Taylor & Francis
Taylor & Francis Group

RAPID COMMUNICATION

🔓 OPEN ACCESS ⟳ Check for updates

Redesigning blood pressure measurement training in healthcare schools

Rupinder Hayer[a], Kate Kirley [iD][a], Stavros Tsipas[a], Jon Allen[b], Darlene Hanson[c] and Eric Johnson[b]

[a]Improving Health Outcomes, American Medical Association, Chicago, IL, USA; [b]School of Medicine and Health Sciences, University of North Dakota, Grand Forks, ND, USA; [c]College of Nursing & Professional Disciplines, University of North Dakota, Grand Forks, ND, USA

ABSTRACT

Blood pressure (BP) measurement is the most commonly performed procedure in clinical practice and requires mastering several skills. A prior study determined that medical school students failed to perform more than half of BP measurement skills correctly, demonstrating a need to redesign how BP measurement is taught. The American Medical Association set out to create and test a solution to address this BP measurement curricula gap. An eLearning series consisting of three modules was developed. The series was informed by evidence-based guidelines, includes content on self-measured blood pressure, is accessible to students at any time within their education journey, is interactive, and available to all healthcare schools at no cost. Prior to launch, a small pilot study was conducted with medical and nursing students to determine if these new eLearning modules address current gaps in BP measurement curricula. Students were instructed to complete an online assessment before and after viewing the main module within the series. Our results suggest that eLearning modules on BP measurement can help improve knowledge and ability to identify correct BP measurement skills. Pronounced improvements were observed in the topics of patient preparation, positioning, and cuff sizing and placement. Revisions were made to content areas where improvement was minimal. Overall, the findings revealed the importance of pilot testing a product prior to launch and while many skills may improve with an eLearning intervention, certain skills will still likely require additional in-person training with peers.

Problem

Blood pressure (BP) measurement is the most commonly performed procedure in clinical practice and requires mastering several skills to produce an accurate measurement[1]. A prior study determined that medical school students failed to perform more than half of BP measurement skills correctly, demonstrating a need to redesign how BP measurement is taught [1]. The American Medical Association (AMA) set out to create and test a solution to address this BP measurement curricula gap.

Approach

In 2020, we spoke to healthcare educators and medical students about the current state of BP measurement training in healthcare schools, gaps and weaknesses associated with the status quo, the ideal state, and opportunities. Current training efforts are usually limited to a one-time training, textbook based, occur early in a medical students' education journey, and do not include self-measured blood pressure (SMBP). [2,3] The ideal state included an eLearning product that is based on evidence-based guidelines, includes SMBP content, is accessible to students at any time within their education journey, is interactive, and available to all healthcare schools at no cost[2].

Based on these findings the AMA developed three eLearning modules. The first module is the foundational module and is designed for students early in their training. The second module focuses on SMBP and is designed for pre-clinical or clinical training once students become more familiar with foundational BP care. The third module is a short refresher module designed for use prior to clinical experiences and repeated as needed. Prior to releasing the modules to the public, the AMA conducted a small pilot study with medical and nursing students to determine if these new eLearning modules address current gaps in BP measurement curricula.

The pilot study was conducted in partnership with the University of North Dakota's medical and nursing students. First year medical and first year baccalaureate nursing students were recruited to complete the online assessment before and after viewing the foundational module. The assessment included 23 items: 19 multiple-choice questions assessing BP measurement knowledge related to definitions, correct BP measurement processes, and classification of BP measurements; and 4 items requiring the critique of

a provider's BP measurement skills depicted in video demonstrations. Each video focused on a different aspect of the BP measurement process: patient preparation and positioning, cuff selection and placement, BP measurement technique, and documentation and communication. The first three videos had multiple errors and the last video had no errors. Students were asked if the correct protocol was followed. If they answered no, they were asked to identify the mistakes. For this short paper, the authors focused on whether students correctly answered yes or no to the initial question regarding the correct protocol.

Due to time constraints, the study only tested the foundational module. However, findings and lessons learned were applied to the entire series as deemed appropriate. The University of Illinois at Chicago's Institutional Review Board (IRB), the local review board for the AMA (Protocol 2020–1305) and University of North Dakota's IRB approved the study protocol.

Results

First year medical and nursing students were eligible to participate since the foundational module was designed for early learners. The a priori sample size was calculated based on observing a two-question improvement. A trial with power 80% and an alpha of 0.05 would require a sample size of 34 or 17 per group. A total of 77 students participated: 33 medical students and 44 nursing students. Table 1 contains the results of the knowledge questions. On average, students answered 72% of the knowledge questions correctly in the pre-test. Following the eLearning module, the students answered 85% of the knowledge items correctly. Furthermore, there was a 25 percentage-point or more improvement in correct responses to the knowledge questions related to factors that influence BP, cuff size and placement, SMBP measurement protocol and protocol for returning patients. However, there was minimal improvement in certain areas including understanding the number of BP measurements to take and the timing between them.

