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## EFFECTIVENESS OF ILLUSTRATIVE SESSIONS IN IMPROVING KNOWLEDGE OF NON-AUTOMATED BLOOD PRESSURE MEASUREMENT AMONG UNDERGRADUATES.

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### Abstract

Blood pressure quantification is the most commonly conducted clinical protocol by nurses. The general purpose of this investigation is to use an illustrative program as a means to enhance knowledge and skills of manual blood pressure measurement among Federal University Otuoke student nurses. This research aimed to improve Federal University Otuoke student nurses' knowledge and skills in manual blood pressure measurement through an educational program. Using a one-group pre-test and post-test quasi-experimental design, 153 Third year nursing students were purposively sampled. Demographically, participants were primarily young (22.9% aged 16-18, 38.6% aged 19-21, 29.4% aged 22-24, and 9.2% aged 25+), predominantly Christian (89.5%), female (79.7%), and single (97.4%). Initially, students demonstrated below-average knowledge and proficiency in blood pressure measurement. Following the illustrative program, their knowledge and proficiency levels improved significantly. Statistical analysis confirmed a significant difference in both knowledge and self-reported proficiency pre- and post-intervention at 95% confidence interval. The illustrative program was crucial in enhancing student nurses' knowledge and practical skills in blood pressure measurement. Such programs are vital for building a strong foundation in clinical skills, standardizing procedures, and promoting patient-centered care, ultimately leading to better patient outcomes and safer healthcare practices. The study emphasizes the importance of continuous training and education to maintain proficiency and ensure blood pressure measurement remains a reliable diagnostic tool.

**Keywords:** Blood pressure; Illustration; Practice; Students; University

## Introduction

Blood pressure measurement is the most frequently performed procedure by nurses <sup>1</sup>. Nonetheless, the accuracy of these measurements is commonly taken for granted, and even in the scientific literature, the methodology for measuring blood pressure is sometimes detailed insufficiently or not at all <sup>1-2</sup>. Blood pressure is a gauge of the coercion exerted by the blood against the muscular walls of the arteries, as the heart pumps it throughout the body's different circulations <sup>3</sup>. Blood pressure (BP) measurement is a frequent, basic clinical procedure which involves a process of assessing the force exerted by the blood against the walls of the arteries <sup>2-3</sup>. Blood pressure measurement is one of the cardinal assessments carried out on every patient in the healthcare industry <sup>4</sup>. However, studies have shown measurement errors derived from problems with the instruments used (inadequate calibration, invalidated devices, etc.) as much as from inappropriate procedures <sup>5-6</sup>. For example, in practice, blood pressure measurement accuracy varies significantly <sup>6-7</sup>. Systolic pressure gauge differed by from above 5mmHg in either direction for 68% of patients, whereas diastolic blood pressure readings varied by greater than two mmHg in either direction for 78% of patients <sup>7-8</sup>. With the automated gauging device introduction, the technique of determining, clinically, blood pressure recording, manually, has been observed to have sharply declined <sup>8</sup>. As Blood Pressure recording directly informs clinical decision, there is a higher tendency and potential inclination that inaccurate recording may precipitate likely harm to the patient and with the increase of electronically-calibrated equipment use for the gauging of blood pressure <sup>9-10</sup>. It was recognized that nurses especially student nurses were predisposed to losing their learned competence at manual-type blood pressure gauging <sup>11</sup>. There are certain situations where a manual measurement will be required, like, where an automated arterial blood pressure reading presents inaccuracy when considered together with a patient's clinical presentation <sup>12</sup>. Student in health specialties and nurses are expected to be competent in manual blood pressure determination and to achieve this requires a wide understanding of the theory and related techniques, as accurate blood pressure measurement is indispensable for proper screening diagnosis and monitoring of high blood pressure <sup>13</sup>. Blood pressure (BP) determination is an essential part of clinical decision-making. A study <sup>14</sup> published in the Journal of Clinical hypertension found out that up to 20% of blood pressure measurement taken in clinical settings may be inaccurate due to various errors. Another study<sup>15</sup> postulated up to 15% of patient may be misclassified as having hypertension due to inaccurate blood pressure measurement.

## Materials and methods

### Research Design

In order to achieve the specific objectives of this study, a quasi-experimental study design was adopted. The one group pre-test, post-test design is a type of quasi-experiment that the outcome of interest is measured twice; that is, once, before and after exposure of a non-random group of participants to a certain measurable intervention. The one-group pre-test post-test design has three major characteristics;

- Sampled participants who receive prescribed intervention is non-randomly selected; which makes it in agreement with a quasi-experimental design.

