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HOW TO TAKE MANUAL BLOOD PRESSURE MEASUREMENT

CLINICAL GUIDEBOOK FOR NURSING STUDENTS

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<p>Manual blood pressure measurement is an essential skill, that every nurse should be able to perform appropriately. Because of how important this skill is, it is then important to learn it correctly at the beginning of the studies. This project-based thesis deals with the manual method of measuring blood pressure. Based on the theory, an educational guidebook has been made for SAMK for the use of teaching and learning.</p> <p>The purpose of this project-based thesis is to produce a clinical guidebook for the nursing student of SAMK providing clear instructions that is evidence based and as current as possible on how to take blood pressure measurement manually.</p> <p>The objective of this project-based thesis is so to adopt a manner to taking blood pressure measurement with evidence-based approach and to make Nursing students of SAMK understand ways to taking manual blood pressure measurement step by step.</p> <p>The theoretical part of the project-based thesis entails the basics of manual blood pressure measurement and the tools used for it, cardiovascular physiology, blood pressure values. The final product is an instructional guidebook. The guidebook contains pictures of manual blood pressure measurement instruments that are commonly used and instructions for taking blood pressure measurement manually. The use of the guidebook would be easy for the nursing students to increase their knowledge of measuring blood pressure manually.</p>		
<p><u>Key words</u> Stethoscope, blood pressure, hypertension, blood circulation, sphygmomanometer, nursing student, clinical guidebook</p>		

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1 INTRODUCTION

High blood pressure is the most significant risk factor for reducing healthy life years worldwide, causing approximately 10.4 million premature deaths each year. The goal of preventing and treating high blood pressure is to prevent related target organ damage, reduce premature cardiovascular events and deaths, and increase the number of healthy life years. About two million adult Finns have high blood pressure. Only one in five blood pressures is at an ideal level. Effective prevention of high blood pressure and its harms requires effective measures to reduce sodium intake in the general population. About a million Finns use antihypertensive drugs, but only about 40% of them have a blood pressure goal. Combination therapy with ACE inhibitors or ATR blockers and calcium channel blockers and diuretics should be increased to achieve therapeutic goals. (Kaypahoito.fi, 2020)

Due to the prevalence of hypertension, there should be a competence in measuring blood pressure manually as this is an important aspect of nursing. According to a study by Gorman Lee (2021), the skills of nursing students in manual measurement of blood pressure were poor this is due to the continuous use of the automated blood pressure measurement. This means students can concentrate on the competent of measuring blood pressure manually from the beginning of the nursing studies. The thesis therefore focuses on the manual method of measuring blood pressure and the related theoretical knowledge. The theoretical information of the thesis includes information about the circulatory system, blood pressure, manual measurement and its equipment, different patient groups, and antihypertensive drugs.(Gorman Lee, 2021) Blood pressure is considered normal when it reads 120/80mmHg (millimetres of mercury). Blood pressure should be satisfactory between 130 and 139 / 85-89 and elevated at **140/90** or greater. (kaypahoito.fi,2020) The bigger number is systolic, or upper pressure, which indicates the pressure inside the artery during heart contraction. The lower number is diastolic. It indicates pressure during the resting

phase of the heart. Hypertension is very common, especially in the middle-aged and older. In young and middle-aged people, where the walls of the artery are elastic, the first to rise is the negative pressure. In the elderly, where the walls of the arteries are stiffer, the lower pressure is often normal, but the upper pressure easily rises too high. In Finland, about a million people use antihypertensive drugs. In young people, high blood pressure is quite rare. With age, its prevalence increases, especially from the age of 40 upwards.(Mustajoki P, 2020)

The authors' preference for the above thesis topic "how to take manual blood pressure measurement", was motivated by the immense demand to produce an educational material which will be appropriate and beneficial to nursing students of Satakunta University of Applied Sciences (SAMK), which will be useful during clinical placements the author who is also inspired by the topic of the thesis. When it comes to patient safety, quality of care, the safety of the clients cannot be over stressed when it comes to the efficacy in terms of health care matters.

The purpose of this project-based thesis is to produce a clinical guidebook for the nursing student of SAMK providing clear instructions that is evidence based and as current as possible on how to take blood pressure measurement manually.

The objective of this project-based thesis is so to adopt a manner to taking blood pressure measurement with evidence-based approach and to make Nursing students of SAMK understand ways to taking manual blood pressure measurement step by step.