Table 1. Student BP measurement knowledge scores – pre and post testing.

	Pre-Test* (mean ± SD)	Post-Test* (mean ± SD)	P-value
All Students (N = 77)	13.6 ± 2.2	16.2 ± 2.0	<.01
Nursing Students (N = 44)	12.9 ± 2.4	15.5 ± 2.2	<.01
Medical Students (N = 33)	14.5 ± 1.6	17.2 ± 1.3	<.01

*Max knowledge score = 19.

Table 2. Number and proportion of students correctly critiquing BP measurement videos – pre and post testing.

	Pre-Test (N, %)	Post-Test (N, %)	P-value
All Students (N = 77)			
Video 1 – Preparation and positioning	21, 27%	65, 84%	<.01
Video 2 – Cuff selection and placement	26, 34%	60, 78%	<.01
Video 3 – BP measurement technique	68, 88%	72, 94%	0.27
Video 4 – Documentation and communication	26, 34%	16, 21%	0.07
Medical Students (N = 33)			
Video 1 – Preparation and positioning	10, 30%	30, 91%	<.01
Video 2 – Cuff selection and placement	15, 45%	28, 85%	<.01
Video 3 – BP measurement technique	30, 91%	33, 100%	0.08
Video 4 – Documentation and communication	8, 24%	6, 18%	0.55
Nursing Students (N = 44)			
Video 1 – Preparation and positioning	11, 25%	35, 80%	<.01
Video 2 – Cuff selection and placement	11, 25%	32, 73%	<.01
Video 3 – BP measurement technique	38, 86%	39, 89%	0.75
Video 4 – Documentation and communication	18, 41%	10, 23%	0.07

Table 2 contains the results of the video questions. There was a 40 percentage-point or more improvement in correctly critiquing the first two videos that focused on preparation and cuff selection and there was no statistically significant improvement with the other two videos.

Lessons learned and next steps

Our results suggest that the AMA foundational eLearning module on BP measurement can help improve knowledge and ability to correctly identify BP measurement skills. Pronounced improvements were observed in the topics of patient preparation, positioning, and cuff sizing and placement. These skills are particularly important as they are required regardless of whether BP is measured manually or using an automated device.

The authors recognize that there were several areas where improvement was minimal. For example, student scores were lower on items related to timings such as how long a patient should rest before having their BP measured or how long to wait in between readings. These findings highlight the importance of pilot testing an eLearning product before launch so one can identify and address content areas that need additional clarity.

Lastly, our findings also suggest that an eLearning module may not be a standalone solution. Certain skills will still likely require additional in-person training with peers and support from healthcare educators [4]. This foundational

module should not replace current in-person BP measurement teaching methods. Instead, it should augment classroom time and is likely a useful pre-work assignment.

Limitations of this pilot study included the virtual setting. Ideally, the skills assessment would have been conducted in-person with a student measuring a patient actor's BP. However, COVID-related restrictions precluded our ability to host an in-person assessment. Critiquing videos does not give the student an opportunity to fully apply the skills they learned via the foundational module. Another limitation was that the students were not true novice learners. The pilot took place a few months after their initial skills training within their programs which means students had prior knowledge of BP measurement. However, even if the study took place prior to their skills training within their program, it is still common for medical and nursing students to have some exposure to BP measurement via previous clinical roles and/or clinical shadowing.

Based on this pilot study findings revisions were made to all three eLearning modules prior to launching them in March 2021, specifically in areas where student performance was low. Since launch the AMA has partnered with 6 healthcare schools across the US on implementing the modules within their curriculum. We intend to share the results of these experiences in future publications.

Disclosure statement

Funding

ORCID

Kate Kirley http://orcid.org/0000-0001-7454-5095

References

[1] Muntner P, Shimbo D, Carey RM, et al. Measurement of blood pressure in humans: a scientific statement from the American heart association. Hypertension. 2019;73(5). DOI:10.1161/HYP.0000000000000087.

[2] Rakotz MK, Townsend RR, Yang J, et al. Medical students and measuring blood pressure: results from the American medical association blood pressure check challenge. J Clin Hypertens. 2017;19(6):614–619.

[3] Hayer R, Kirley K, Cohen JB, et al. Using web-based training to improve accuracy of blood pressure measurement among health care professionals: a randomized trial. J Clin Hypertens. 2022;24(3):255–262.

[4] EW M, JL B, JL D. E-learning and nursing assessment skills and knowledge - An integrative review. Nurse Educ Today. 2018Jul;66:166–174.