- Non-existence of a group, denoted as control, against which the potential result can be placed in comparison.
- The impact of the intervention is gauged by comparing the pre-intervention and post-intervention analysis

The selected design is the most relevant design when assessing nursing student led illustrative programme on the knowledge of Federal University Otuoke nursing students on blood pressure measurement.

### Research Setting

The research setting for the study is Federal University Otuoke, Bayelsa State in South-South geopolitical region in Nigeria. The University comprises of 17 Faculties. Participants were selected from The Faculty of Nursing Science, which was established in 2023 after a successful resource verification and subsequent accreditation by the Nursing and Midwifery Council (NMCN) and University Commission (NUC) in Nigeria.

### Target population

The study population consists of all 300 level students in Nursing in Federal University situated in Otuoke, somewhere in Bayelsa State. These study participants were used for data collecting process for analysis. From the data existing, the population size was 249 nursing students; who fit the profile needed for the study; these were adopted as the target population.

### Sample size

Sample size was estimated using the Taro Yamane formula;

$n$  = Sample size

$N$  = Population size

$E$  = Tolerance error (0.05), which is a constant

$$n = \frac{N}{(1 + N(E)^2)}$$
$$n = \frac{249}{(1 + 249(0.05)^2)}$$
$$n = 3$$

Therefore, 153 nursing students will be used for this study.

### Sampling technique

The sampling method used was purposive sampling; 300 level students were selected on purpose. Purposive sampling is a non-probability sampling technique adopted in research for participant selection based on specific criteria or characteristics that concern the research objective. This sampling technique was adopted because of complaints on the poor blood pressure measurements in clinical settings and demonstration room.

### Instruments for data collection

#### Researcher-administered Questionnaire

A questionnaire, which covered the relevant area of concern, was used to collect the information essential on the knowledge of undergraduate nursing students on blood pressure measurement. A pre-questionnaire was given to the student and later on after the educational program, the same questionnaire this time around a

post-questionnaire was re-administered to the student. The questionnaire was into 3 sections, divided, as; A, B and C using Likert scale. Section A contains questions on socio demographic characteristics of study participant; section B contain questions to extract information on student nurse knowledge on blood pressure measurement using manual sphygmomanometer and section C to get data on student self-reported level of proficiency on techniques in manual blood pressure measurement.

#### Validity of instrument

All phases of scientific study protocols were adhered to, to verify for internally approved validity. The questionnaire was validated by Two (2) Health experts at the University along with the Project supervisor. Their main task was to review the questionnaire to ensure that it contained the appropriate and anticipated questions and to determine whether the contents are in line with the objectives of the study. They were also to screen appropriateness of every selected item with respect to language used. Their constructive evaluations, criticism and suggestions were replicated to produce the final version of the desired instrument that was used for the data collection for this study.

#### Reliability of the instrument

Reliability refers to the measure that ensures much consistency of a test in a study. Statistical Package for Social Sciences (IBM-SPSS) batch system is generally considered to be a reliable software tool. The test-retest method was used to test the reliability of the constructed questionnaire. The questionnaire was presented or issued pre and post educational program Reliability of the data collection instrument and method was tested using Cronbach's coefficient test. For this study, a reliability index of 0.9 was used.

#### Method of data collection

Permission to carry out the study was gotten from the Head of Department (HOD). The pre-test data were collected using a questionnaire. A questionnaire was used as source of data collection. Duplication by respondents was prevented. Established guidelines and ethical clearance was adhered to during the selection of respondents in the study.

The questionnaires were administered to the target population (500 level nursing students) before the commencement of the educational program that lasted for two (2) days. The educational intervention was carried out to improve the knowledge of the student nurse about the theory of manual BP recording with the belief that this could directly shape their practice and ability to carry out this skill consistently and competently.

Afterwards, the same questionnaire was re-administered again (post-test) to test if there was an improvement on knowledge and technique in the practice of manual blood pressure measurement amongst the student.

#### Method of data analysis

The analysis was done using Descriptive Simple Percentage. While statistical test was used to calculate the pre and posttest.

#### Ethical considerations

This study was considered by the Research Ethics Committee of the Department of Human Physiology, Faculty of Basic Medical Sciences, Federal University Otuoke with Reference: FUO/REC/HP/2026/071.

The researcher maintained the following ethical considerations during the course of the research.

- **Anonymity:** The researcher ensured that the respondents did not give self-identifying details like name thus to ensure anonymity.
- **Confidentiality:** The researcher ensured that all information's provided are treated confidentially.
- **Informed consent:** The researcher ensured that the respondents gave out their approval and acceptance before giving out the questionnaire
- **Respect:** the respondents were respected and approached with courtesy
- **Plagiarism:** the researcher ensured that all works used, ideas referenced.

**Voluntary participation:** the researcher ensured that the subjects had the right to voluntarily decide whether to participate in the study or not without risk of penalty.

