*

> *[...] to auscultate approximately 20 to 30 mmHg below the last sound to confirm its disappearance and then proceed to rapid and complete deflation;*

Table 2 - Frequency of the steps of the blood pressure measurement related to the preparation of the patient, performed by nursing professionals (n=80) correctly, incorrectly or not performed, Londrina, 2013

Variables	Correct		Incorrect		Not performed	
	n	%	n	%	n	%
Explaining the procedure to the patient	5	6.3	–	–	75	93.8
Guiding to rest for at least 5 minutes in a calm environment	3	3.8	–	–	77	96.3
Guiding the patient not to talk during the measurement	2	2.5	–	–	78	97.5
Clarifying possible doubts before or after the procedure	2	2.5	–	–	78	97.5
Making sure the patient is NOT with a full bladder	–	–	–	–	80	100
Making sure the patient did NOT exercise for at least 60 minutes	–	–	–	–	80	100
Making sure the patient did NOT drink alcohol, coffee or food in the 30 minutes before the measurement	–	–	–	–	80	100
Making sure the patient did NOT smoke within 30 minutes before the measure	–	–	–	–	80	100
Guiding the patient to remain in a seated position	73	91.3	–	–	7	8.7
Guiding the patient to keep legs uncrossed	43	53.8	34	42.5	3	3.8
Guiding the patient to keep feet on the floor	46	57.5	30	37.5	4	5
Guiding the patient to keep the backrest in the chair and relaxed	69	86.3	6	7.5	5	6.3
Keeping the patient´s arm at heart level	78	97.5	–	–	2	2.5
Keeping the patient´s arm free of clothing	70	87.5	5	6.3	5	6.3
Keeping patient´s arm supported	76	95	–	–	4	5
Keeping the patient´s arm with the palm of the hand facing up.	69	86.3	9	11.3	2	2.5
Keeping the patient´s elbow slightly flexed	78	97.5	2	2.5	–	–

Source: Primary data collected in the research.

[...] if the beats persist until level zero, determine the diastolic pressure in the muffling of sounds (Korotkoff phase IV) and note systolic/diastolic/zero values.

The frequencies of the blood pressure measurement steps related to obtaining the pressure index, a record of the annotations and conditions of the devices are presented in Tables 3 and 4 and 5, respectively.

Table 3 - Frequency of the blood pressure measurement steps directly related to the achievement of the pressure index, correctly or incorrectly performed by nursing professionals (n=80), Londrina, 2013

Variables	Correct		Incorrect		Not perfromed	
	n	%	n	%	n	%
Obtaining the arm circumference at the midpoint of the arm	–	–	–	–	80	100
Selecting the cuff of appropriate size for arm circumference	–	–	3	3.8	77	96.3
Placing the cuff, without leaving a gap, 2 to 3 cm above the cubital fossa	64	80	16	20	–	–
Centering the compressive part of the cuff over the brachial artery	26	32.5	54	67.5	–	–
Estimating systolic pressure by palpating the radial pulse	48	60	25	31.3	7	8.8
Palpating the brachial artery in the cubital fossa and place the bell/diaphragm of the stethoscope without excessive compression	2	2.5	61	76.3	17	21.3
Quickly inflating the rubber bag of the cuff until it exceeds 20 to 30 mmHg of the estimated systolic pressure level	–	–	80	100	–	–
Proceeding to deflation slowly at a speed of 2 mmHg/second	2	2.5	78	97.5	–	–
Waiting approximately one minute for the new measurement	1	1.3	–	–	79	98.8
Informing the patient of the blood pressure values obtained	78	97.5	–	–	2	2.5
Noting the exact values without "rounding" them	–	–	80	100	–	–

Source: Primary data collected in the research.