The partner of the project is SAMK. This project thesis is being made for SAMK in form of a self-educational material that will be produced in English language. The reason to why English language will be the language of produce, is because SAMK does not have, or rather have less than enough educational material in English language and requires an educational material in English language most especially for this kind of project topic "Taking Manual Blood Pressure Measurement".

2 THEORETICAL BASIS OF THE PROJECT

Blood pressure levels varies in different individuals. Especially in women, lower blood pressure readings can be found than normal. In healthy and asymptomatic adolescents and middle-aged people, systolic blood pressure may be 100 mmHg or lower, but there is no need to worry about this. Some may suffer from abnormally low blood pressure, i.e., hypotension, while others may suffer from hypertension. Factors such as bleeding, low body temperature, heart failure due to myocarditis disease, severe dehydration due to vomiting or diarrhea, reactions to medication or alcohol and shock affect blood pressure. (Duodecim, 2019)

Blood pressure can be measured either manually, automatically or intracorporeally. When measuring manually and automatically, we are talking about non-invasive or non-invasive measurement methods. By invasive measurement is meant a cannula inserted into an artery which is used to measure intra-arterial pressure. However, this bachelor thesis focuses only on non-intrusive blood pressure measurement methods and the main emphasis is on manual blood pressure measurement. (Ruuhilehto & Vikström, 2015)

2.1 Circulation system

Circulation can be divided into two parts which is systemic circulation and pulmonary circulation. Systemic circulation implies major circulation and pulmonary circulation means small blood circulation. The reason for systemic circulation is to transport blood to different organs of the body. Blood progress from the arteries onwards the capillaries on the surface of the alveoli and the oxidized blood moves forward through the pulmonary veins to the left atrium of the heart. Which comprise of arterial blood is called runic oxygen, in the pulmonary circulation pulmonary arteries, for example, low in oxygen, and pulmonary veins again in runic oxygen blood. In the pulmonary circulation, carbon dioxide is released from the blood and blood is oxidized. (Healthline Medical Network, 2020)

Figure 1 shows the systemic and pulmonary circulation of the circulatory system

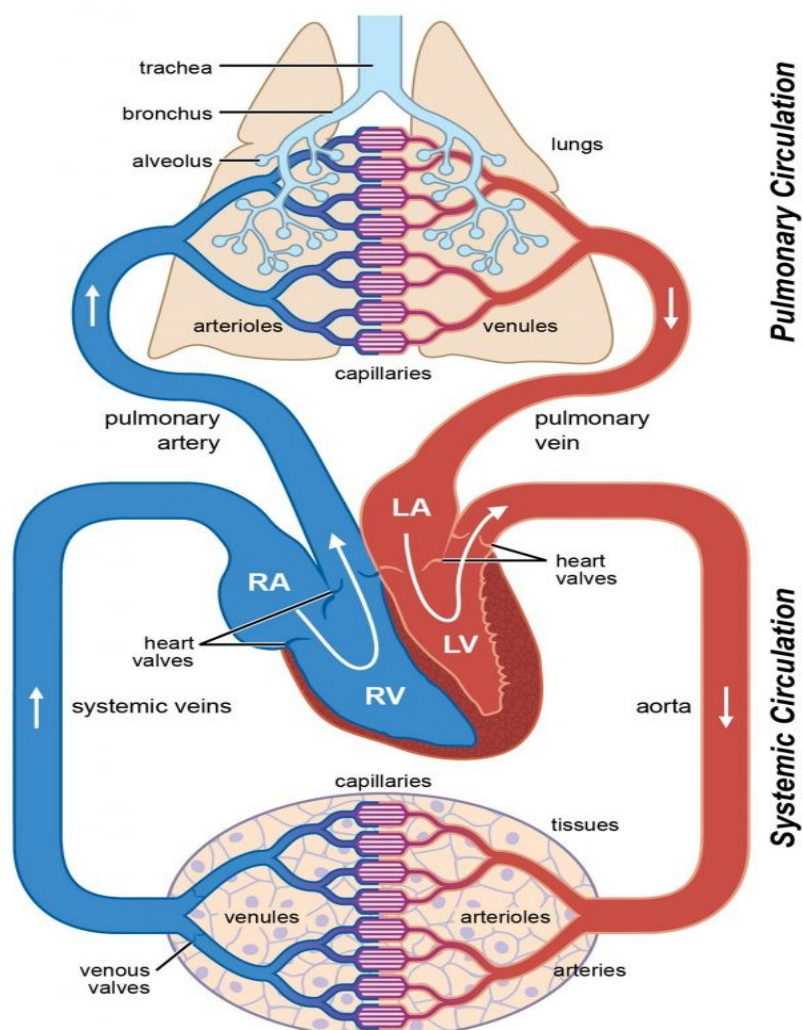


Figure 1. Circulatory system (Ohio State University, 2020)