#### Results

The results of this study are presented as follows;

**Table 1:** Socio-Demographic characteristics of the study respondents

| Variables             | Group                | Frequency (n) | Percentage (%) |
|-----------------------|----------------------|---------------|----------------|
| <b>Age (years)</b>    | 16-18                | 10            | 6.5            |
|                       | 19-21                | 60            | 39.2           |
|                       | 22-24                | 55            | 35.9           |
|                       | 25 and above         | 28            | 18.3           |
| <b>Religion</b>       | Christianity         | 137           | 89.5           |
|                       | Islam                | 16            | 10.5           |
|                       | Traditional religion | 0             | 0              |
|                       | Others               | 0             | 0              |
| <b>Gender</b>         | Male                 | 31            | 20.3           |
|                       | Female               | 122           | 79.7           |
| <b>Marital status</b> | Single               | 149           | 97.4           |
|                       | Married              | 4             | 2.6            |
|                       | Divorced             | 0             | 0              |

Table 1, above describes the sociodemographic characteristics of the study participants. The age distribution data shows that 6.5% were between the ages of 16-18, 39.2% between the ages of 19-21 years, 35.9% between the ages of 22-24 years and 18.3 % were 25 years or above. 89.5% of the study participants were Christians while 10.5 were Muslims. Data on the gender of the study participants shows that 79.7% were females while 20.3% were males. Data on the marital status of the study participants shows that 97.4% were single, 2.6% were married.

**Table 2: Knowledge on Blood Pressure Measurement**

| Variables                                                                                                                    | SA (%)       | A (%)        | D (%)        | SD (%)       |
|------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------|--------------|
| The different components of a blood pressure reading (systolic and diastolic pressures) are well familiar.                   | 75<br>(49.0) | 41<br>(26.8) | 25<br>(16.3) | 12<br>(7.8)  |
| The significance of blood pressure measurement in assessing cardiovascular health is understood.                             | 81<br>(52.9) | 37<br>(24.2) | 26<br>(17.0) | 9<br>(5.8)   |
| There is good awareness of the correct positioning of the arm during blood pressure measurement.                             | 30<br>(19.6) | 44<br>(28.8) | 54<br>(35.3) | 25<br>(16.3) |
| Appropriate cuff size to use for different arm circumferences is well known.                                                 | 22<br>(14.4) | 47<br>(30.7) | 57<br>(37.3) | 27<br>(17.6) |
| The importance of allowing the individual to rest before measuring their blood pressure is understood.                       | 44<br>(28.8) | 52<br>(34.3) | 38<br>(25.3) | 19<br>(12.4) |
| The correct technique for placing the stethoscope over the brachial artery is well familiar.                                 | 27<br>(18.1) | 40<br>(26.1) | 48<br>(31.3) | 38<br>(24.8) |
| Korotkoff sounds during blood pressure measurement can be accurately identified.                                             | 17<br>(11.1) | 48<br>(31.4) | 55<br>(35.9) | 33<br>(21.6) |
| Appropriate frequency of blood pressure measurement for individuals with hypertension or other related conditions are known. | 14<br>(9.2)  | 20<br>(13.1) | 31<br>(20.3) | 88<br>(57.5) |
| Potential factors that can influence blood pressure readings are knowledgeable.                                              | 58<br>(37.9) | 55<br>(35.9) | 32<br>(20.9) | 8<br>(5.2)   |

Table 2, describes the knowledge on blood pressure measurement among the study participants pre-educational program. The results show that a high proportion of the study participants agreed with being familiar with different components of a blood pressure reading, understanding the significance of blood pressure measurement in assessing cardiovascular health, knowledge about the potential factors that can influence blood pressure readings. The results also revealed that the study participants had little knowledge of the appropriate frequency of blood pressure

measurement for individuals with hypertension or other related conditions, how to accurately identify Korotkoff sounds during blood pressure measurement and the appropriate cuff size to use for different arm circumferences. About half of the study participants had knowledge of the importance of allowing the individual to rest before measuring their blood pressure and the correct technique for placing the stethoscope over the brachial artery.