Table 4 - Characteristics of the recording blood pressure measurement by nursing professionals (n=79)* according to data from the medical chart, Londrina, 2013

Variables	Yes		No	
	n	%	n	%
Annotation date	78	98.7	01	1.3
Annotation time	23	29.1	56	70.9
Erasure	03	3.8	76	92.1
Space or blank lines	65	81.3	14	17.7
Readable letter	67	83.8	12	15
Spelling error	–	–	79	100
Terms with connotation of value (well, badly, very,...)	–	–	79	100
Identification of the professional registry	02	2.5	77	96.3
Identification of the professional by signature	04	5	75	93.8
Clinical conditions of the patient at the time of measurement	–	–	79	100
Information on technique or equipment used for measurement	–	–	79	100
Positioning of the patient during the measurement	–	–	79	100
Limb of the measure	–	–	79	100
Obtaining the brachial circumference	–	–	79	100
Cuff size used	–	–	79	100
Systolic blood pressure values in 3 digits	–	–	79	100
Diastolic blood pressure values in 2 digits	05	6.3	74	92.5
Reference units (mmHg, cm,...)	–	–	79	100
Interventions carried out after the measure (s/n)	–	–	79	100

Source: Primary data collected in the research.
*One participant did not record the procedure, being removed from this phase.

Table 5 - Technical conditions of the devices (n=15) used in blood pressure, Londrina, 2013

Variables	Yes		No	
	n	%	n	%
Calibration of equipment checked less than one year ago	–	–	15	100
Equipment with the INMETRO validation seal	14	90	1	10
Availability of sleeves of varying sizes	–	–	15	100
Integral rubber bag and stable clamps up to maximum inflation	14	90	01	10
Extenders with leak-free connections and integral rubber	14	90	01	10
Pear and valve intact and without air leaks	15	100	–	–
Pressure gauge at "0" mmHg in the initial measurement	14	90	01	10

Continue...

... continued

Table 5 - Technical conditions of the devices (n=15) used in blood pressure, Londrina, 2013

Variables	Yes		No	
	n	%	n	%
Manometer reaching maximum value at insufflation	15	100	–	–
Stethoscope free of leaks and dryness	15	100	–	–
Stethoscope Earpieces are present and intact	15	100	–	–

Fonte: Dados primários levantados na pesquisa.

DISCUSSION

The findings of this investigation show gaps in the knowledge, appearing inaccuracies in the execution of the steps for the measurement and recording of BP. A lot of articles identifying such failures suggest the need for the popularization of new methods. The most viable alternative is the residential blood pressure measure (RBPM), according to guidelines in the area by solving many of the problems detected, and it has gained importance due to the proof of its effectiveness and low level of cost.

As implicit in its name, HBPM is the method of BP measurement practiced by the patient or person skilled in their home. The measurement is performed by an equipment validated and calibrated during the waking period, and it can be used for long periods, providing a continuum of data for diagnosis. Compared to the findings of this study, HBPM would suppress possible alarm reactions to the presence of the health professional and would also minimize or even avoid errors regarding patient and observer conditions and those resulting from the environment. Also, the quality of the HBPM data is in line with the number of measurements, and it provides a more solid basis for the diagnosis than those provided by the casual measure since it is recommended to record measurment in duplicate (morning and evening) by the minimum period of at least four days. Regarding the equipment, it is recommended to use the oscillometric technique and with data storage and sending to specific software.[15]

Although the indirect method of BP measurement is the most taught and disclosed, researchers indicate that only 7.8% of the nurses of a given ICU team obtained 60% success rate on multiple choice questions about the auscultatory and oscillometric methods.[16]

Results of the study to verify if the Brazilian hypertension guidelines are met by nursing assistants and technicians presented the following percentage of answers regarding questions about BP verification: 65.5% for nursing technicians and 59.6% for nursing assistants. This outcome is due to the quality of vocational training (considering the course hours).[17]

Scholars in the area propose the use of an educational hypermedia to teach the PA measurement technique among the educational suggestions for solving health problems. The tool presents videos, photos, animations and simulations to demonstrate and teach the procedure.[18]

According to the results of this study, one of the critical areas to be addressed in the educational process would be the communication between the health professional and the patient. Variable 1 of Table 2 – "explaining the procedure to the patient" – obtained the index of 93.8% in the "not performed" category. This lack of information can cause fear and anxiety in the patient and, as previously mentioned, giving rise to the alarm reaction, a phenomenon that, admittedly, increases the BP level.[8]

Also from this perspective, when considering the other results, it is observed that the procedures regarding guiding and interaction with the patient, through verbal communication, are those with the highest percentages of "not performed." Such indexes can illustrate the difficulty of establishing dialogue and communication of the assistants, technicians, and nurses with the patient or even the lack of knowledge of the orientation to the patient and the obtaining of this information being inherent to the nursing care.