2.2 Blood Pressure

Blood pressure pertains to the pressure which propels blood towards the blocks of the arteries. The fluid in the bloodstream of the marginal bloodstream influences the pressure in the artery. The body needs blood pressure since the pressure causes the blood to spread and allows the blood to carry nutrients to the tissues, waste products, carbon dioxide out of the tissues. (Ambardekar Nayana, 2020)

Blood pressure important indicators of circulatory efficacy. This tells how the blood vessels perform its function. The rhythm of the heart provides information about electrical activity and monitoring of heat for the state of peripheral blood circulation. Asking the patient as well provides information about the patient's feelings as well as the patients experiences. In an emergency, information about well-being is obtained from the patient's evaluations.(Wiley Online Library, 2018)

Blood pressure can be measured in millimetres. Can be measured in systolic and diastolic pressure. Blood pressure is the computation that compels the heart to pump blood through the body. Blood pressure is classified into high blood pressure and low blood pressure. Blood pressure is classified as systole, i.e., upper pressure and diastole, i.e., lower pressure. Systolic pressure refers to the working pressure of pumping the heart. Diastolic pressure, on the other hand, means pressure that occurs during the resting phase of the heart. Factors affecting systolic pressure, such as elasticity of the walls of the aorta and major arteries, workload in the left ventricle, and peripheral resistance of the blood supply. Factors affecting diastole pressure include blood circulation resistance and elasticity of arterial walls. (Wiley Online Library, 2018)

2.3 Blood pressure values

Blood pressure values are very individual in different individuals. Especially women can meet lower than normal blood pressure readings. In healthy and asymptomatic adolescents as well in middle-aged people, systolic blood pressure may be 100 mmHg or less, but this however, there is no need to worry. Others may suffer from abnormally low blood pressure, or hypotension, when others about high blood pressure, or hypertension. (Mustajoki P, 2020)

Blood pressure is elevated if the blood pressure measured is 140/90 mmHg or more. A person's blood pressure level must be measured on at least four different days with two consecutive measurements and averaged. Usually, it is already recommended to start antihypertensive treatment if the readings are at least 140/90 mmHg at the reception despite lifestyle changes. In home measurements, the limit values for blood pressure readings in the upper and lower values are 5 mmHg lower than in the results measured at reception. (Mustajoki P, 2020)

Table 1 below shows the blood pressure reference values according to the current treatment recommendations

Table 1. Blood pressure values (Kaypahoito.fi, 2020)

Blood Pressure Category	Systolic Pressure		Diastolic Pressure
Optimal	less than 120	and	less than 80
Normal	120 - 129	and/or	less than 80-84
Normal high	130 - 139	and/or	85 - 89
Slightly elevated	140 - 159	and/or	90 - 99
Significantly elevated	higher than 180	and/or	higher than 110
Hypertensive crisis	higher than 200	and/or	higher than 130
Isolated systolic hypertension	higher than 140	and	less than 90

2.4 Medication

Antihypertensive drugs mainly affect three factors. They remove salt and fluid from the body, reduce the function of the involuntary sympathetic nervous system and dilate blood vessels. The foregoing leads to a reduction in circulating blood volume, as well as a decrease in heart rate and heart rate, and decrease in peripheral circulatory resistance. As a result of these effects, blood pressure drops. The effectiveness of antihypertensive medication is monitored through home measurements, as well as visits to the doctor or nurse at intervals of 1 to 2, leading to an interpreted study and ensuring that the blood pressure level is reached to achieve the goal. The method is the same when the doses of drugs are changed. (Paakkari P, 2020)