**Table 3: Self-Reported Level of Proficiency on Techniques in Blood Pressure Measurement.**

| Variables                                                                                                                                                                                   | HP (%)       | MP (%)       | SP (%)       | NP (%)       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------|--------------|
| Correctly positioning the patient for blood pressure measurement.                                                                                                                           | 30<br>(19.6) | 46<br>(30.1) | 47<br>(30.7) | 30<br>(19.6) |
| Selecting the appropriate-sized cuff for blood pressure measurement.                                                                                                                        | 18<br>(11.7) | 45<br>(29.4) | 46<br>(30.1) | 44<br>(28.8) |
| Locating the brachial artery for accurate blood pressure measurement.                                                                                                                       | 22<br>(14.4) | 42<br>(27.4) | 49<br>(32.0) | 40<br>(26.1) |
| Inflating and deflating the cuff at an appropriate rate for blood pressure measurement.                                                                                                     | 11<br>(7.2)  | 28<br>(18.3) | 73<br>(47.7) | 41<br>(26.7) |
| Using the correct technique to auscultate Korotkoff sounds during blood pressure measurement.                                                                                               | 16<br>(10.5) | 36<br>(23.5) | 61<br>(39.9) | 40<br>(26.1) |
| Accurately reading and recording blood pressure measurements.                                                                                                                               | 37<br>(15.6) | 50<br>(32.7) | 46<br>(30.1) | 20<br>(13.1) |
| Palpate a clear pulse distal to the device cuff, e.g., for brachial or radial. Enclosed air valve and inflate, rapidly, the cuff to about 30 mm Hg above point of observable pulse or above | 22           | 51           | 53           | 27           |

|                                                                                                                                                                                                                   |              |              |              |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------|--------------|
| estimated systolic pressure of blood.                                                                                                                                                                             | (14.4)       | (33.3)       | (34.6)       | (17.6)       |
| Place the stethoscope, but gently, over artery.                                                                                                                                                                   | 42<br>(27.5) | 58<br>(37.9) | 43<br>(28.1) | 10<br>(6.5)  |
| Open the device valve, gently, and release slowly the air, permitting the drop in pressure from 2–3 mm Hg per heartbeat, simultaneously auscultating for pressure sounds or palpating for an observable pulse.    | 31<br>(20.6) | 49<br>(32.0) | 62<br>(40.5) | 11<br>(7.2)  |
| Obtaining a reading of blood pressure or gauging.<br>Systolic pressure; The gauging at which you first hear audible sounds.<br>Diastolic pressure; The gauging when sounds are not prominent or become inaudible. | 37<br>(24.2) | 50<br>(32.7) | 45<br>(29.4) | 21<br>(13.7) |
| Not leaving the cuff inflated for an extended or for a period of long duration                                                                                                                                    | 35<br>(22.9) | 58<br>(37.9) | 51<br>(33.3) | 9<br>(5.9)   |
| Rapidly Deflating the cuff, succeeded by removal from the arm.                                                                                                                                                    | 39<br>(25.5) | 43<br>(28.1) | 57<br>(37.3) | 14<br>(9.2)  |
| Waiting 2 minutes, just before gauging another blood pressure                                                                                                                                                     | 60<br>(39.2) | 51<br>(33.6) | 37<br>(24.2) | 5<br>(3.4)   |

Table 3, shows the self-reported level of proficiency on techniques in blood pressure measurement of the respondent's pre-educational program. The result shows that the study participants had below average level of proficiency on techniques in blood pressure measurement. On correctly positioning the patient for blood pressure measurement, 19.6% of the study participants reported high proficiency, 30.1% reported moderate proficiency, 30.7% reported slight proficiency and 19.6% reported no proficiency. Data on the proficiency in selecting the appropriate-sized cuff for blood pressure measurement shows that 11.7% reported high proficiency, 29.4% reported moderate proficiency, 30.1% reported slight proficiency and 28.8% reported no proficiency. Data on the proficiency in locating the brachial artery for accurate blood pressure measurement revealed that 14.4% reported high proficiency, 27.4% reported moderate proficiency, 32.0% reported slight proficiency and 26.1% reported no proficiency. Proficiency in inflating and deflating the cuff at an appropriate rate for blood pressure measurement show that 7.2% reported high proficiency, 18.3% reported moderate proficiency, 47.7% reported slight proficiency and 26.7% reported no proficiency. Data on the proficiency in using the correct technique to auscultate Korotkoff sounds during blood pressure measurement shows that 10.5% reported high proficiency, 23.5% reported moderate proficiency, 39.9% reported slight proficiency and 26.1% reported no

proficiency. On the proficiency in accurate reading and recording of blood pressure measurements, 15.6% reported high proficiency, 32.7% reported moderate proficiency, 30.1% reported slight proficiency and 13.1% reported no proficiency. On proficiency in palpating a pulse distal to the cuff, 14.4% reported high proficiency, 33.3% reported moderate proficiency, 34.6% reported slight proficiency and 17.6% reported no proficiency. On the placement of stethoscope gently of the artery, 27.5% reported high proficiency, 37.9% reported moderate proficiency, 40.5% slight proficiency and 7.2% reported no proficiency. On the proficiency of recognizing the systolic and diastolic blood pressure, 24.2% reported high proficiency, 32.7% reported moderate proficiency, 29.4% reported slight proficiency and 13.7% reported no proficiency. On not leaving the cuff inflated for a prolonged period, 22.9% reported high proficiency, 37.9% reported moderate proficiency, 33.3% reported slight proficiency and 5.9% reported no proficiency. On the proficiency of deflating the cuff rapidly and completely and remove from the arm, 25.5% reported high proficiency, 28.1% reported moderate proficiency, 37.3% reported slight proficiency and 9.2% reported no proficiency. On waiting for 2 minutes before taking another blood pressure, 39.2% reported high proficiency, 33.6% reported moderate proficiency, 24.2% reported slight proficiency and 3.4% reported no proficiency.

