

Cynthia Kallás Bachur¹, Juliana Pereira Machado², Eugenia Velludo veiga³, José Alexandre Bachur⁴ and Paulo Alexandre Carvalho Ferreira⁵

¹Professor, University of Franca, Physical Therapy and Medicine, Brazil.

²Assistant Professor, Centro Universitário Barão de Mauá, Brazil

³Associate Professor, University of São Paulo at Ribeirão Preto College of Nursing, Brazil

⁴Professor, University of Franca, Physical Therapy Program, Brazil.

⁵Professor, Escola Superior de Enfermagem de Coimbra, Portugal.

É E t , R4 M Á P oá P É n Ái l ed É P z a Á P , Á i » Á M ioJ Á á'le o M ' n u-C Pm BngÁ É n Á R

preparing professionals for decision-making leadership, teamwork,
management and continuous education.

one (12.5%) was level 3 Table 1 synthesizes the analysis of the papers included in this integrative review (appendix 1).

Title	Authors	Journal	Year	Database	Methodological design	Population	University/Country	Teaching strategies	Data collection instruments	Evidence level
Modification of nursing students' performance in blood pressure measurement: an educational retraining programme [20]	Brokalaki H., et al	Inter Nursing Review	2008	CINAHL and Medline	Before-and-after intervention study with a single group.	Nursing students	University of Athens, Greece	Complementary program (tutorial/video)	Checklist	3
Nursing student caring behaviors during blood pressure Measurement [21]	Minnesota baccalaureate Psychomotor skills Faculty Group	J Nursing Education	2008	CINAHL and Medline	Descriptive, quantitative, observational study.	Nursing students	University of Minnesota, USA	Complementary program (Dramatization)	Check list	6
Knowledge of correct blood pressure measurement procedures among medical and nursing students [22]	González-López JJ, et al.	RerEsp Cardiol	2009	Medline	Descriptive, quantitative, observational study.	Nursing and medical students	Universidad Autónoma de Madrid, Spain	Conventional theoretical/practical teaching	Questionnaire	6
A survey of first year student nurses' experiences of learning blood pressure measurement [23]	Baillie, L; Curzio, J.	Nurse Educ Practice	2009	CINAHL and Medline	Descriptive, quantitative, observational study.	Nursing students	London South Bank University, England	Conventional theoretical/practical teaching	Questionnaire	6
Student Measurement of Blood Pressure Using a Arm Simulator Compared with a Live Subject's Art [24]	Lee JJ, et al.	Am J Pharm Educ	2010	Medline	Cross-sectional, crossover	Pharmacy students	University of Connecticut School of Pharmacy, USA	Complementary program (Simulation)	Questionnaire	4
Development and validation of an educational game: blood pressure measurement [25]	Andrade, LZC; e cols.	Rev. Enferm. UERJ	2012	LILACS and CINAHL	Descriptive, quantitative, methodological study.	Nursing students	Federal University of Ceará, Brazil	Educational game (dominoes)	Questionnaire	6
Preparing students to competently measure blood pressure in the real-world environment: a comparison between New Zealand and the United Kingdom [26]	Bland M; Ousey K.	Nurse Educ Practice	2012	CINAHL and Medline	Descriptive, quantitative, observational study.	Nursing students	University of Huddersfield, United Kingdom	Conventional theoretical/practical teaching	Questionnaire	6

Knowledge of
accurate blood
pressure
measurement

With the same rationale, another review study [24] used an arm simulator for pharmacology students to take BP measurements. Life-size arm simulators enable students to practice the same skills and techniques required to measure BP in a human subject [32]. The study does not report significant differences in the BP readings obtained from a human arm compared to those obtained from an arm simulator and students did not manifest preferences for learning the techniques with humans instead of simulators or vice-versa. Whether arm simulators can facilitate the learning of BP measurement or whether students are able to measure BP should be assessed in future studies.

Only one of the studies included in this review was conducted in Brazil [25]. The paper describes the methodological steps to construct an educational strategy to consolidate the technique for indirect measurement of BP through a game applied to nursing students. The authors needed a strategy that was easy to transport and store and easy to be applied by a single mediator. Thus, they chose dominoes, which is a simple game, widely available, cheap and easy to learn, and specific rules could be established for the game. The game set has 28 domino pieces, 28 cards and one instruction card. Each domino has a pair of risk factors related to the pathophysiology of cardiovascular diseases, therapeutic drug control and the prescription of exercise. The students' performance improved after the activity. The authors note that the use of educational games, such as dominoes, in learning arouses learners' motivation, curiosity and interest in learning in a fun and enjoyable way.

Studies report important gaps in the knowledge of students in regard to the stages of indirect BP measurement, namely, aspects regarding the instrumental technique and the anatomy- physiology involved. Currently, the education of health sciences students goes beyond pedagogical and didactic scientific updating; it is supposed to enable students to participate, reflect, and practice. We stress the need to develop new teaching models for the indirect measurement of BP directed to professionals and students in the health field.

It is worth noting that no population-based studies addressing either physical therapy or physical education students were found. These professionals constantly use the indirect measurement of BP in their clinical practice as a key parameter to assess exercise-induced cardiovascular output, especially in cardiovascular rehabilitation programs. Therefore, because there are few studies in these fields, these populations should be considered in future research addressing educational interventions concerning the measurement of BP.

This integrative review enabled the construction of a synthesis of scientific studies investigating the level of knowledge of health sciences students in regard to the indirect measurement of BP. There are gaps in the knowledge of students. The studies were classified as having a low level of evidence, thus, studies with greater methodological rigor are needed. Groups with interest in research should unite efforts with the encouragement of funding agencies to expand intervention studies and research involving students from various fields of health in order to play an important role in the expansion of knowledge in this field.

This paper's results reveal studies using conventional methods and some isolated educational interventions, such as an extra-curricular program including lectures, tutorial videos and skills classes in laboratories, simulations and games. There is also a need to train skills during the course of the undergraduate program so that students will commit the measurement process to memory. This study shows the link between the need for interventions and improved qualification