2.4.1 Medication for high blood pressure

There are many types of antihypertensive drugs. The selection of medication is influenced by many things, such as the age of the patient and other illnesses. Medications for high blood pressure may be detrimental to other illness. Among other things, beta-blockers may be the worst case exacerbates asthma. Angiotensin converting enzyme inhibitors, angiotensin receptor blockers, beta-adrenergic receptor blockers, diuretics and calcium channel blockers are primarily used in the treatment of hypertension. Diuretics, or dehydration, are often used as first-line treatment in an elderly patient. Young patients use beta-blockers also coronary heart disease patients use beta-blockers. People with diabetes or heart failure use ACE inhibitors and angiotensin receptors. Angina pectoris patients use calcium channel blockers. (Mustajoki P, 2020)

2.4.2 Medication for low blood pressure

There is drug that affect hypotension but is not very effective. Therefore, if the patient is taking antihypertensive drug and the patient feels dizzy, the doctor may look for safer drug alternatives. A drug that acts like a salt hormone can be used in difficult situations to raise blood pressure. (Mustajoki P, 2021)

2.5 The effect of lifestyle on blood pressure

Several different factors cause hypertension and increase its development. These include, but are not limited to, smoking, overweight, lack of exercise, excessive salt use, alcohol, stress, pain, hereditary predisposition, chronic kidney disease, adrenaline, and medication. Age also affects blood pressure by raising it edible salt contains sodium chloride, the sodium of which raises blood pressure when used excessively. Obesity appears to increase the risk of developing hypertension. It shows that high blood pressure is three times more common among overweight people than among underweight people. Excessive intake of alcohol can relate to increase blood pressure which can lead to an acute outcome. Studies has shown that excessive intake of salt can increase the left ventricular mass from the arterial pressure autonomously. A very light intake of alcohol is said to reduce incident of coronary disease, low amount of mortality associated with cardiovascular disease and its causes. (Bruno, 2018)

2.6 Taking manual blood pressure measurement

The subject must be well rested before the measurement. The measurement result may come out not accurate if the person is not well rested or take breaks between measurements. It is recommended to avoid taking caffeinated beverages, strenuous physical exercise, smoke before measurement. Blood pressure readings can also be affected if the patient is not sitting in an upright position for example if the person to be measured is seated with their legs being crossed. (Cardiovascular Group, 2019)

2.6.1 Equipment

Manual sphygmomanometer is a pressure cuff or machine with an air-filled cuff with two tubes. A part of the tube is attached to the pressure hand control knob while the other part of the tube to the pressure gauge. Studies have shown that manual blood pressure measurements are more accurate than that of automatic blood pressure measurements in terms of systolic and diastolic blood pressures. (Rock Mark, 2018)

The cuff is the part of the blood pressure monitor that is placed around the upper arm. Inside is a rubber bag to which pressure is pumped. The right size of the rubber bag part of the cuff is an essential factor in the success of the measurement, because if the pressure bag is too short or too long, indicates an incorrect reading. In the selection of a cuff, it is good to remember that the rubber bag part in the cuff must be at least 80% of the length and at least 40% of the width of the upper arm circumference. The cuff selected either a small adult cuff, a medium adult cuff, or a large cuff. The small adult cuff is chosen if the circumference of the arm to be measured is 26– 32 cm. The width of the rubber bag part of the medium-sized adult cuff is used if the circumference of the upper arm is 33 – 41 cm. The large cuff is only used when the circumference of the upper arm exceeds 41 cm. (Kaypahoito.fi, 2020)

A stethoscope is a device used to measure blood pressure which is achieved by the auscultation method. A stethoscope listens to Korotkoff's sounds from the artery as the cuff is enclosed around the upper arm. Korotkoff sound is the sound heard through the stethoscope. When using the listening or auscultation method to measure blood pressure, it is essential to listen to Korotkoff's sounds, or pulses, correctly. Korotkoff's sound can be divided into five different sections. The first step involves sharpening the audibility of the pulse sounds and lowering their intensity. To the second stage it sounds like the sounds are getting softer and at the same time sizzling. They can even momentarily disappear at the end of the second stage. During the third stage of the blood vessel the sounds heard become sharper and more pronounced. When we reach the fifth phase, the sounds will soften and weaken quickly. In the fifth or final stage, the sounds are lost. (Liu Chengyu & et al, 2016) Measurement of blood pressure accessories include a hand sanitizer, stethoscope, a sphygmomanometer, pen and paper for recording the results, stopwatch and a tape. Figure 2 shows equipment used in measuring blood pressure measurement.