**Table 4;** Knowledge on Blood Pressure Measurement

| Variables                                                                                              | SA (%)        | A (%)        | D (%)       | SD (%)     |
|--------------------------------------------------------------------------------------------------------|---------------|--------------|-------------|------------|
| Different components of a blood pressure reading (systolic and diastolic pressures) are well familiar. | 110<br>(71.9) | 34<br>(22.3) | 9<br>(22.2) | 0<br>(0.0) |
| The significance of blood pressure measurement in assessing cardiovascular health is understood.       | 118<br>(77.1) | 21<br>(13.7) | 11<br>(7.2) | 3<br>(2.0) |
| There is good awareness of the correct positioning of the arm during blood pressure measurement.       | 106<br>(69.3) | 33<br>(21.6) | 9<br>(5.9)  | 5<br>(3.4) |
| Appropriate cuff size to use for different arm circumferences is well known.                           | 100<br>(65.4) | 37<br>(24.2) | 12<br>(7.2) | 4<br>(2.4) |
| The importance of allowing the individual to rest before measuring their blood pressure is             | 124           | 18           | 11          | 0          |

|                                                                                                                              |               |              |              |             |
|------------------------------------------------------------------------------------------------------------------------------|---------------|--------------|--------------|-------------|
| understood.                                                                                                                  | (81.3)        | (12.0)       | (7.8)        | (0)         |
| The correct technique for placing the stethoscope over the brachial artery is well familiar.                                 | 92<br>(60.1)  | 39<br>(25.5) | 12<br>(7.8)  | 10<br>(6.5) |
| Korotkoff sounds during blood pressure measurement can be accurately identified.                                             | 103<br>(67.3) | 41<br>(26.8) | 7<br>(4.6)   | 2<br>(1.3)  |
| Appropriate frequency of blood pressure measurement for individuals with hypertension or other related conditions are known. | 90<br>(58.8)  | 44<br>(28.8) | 16<br>(10.5) | 3<br>(1.9)  |
| Potential factors that can influence blood pressure readings are knowledge.                                                  | 112<br>(73.2) | 37<br>(24.8) | 4<br>(2.6)   | 0<br>(0.0)  |

Table 4 describes the knowledge on blood pressure measurement among the study participants post-educational program. The results shows that a high proportion of the study participants agreed with being familiar with different components of a blood pressure reading, understanding the significance of blood pressure measurement in assessing cardiovascular health, the potential factors that can influence blood pressure readings, the appropriate frequency of blood pressure measurement for individuals with

hypertension or other related conditions, how to accurately identify Korotkoff sounds during blood pressure measurement, the appropriate cuff size to use for different arm circumferences, the appropriate cuff size to use for different arm circumferences, the importance of allowing the individual to rest before measuring their blood pressure and the correct technique for placing the stethoscope over the brachial artery.