Failure to observe the steps related to the investigation of consumption of alcohol, coffee, cigarettes, and food in the minutes before the BP measurement can lead to unreliable blood pressure levels. The BP of smokers after nocturnal abstention of cigarettes has lower rates remaining reduced if abstinence is sustained. However, when the patient smokes again, the values increase within 15 minutes. The intake of 200 mg of caffeine raises the pressure by up to 10/7 mmHg over the period of one to two hours. The combination of coffee and smoking sustained increase in BP for 5 to 120 minutes.[19]

The first steps related to obtaining the brachial circumference and selection of the adequate cuff, obtained an almost absolute index of non-performed, 100 and 96.3%, respectively. The implications of this event can be serious, as studies have shown that the size of the cuff used may influence the outcome of the BP measurement.[20] However, it is important to note that health services do not provide cuffs of varying sizes.

Regarding the record of the BP measurement procedure by the nursing professional, the results of the investigation reveal that 10 of the 19 information evaluated were disregarded, that is, they were absent from the records observed, such as: "spelling error", "terms with a connotation of value (good, bad, much...)", "clinical conditions of the patient when measuring the BP", "information about technique or equipment used for the measurement", "(mmHg, cm)" and "interventions carried out after the measurement (s/n)" were used. It should be noted that spelling errors and terms with a value connotation were absent because the totality of the records was limited to the description of the BP value.

Other indices in the "no" category were: "erasure" (92.1%), "identification of professional registration" (96.3%), "values of double-digit diastolic blood pressure" (92.5%). Table 4 shows the "annotation date" (98.7%), "blank space or lines" (81.3%), "legible letter" (83.8), "three-digit systolic blood pressure values" (93.8%). Most (70.9%) did not record the annotation time.

Specifically, in the BP record, the observer´s preference for rounding the values found for zero-ended or zero-digit numbers, with a zero-digit preference, both in the recording of systolic blood pressure (SBP) and of diastolic blood pressure (DBP).[9] The consequences may seem modest. However, not only the diagnosis but the treatment with antihypertensive can be systematically affected by this practice.[21] It is common to find in the literature alerts on the rounding of the values found for numbers ending in zero or five.

According to the Regional Nursing Council of the State of São Paulo (COREN-SP), nursing records are fundamental for proving the application of assistance based on scientific, technical principles. Without them, the nursing would cease to be a science, going to the simple care provided without any direction, generating unforeseen and possibly harmful results to the patient. Moreover, they constitute a legal document for the defense of professionals and must be imbued with authenticity and legal significance.[22,23]

Regarding the conditions of the equipment used for the measurement of BP, the most critical factors were the periodic verification of calibration of the sphygmomanometer and the unavailability of the cuff of different sizes. However, although the information on the variable "equipment calibration verified for less than one year" obtained the 100% index in the "no" category, since there were no records of the control of that maintenance, the variable "equipment presents the validation seal of the INMETRO" pointed out that most of the devices (90%) contained this document.

The answers were positive for the other technical conditions analyzed, indicating the good condition of the equipment, despite the lack of control of its maintenance. There were also 100% negative responses regarding the availability of various sized cuffs, making inaccurate diagnoses and, consequently, misguiding possible treatments.[24] In the population of 80 patients, the cuff 13x30 cm (adult) was only adequate for 50% of the patients studied due to the variation of the brachial circumference. From this result, it is possible to infer that 50% of the registries have probably underestimated or overestimated pressure indices, meaning that patients may be following incorrect treatments.[24]

The investigation is limited by the fact that the results obtained are only about the sample observed, being a descriptive study. Also, the sample included servers from the same organization, which may have influenced the results.