Figure 2. Instrument for measuring manual blood pressure. (Adeboye, 2021)

2.7 Things to consider when measuring

In children, high blood pressure is usually due to secondary causes, i.e., the underlying cause is often a disease that raises blood pressure. Primary hypertension is rare in children, but it begins to develop, however, in early childhood from age 6. High blood pressure in relation to age predicts later a sharper rise in blood pressure so it is important to reliably measure the child's blood pressure values due to the need for further treatment. (Mayo Clinic, 2021) In children, blood pressure when measuring, keep in mind that the child should calm down before being measured at least without jumping and running. It may also be important for the child to become familiar with the measurement equipment as needed to avoid fear, crying or restlessness which falsify the measurement result. (Weber O. Craig, 2019)

people living with diabetes, the blood pressure may be lower than normal, so it is good to consider this when measuring (Nursing Times, 2020). As with the elderly, those with diabetes dizziness and light headedness can happen when standing up. A person who has had diabetes for a long while can develop in addition to low blood pressure, also increased heart rate, the disease can affect the autonomic nervous system, which regulates heart rate and blood pressure. Particular attention should be paid to blood pressure values in people with diabetes, as they have a lower risk limit for the values compared to others. Their blood pressure should start to be treated regardless of age when the values are in the order of 130/80mmHg. (Nursing Times, 2020)

There is every possibility that women may develop hypertension during pregnancy (Preeclampsia Foundation, 2019). High blood pressure is one of the most common health issues that arises during pregnancy. The importance of right cuff size when measuring blood pressure for women with pregnancy cannot be over emphasized Without a suitable size, the result of the measurement does not show a reliable result, and this can be dangerous for the mother as well as the foetus blood pressure should be monitored regularly for the safety of mother and foetus. (Preeclampsia Foundation, 2019)

2.7.1 Taking blood pressure measurement step by step

The measurement situation starts with guiding the person to be measured. The patient must be told that he should avoid heavy exercise, smoking, caffeinated beverages, and heavy meals for 30 minutes prior to the measurement. Before measuring, it is good to ask if these things done before the measurement. The person to be measured is instructed to remove the clothing that is squeezing the upper arm. For example, the top shirt. This avoids getting an error result. An incorrectly sized cuff gives the wrong blood pressure value. (Mayo Clinic, 2021)

The person being measured is instructed to sit relaxed lying down on a bed or in a chair and with his or her back supported. Cuff placed on the upper arm before measurement The upper arm must be at the level of the heart during the measurement. The subject is instructed to breathe normally, not to speak during the measurement and to think nice things. The feet of the subject must not be crossed or overlapped to avoid blood pressure-raising effect. (Nursing Times, 2020) Figure 3, 4, 5 and figure 6 below shows the procedures to taking manual blood pressure measurement. The step-by-step to take manual blood pressure is as follow:

The first and important thing to note as a nurse when dealing with patients is the importance of hygiene. As we know that hygiene is the basis of aseptic way of working. Disinfecting the hands properly before and after contact with patient is a must. Good hand hygiene before and after procedures prevents the transmission of microbes from one person to another or from one part of the body to another. When taking blood pressure measurement, washing of hand is not necessary but if you feel you have dirt in your hands then, you can go ahead to wash your hands but disinfecting of the hand with a disinfectant is necessary.

The measurement situation starts with guiding the person to be measured. The patient must be told that he should avoid heavy exercise, smoking, caffeinated beverages, and heavy meals for 30 minutes prior to the measurement. Before measuring, it is good to ask if these things have been done before the measurement this is done to avoid errors in measurements. (Mustajoki P, 2020) All the equipment needed should be placed on the table for easy access.

For the most accurate result possible, the patient is asked to sit still for 5 minutes after attaching the cuff. Make sure to use the right cuff size. The lower edge of the cuff about 2 – 3cm below the elbow. Have in mind not to place the meter directly facing the patient. It is not advisable for patients to see what the meter reads during measurement because this could lead to tension which will affect the result of the measurement. Search for an arterial heart rate by palpating the elbow flexion to find the correct listening point. (www.terveysportti.fi, 2021) Feel the heartbeat on the wrist. Start pumping when you do not feel the heart rate anymore, 30 mmHg more pressure. Now place the funnel part of the stethoscope tightly but lightly over the shoulder artery in the elbow flexion. Start lowering/reducing the pressure very slowly and at the same time follow the meter, listening carefully with stethoscope. Reduce the pressure slowly, approximately about 2-3mmHg/heartbeat. The systolic pressure, this is when you hear the Korotkoff sound (which is the top number also the first sound you hear) is recorded at the point where the heart rate begins to fall. Diastolic pressure, when you do not hear the Korotkoff sound anymore (it is the bottom number where you no longer hear the sound) is recorded when the sounds disappear