**Table 5; Self-Reported Level of Proficiency on Techniques in Blood Pressure Measurement.**

| <b>Variables</b>                                                                                                                                                                               | <b>HP<br/>(%)</b> | <b>MP<br/>(%)</b> | <b>SP<br/>(%)</b> | <b>NP<br/>(%)</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|-------------------|-------------------|
| I am proficient in correctly positioning the patient for blood pressure measurement.                                                                                                           | 90<br>(58.8)      | 52<br>(34.0)      | 9<br>(5.9)        | 2<br>(1.3)        |
| I am proficient in selecting the appropriate-sized cuff for blood pressure measurement.                                                                                                        | 70<br>(45.8)      | 46<br>(30.1)      | 28<br>(16.3)      | 9<br>(5.9)        |
| I am proficient in locating the brachial artery for accurate blood pressure measurement.                                                                                                       | 93<br>(60.8)      | 32<br>(20.9)      | 21<br>(13.7)      | 7<br>(4.6)        |
| I am proficient in inflating and deflating the cuff at an appropriate rate for blood pressure measurement.                                                                                     | 87<br>(56.9)      | 45<br>(29.4)      | 19<br>(12.4)      | 2<br>(1.3)        |
| I am proficient in using the correct technique to auscultate Korotkoff sounds during blood pressure measurement.                                                                               | 64<br>(41.8)      | 51<br>(33.3)      | 23<br>(15.0)      | 15<br>(4.5)       |
| I am proficient in accurately reading and recording blood pressure measurements.                                                                                                               | 115<br>(75.2)     | 28<br>(18.3)      | 8<br>(5.2)        | 2<br>(1.3)        |
| Palpate a pulse distal to the cuff, e.g., brachial or radial. Close air valve and rapidly inflate cuff to 30 mm Hg above where pulse no longer felt or above expected systolic blood pressure. | 89<br>(58.2)      | 53<br>(34.6)      | 10<br>(6.5)       | 1<br>(0.7)        |
| Place stethoscope gently over artery.                                                                                                                                                          | 91<br>(59.5)      | 36<br>(23.5)      | 20<br>(13.1)      | 6<br>(3.9)        |
| Open the valve and slowly release the air, permitting the pressure to drop 2–3 mm Hg per heart beat while auscultating for BP sounds or palpating for a pulse.                                 | 73<br>(47.7)      | 41<br>(26.8)      | 28<br>(18.3)      | 11<br>(7.2)       |
| Obtaining a blood pressure reading.<br>Systolic pressure; The pressure at which you first hear sounds.<br>Diastolic pressure; The pressure when sounds become inaudible                        | 80<br>(52.3)      | 43<br>(28.1)      | 21<br>(13.7)      | 9<br>(5.9)        |
| Not leaving the cuff inflated for a prolonged period.                                                                                                                                          | 115<br>(75.2)     | 32<br>(20.9)      | 5<br>(3.3)        | 1<br>(0.7)        |
| Deflating the cuff rapidly and completely and remove from the arm.                                                                                                                             | 99<br>(64.7)      | 24<br>(15.7)      | 19<br>(12.4)      | 11<br>(7.2)       |
| Waiting 2 minutes before taking another blood pressure                                                                                                                                         | 123<br>(80.4)     | 21<br>(13.7)      | 9<br>(5.9)        | 0<br>(0.0)        |

Table 5, shows the self-reported level of proficiency on techniques in blood pressure measurement of the respondent's post-educational program. The result shows that the study participants had high level of proficiency on techniques in blood pressure measurement. On correctly positioning the patient for blood pressure measurement. 58.8% of the study participants reported high proficiency, 34.0% reported moderate proficiency, 5.9% reported slight proficiency and 1.3% reported no proficiency. Data on the proficiency in selecting the appropriate-sized cuff for blood pressure measurement shows that 45.8% reported high proficiency, 30.1% reported moderate proficiency, 16.3% reported slight proficiency and 5.9% reported no proficiency. Data on the proficiency in locating the brachial artery for accurate blood pressure measurement revealed that 60.8% reported high proficiency, 20.9% reported moderate proficiency, 13.7% reported slight proficiency and 4.6% reported no proficiency. Proficiency in inflating and deflating the cuff at an appropriate rate for blood pressure measurement show that 56.9% reported high proficiency, 29.4% reported moderate proficiency, 12.4% reported slight proficiency and 1.3% reported no proficiency. Data on the proficiency in using the correct technique to auscultate Korotkoff sounds during blood pressure measurement shows that 41.8% reported high proficiency, 33.3% reported moderate proficiency, 15.0% reported slight proficiency and 4.5% reported no

proficiency. On the proficiency in accurate reading and recording of blood pressure measurements, 75.2% reported high proficiency, 18.3% reported moderate proficiency, 5.2% reported slight proficiency and 1.3% reported no proficiency. On proficiency in palpating a pulse distal to the cuff, 58.2% reported high proficiency, 34.6% reported moderate proficiency, 6.5% reported slight proficiency and 0.7% reported no proficiency. On the placement of stethoscope gently of the artery, 59.5% reported high proficiency, 23.6% reported moderate proficiency, 6.5% slight proficiency and 0.7% reported no proficiency. On the proficiency of recognizing the systolic and diastolic blood pressure, 59.5% reported high proficiency, 23.5% reported moderated proficiency, 13.1% reported slight proficiency and 3.9% reported no proficiency. On not leaving the cuff inflated for a prolong period, 75.2% reported high proficiency, 20.9% reported moderate proficiency, 3.3% reported slight proficiency and 0.7% reported no proficiency. On the proficiency of deflating the cuff rapidly and completely and remove from the arm, 64.7% reported high proficiency, 15.7 % reported moderate proficiency, 12.4% reported slight proficiency and 7.2% reported no proficiency. On waiting for 2 minutes before taking another blood pressure, 80.4% reported high proficiency, 13.7% reported moderate proficiency, 5.9% reported slight proficiency and 0% reported no proficiency.