CONCLUSIONS

The results of this study showed that the practices adopted by nursing professionals in the indirect measurement procedure and the registry of the BP contain flaws that can result in damages to the health of the individual since they dissimulate their real clinical condition and induce the wrong treatments in the antihypertensive therapy approach. However, the difficulties are not confined to the nursing team alone, but they add to institutional failures since errors there are also and omissions from the lack of control in the maintenance of equipment or even the absence of adequate instruments.

It is important to emphasize educational programs as part of the solution to the problem investigated. However, although the health professional is the most visible part of the problem, materializing the failures and errors of the system, its breadth and gravity require governmental entities, institutions and regulatory bodies assuming more responsibilities, either in the more active and knowledge or even in the material and technical requirements that the procedure requires.

REFERENCES

1. World Health Organization. Global action plan for the prevention and control of noncommunicable diseases.2013-2020.Geneve: WHO; 2013. [cited 2013 Dec 02]. Available from: http://www.who.int/nmh/events/2013/revised_draft_ncd_action_plan.pdf
2. World Health Organization. Global health risks: mortality and burden of disease attributable to selected major risks. Geneve: WHO; 2009. [cited 2013 Dec 02]. Available from: http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf
3. World Heart Federation. Hypertension and cardiovascular disease. [cited 2014 Apr 08]. Available from:http://www.world-heart-federation.org/cardiovascular-health/cardiovascular-disease-risk-factors/hypertension/
4. Sociedade Brasileira de Cardiologia. VI Diretrizes brasileiras de hipertensão arterial. São Paulo: SBC; 2010. [cited 2013 Dec 02]. Available from: http://publicacoes.cardiol.br/consenso/2010/Diretriz_hipertensao_associados.pdf
5. Center for Disease Control and Prevention. Atlanta. Chronic disease indicators. [cited 2014 May 02]. Available from:http://apps.nccd.cdc.gov/cdi/
6. Nobre F. Valores de pressão arterial para o diagnóstico e metas: análise crítica das diretrizes mais recentes. Rev Soc Cardiol. 2015[cited 2013 Dec 30];4(1):19-22. Available from: http://www.socesp.org.br/upload/revista/2015/REVISTA-SOCESP-V25-N1.pdf
7. Dieterle T. Blood pressure measurement – an– overview. Swiss Med Weekly. 2012[cited 2014 May 04];142:1-9. Available from: http://www.smw.ch/content/smw - 2012-13517/
8. Gusmão JL, Raymundo AC, Campos CL, Mano GP, Alencar NP, Silva JS, *et al*. Fontes de erro na medida da pressão arterial: papel do esfigmomanômetro e do observador. Rev Hipertensão. 2011[cited 2014 May 04];14(2):33-44. Available from: http://www.sbh.org.br/pdf/2012_2.pdf
9. Alsanjari ON, Lusignan S, van Vlymen J, Gallagher H, Millett C, Harris K, *et al*. Trends and transient change in end-digit preference in blood pressure recording: studies of sequential and longitudinal collected primary care data. Int J ClinPract. 2012[cited 2014 May 10];66(1):37-43. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22171903
10. Mouro DL. Medida indireta e registro da pressão arterial: práticas adotadas por profissionais de enfermagem [dissertação]. Ribeirão Preto: Universidade de São Paulo, Escola de Enfermagem de Ribeirão Preto; 2014. [cited 2015 Oct 06]. Available from: http://www.teses.usp.br/teses/disponiveis/22/22132/tde-06022015-200608/