**Table 6:** Statistical Comparison of Knowledge of Student Nurses on Manual Blood Pressure Measurement Pre and Post Educational Program

|           | mean | variance | Observations | P-value | Significance |
|-----------|------|----------|--------------|---------|--------------|
| Pre-test  | 42.5 | 609.1    | 36           | 0.044   | Yes          |
| Post-test | 41.2 | 1059.6   | 36           |         |              |

Table 6 shows the Statistical comparison of knowledge of student nurses blood pressure measurement pre and post educational program. The results show that there is an extent of difference that

is significant in the level of knowledge of student nurses blood pressure measurement pre and post educational program ( $p \leq 0.05$ )

**Table 7:** Statistical Comparison of Self-Reported Level of Proficiency on Techniques in Manual Blood Pressure Measurement Pre and Post Educational Program

|           | mean | variance | Observations | P-value | Significance |
|-----------|------|----------|--------------|---------|--------------|
| Pre-test  | 61.6 | 1265.0   | 52           | 0.49    | yes          |
| Post-test | 60.2 | 3237.8   | 52           |         |              |

Table 7; shows the Statistical comparison of self-reported level of proficiency on techniques in blood pressure measurement pre and post educational program. The results show that there is a difference that's significant in the self-reported level of proficiency on techniques in blood pressure measurement pre and post educational program ( $p \leq 0.05$ ).

## Discussion

Blood pressure measurement is a critical clinical skill for nurses as it helps in assessing a patient's cardiovascular health and detecting potential issues like hypertension. Proper measurement technique is essential to obtain accurate and reliable readings<sup>14</sup>. Improving methods of blood pressure measurement was a key research goal identified in the 2016 Lancet commission on hypertension<sup>12</sup>. The results of the knowledge of the respondents on blood pressure measurement pre educational program shows that a high proportion of the study participants agreed with being familiar with different components of a blood pressure reading, understanding the significance of blood pressure measurement in assessing cardiovascular health, knowledge about the potential factors that

can influence blood pressure readings. The results also revealed that the study participants had little knowledge of the appropriate frequency of blood pressure measurement for individuals with hypertension or other related conditions, how to accurately identify Korotkoff sounds during blood pressure measurement and the appropriate cuff size to use for different arm circumferences. About half of the study participants had knowledge of the appropriate cuff size to use for different arm circumferences, the importance of allowing the individual to rest before measuring their blood pressure and the correct technique for placing the stethoscope over the brachial artery. This finding is in line with earlier studies<sup>16</sup> in which the level of knowledge of blood pressure measurement was relatively low among year 1-3 undergraduate nursing students. The results of these studies shows that about half of the study participants had knowledge on the basic steps for measuring blood pressure, which include selecting the appropriate cuff size, positioning the patient correctly, using a stethoscope or electronic device, and recording systolic and diastolic pressures. Proficiency in blood pressure measurement is a crucial skill for student nurses and healthcare professionals alike. Accurate blood

pressure measurement is essential for diagnosing and managing various medical conditions, including hypertension (high blood pressure) and hypotension (low blood pressure) <sup>17</sup>. The result of the proficiency of the study participants on blood pressure measurement pre-educational program revealed a below average level of proficiency on techniques in blood pressure measurement. On correctly positioning the patient for blood pressure measurement, 19.6% of the study participants reported high proficiency, 30.1% reported moderate proficiency, 30.7 reported slight proficiency and 15.0% reported no proficiency. Data on the proficiency in selecting the appropriate-sized cuff for blood pressure measurement shows that 11.7% reported high proficiency, 29.4% reported moderate proficiency, 30.1% reported slight proficiency and 28.8% reported no proficiency. Data on the proficiency in locating the brachial artery for accurate blood pressure measurement revealed that 14.4% reported high proficiency, 27.4% reported moderate proficiency, 32.0% reported slight proficiency and 26.1% reported no proficiency. Proficiency in inflating and deflating the cuff at an appropriate rate for blood pressure measurement show that 7.2% reported high proficiency, 18.3% reported moderate proficiency, 47.7% reported slight proficiency and 26.7% reported no proficiency. Data on the proficiency in using the correct technique to auscultate Korotkoff sounds during blood pressure measurement shows that 10.5% reported high proficiency, 23.5% reported moderate proficiency, 39.9% reported slight proficiency and 26.1% reported no proficiency. On the proficiency in accurate reading and recording of blood pressure measurements, 15.6% reported high proficiency, 32.7% reported moderate proficiency, 30.1% reported slight proficiency and 13.1% reported no proficiency. On proficiency in palpating a pulse distal to the cuff, 14.4% reported high proficiency, 33.3% reported moderate proficiency, 34.6% reported slight proficiency and 17.6% reported no proficiency. On the placement of stethoscope gently of the artery, 27.5% reported high proficiency, 37.9% reported moderate proficiency, 40.5% slight proficiency and 7.2% reported no proficiency. On the proficiency of recognizing the systolic and diastolic blood pressure, 24.2% reported high proficiency, 32.7% reported moderate proficiency, 29.4% reported slight proficiency and 13.7% reported no proficiency. On not leaving the cuff inflated for a prolong period, 22.9% reported high proficiency, 37.9% reported moderate proficiency, 33.3% reported slight proficiency and 5.9% reported no proficiency. On the proficiency of deflating the cuff rapidly and completely and remove from the arm, 25.5% reported high proficiency, 28.1% reported moderate proficiency, 37.3% reported slight proficiency and 9.2% reported no proficiency. On waiting for 2 minutes before taking another blood pressure, 39.2% reported high proficiency, 33.6% reported moderate proficiency, 24.2% reported slight proficiency and 3.4% reported no proficiency. However, the finding is in agreement with another study <sup>18</sup> conducted in India that showed the overall proficiency in blood pressure measurement was below average. The result of these study indicated that despite having theoretical knowledge as Student nurses typically receive lecture in blood pressure measurement as part of their nursing education., most nursing students lacked the practical skills. They learn about the anatomy and physiology of the cardiovascular system, the different types of blood pressure (systolic and diastolic), and the proper techniques for measurement. The incorrect manifestation of a large number of undergraduates in this study is in agreement with findings from earlier studies where medical; dental, nursing, physiotherapy, chiropractic, and pharmacy undergraduates presented discouraging

performance of arterial blood pressure estimation. This probably demonstrates that the poor performance of blood pressure measurement among students is an international challenge that deserves a resolution. Several strategies have been devised to control the loss of competent method of blood pressure measurement in some geographical regions. In Turkey, for instance, refresher physical activity within third year of medical school after initial training in the second year has been successful. Previous data revealed the repercussion of the poor performance of blood pressure measurement. In this study, the educational program which was aimed at improving the knowledge, accuracy, proficiency and consistency of blood pressure measurement had a significant impact on student nurses' ability to perform this essential skill. These programs are of benefit student nurses, as well as other healthcare providers. illustrative program provided participants with a deeper understanding of the principles and techniques involved in blood pressure measurement. This knowledge can lead to increased accuracy in measuring blood pressure, reducing the likelihood of measurement errors as well as various factors that can affect blood pressure measurements, such as the importance of arm positioning, cuff size, and the role of environmental conditions. Understanding these factors allows providers to make necessary adjustments for accurate readings. Most errors in the blood pressure measurement technique results in higher values of blood pressure. A 5mmHg to 10 mmHg error, for instance, can be linked to an inaccurate categorization of blood pressure from prehypertension to the stage 1 type of hypertension which is linked to an unnecessary and potentially lethal therapy for a good number of patients. Likely harmful effects on patients can result from an abnormal escalation of therapeutic method when controlled hypertension appears to be uncontrolled due to poor clinical technique. Nursing students need to master blood pressure measurement techniques as accurate blood pressure recordings will improve blood pressure management because they will identify hypertensive patients that will require referral to an appropriate health facility. For student nurses to attain and maintain this critical skill and must improve methods used to teach students how to master blood pressure measurement skills accurately. In addition, it is critical that a system is put in place to ensure that oral health professionals maintain mastery throughout their careers. When periodic training of clinical or nursing students in accurate method or technique of blood pressure measurement using visual as well as audio means and in-person test for expertise was undertaken; the staff were able to sustain their ability to record or measure arterial blood pressure accurately <sup>19</sup>. The application of automated recorders now preferred and recommended for arterial blood pressure measurement could reduce, potentially, the need for retraining because these devices have an advantage of reducing observer errors and the white-coat effect and providing multiple measurements. For now, automated blood pressure readers are not a common choice in the training of undergraduate and postgraduate clinical specialties, especially in still developing countries like Nigeria.

## Conclusion

In summary, the illustrative program on blood pressure measurement played a pivotal part in improving the knowledge and also the proficiency of this essential clinical skill among undergraduate nursing students. They benefit both student nurses and experienced health practitioners by providing a strong basic knowledge or foundation in blood pressure measurement

techniques, standardizing the procedures, and emphasizing patient-centered care. These illustrations contribute to better patient outcomes and safer healthcare practices. However, continuous training and education are essential to maintaining proficiency and ensuring that blood pressure measurement remains a reliable and accurate diagnostic tool in healthcare settings.

#### Authors contribution

The sole author was responsible for the conceptualization, methodology, data collection, analysis, writing and final approval of the manuscript.

#### Conflict of interest

There are no conflict of interest regarding this study

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This statement does not apply to this article

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