11. Ministério da Saúde (BR). Banco de dados do Sistema Único de Saúde-DATASUS, Cadastro Nacional de Estabelecimentos de Atenção à Saúde - CNES. [cited 2013Jan 21]. Available from: http://cnes.datasus.gov.br/Lista_Es_Municipio.asp?VEstado=41&VCodMunicipio=411370&NomeEstado=PARANA
12. Conselho Regional de Enfermagem. Anotações de Enfermagem. 2009. [cited 2014 Feb 12]. Available from: http://www.portaldaenfermagem.com.br/downloads/manual-anotacoes-de-enfermagem-coren-sp.pdf
13. Tognoli SH. Medida indireta da pressão arterial: avaliação de programa de educação permanente oferecido em dispositivo móvel[dissertação] Riberão Preto: Escola de Enfermagem de Ribeirão Preto; 2012. 101 f.
14. Wisconsin Heart Disease and Stroke Prevention Program. Division of Public Health. Department of Health Services. Blood pressure measurement toolkit: improving accuracy, enhancing care. Madison; 2010. [cited 2014 Jan 20]. Available from: http://www.dhs.wisconsin.gov/publications/p0/p00623.pdf
15. Parte 3: III Diretrizes Brasileiras de Monitorização Residencial da Pressão Arterial (MRPA). Arq Bras Cardiol. 2011[cited 2016 May 08];97(3):17-24. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0066-782X2011001800004&lng=en.
16. Almeida TCF, Lamas JLT. Enfermeiros de Unidade de Terapia Intensiva adulto: avaliação sobre medida direta e indireta da pressão arterial. Rev Esc Enferm USP. 2013[cited 2016 May 08];47(2):369-76. Available from: http://www.scielo.br/pdf/reeusp/v47n2/14.pdf
17. Boll LFC, Irigoyen MC, Goldmeier S. Diretrizes brasileiras de hipertensão arterial: realidade da enfermagem em hospital especializado. Acta Paul Enferm. 2012[cited 2014 May 08]; 25(5):775-80. Available from: http://www.scielo.br/pdf/ape/v25n5/20.pdf
18. Alavarce DC, Pierin AMG. Elaboração de uma hipermídia educacional para o ensino do procedimento de medida da pressão arterial. Rev Esc Enferm USP. 2011[cited 2014 May 08];45(4):939-44. Available from: http://www.scielo.br/pdf/reeusp/v45n4/v45n4a21.pdf
19. Freestone S, Ramsay LE. Effect of coffee and cigarette smoking on the blood pressure of untreated and diuretic-treated hypertensive patients. Am J Med. 1982.[cited 2014 May 10];73(3):348-53. Available from: http://www.ncbi.nlm.nih.gov/pubmed/7124761
20. Arcuri EAM. Fatores de erro na medida da pressão arterial: a influência do manguito. Rev Hipertens. 2011[cited 2014 May 12];14(2):21-32. Available from: http://www.sbh.org.br/pdf/2012_2.pdf
21. Nietert PJ, Wessell AM, Feifer C, Ornstein SM. Effect of terminal digit preference on blood pressure measurement and treatment in primary care. Am J Hypertens. 2006[cited 2014 May 12];19(2):147-52. http://www.ncbi.nlm.nih.gov/pubmed/16448884
22. Conselho Regional de Enfermagem. Anotações de Enfermagem. São Paulo: COREN SP; 2009. [cited 2016 Apr 20]. Available from: http://www.sobecc.org.br/programacao/coren /anotacoes_enfermagem.pdf.
23. Conselho Regional de Enfermagem . Decisão COREN-SP-DIR/001/2000. Normatiza no Estado de São Paulo os princípios gerais para ações que constituem a documentação de Enfermagem. São Paulo: COREN SP; 2000. [cited 2014 Feb 08]. Available from: http://portal.coren-sp.gov.br/node/30747
24. Freitas CCQ, Pantarotto RFR, Costa LRLG. Relação circunferência braquial e tamanho de manguitos utilizados nas Unidades Básicas de Saúde de uma cidade do interior paulista. J Health Sci. 2013[cited 2014 May 10];31(3):48-52. http://www.unip.br/comunicacao/publicacoes/ics/edicoes/2013/01_jan-mar/V31_n1_2013_p48a52.pdf