Sometimes it can happen that the pulse sounds do not disappear at all. Mark the diastolic value of the meter reading at the point where you notice that the Korotkoff sounds soften and weaken. For example, if the point at which the sound begins at 160 which is the systolic and the sound of the diastolic soften or weaken at 80, then record the result as 160/80mmHg. Record the result of the blood pressure on the blood pressure card or in the client's documents also inform the patient about the results and remember to take pulse. Disinfect hands and clean instrument. (www.terveysportti.fi, 2021)



Figure 3. (Adeboye, 2021)



figure 4. (Adeboye, 2021)

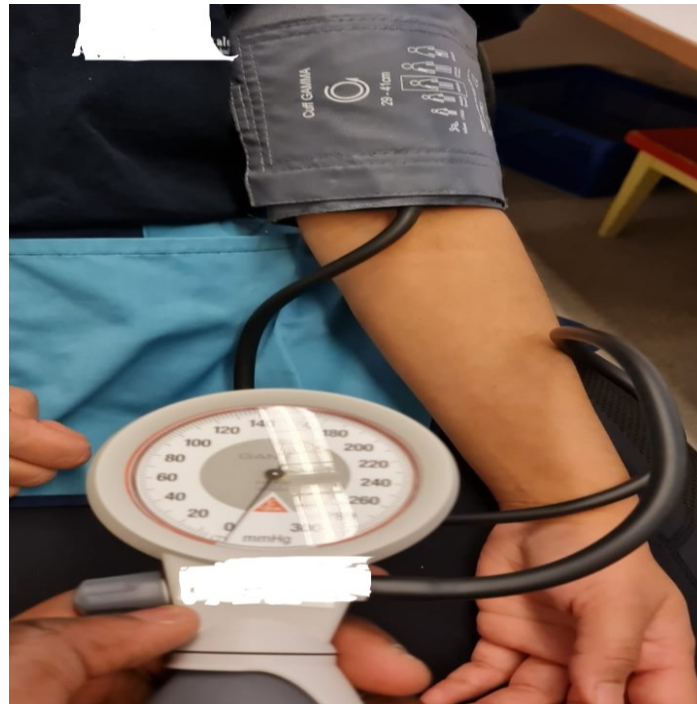


Figure 5. (Adeboye, 2021)



Figure 6. (Adeboye, 2021)

2.7.2 Causes of failed blood pressure measurement

When measuring blood pressure, there is a lot to remember so that the measurement technique is very extensive, because the results will guide the measurable treatment choices. Error sourced during blood pressure should be removed for the desired result to be realistic. Sources of error can be divided into several different categories, the reasons for the failure of blood pressure measurement results, physical or health related, the environment, patient related, measuring equipment. Reasons for the inaccuracy of measurement results for amateurs due to the measuring meter are available small or big. When attaching the cuff, you need to attach it well so that the cuff can be in place because failure to do so will affect the result of such blood pressure measurement. In addition, having in mind the tension of the cuff also, which maybe too tight or too loose can also affect measurement results. (Mustajoki P, 2020)

The subject must be well rested before the measurement. The measurement result may come out not accurate if the person is not well rested or take breaks between measurements. It is recommended to avoid taking caffeinated beverages, strenuous physical exercise, smoke before measurement. Blood pressure readings can also be affected if the patient is not sitting in an upright position for example if the person to be measured is seated with their legs being crossed. (Cardiovascular Group, 2019)

Stress or anxiety also can lead to abnormal blood pressure readings when one is stressed or anxious during the blood pressure measurement, it provoke the cortisol level to spike up which could cause the blood pressure reading to rise above normal and it will affect the results. The thoughts of being measured by the doctor or nurse could get some patients anxious and will affect the results for example blood pressure values measured by a nurse or doctor are at least 140/90 mmHg, even if the blood pressure values measured by the person being measured at home are less than 135/85mmHg. (Cardiovascular Group, 2019)

3 PURPOSE AND OBJECTIVES OF THE PROJECT

The purpose of this project-based thesis is to produce a clinical guidebook for the nursing student of SAMK providing clear instructions that is evidence based and as current as possible on how to take blood pressure measurement manually. It will include pictures of equipment that is being used in the hospital environment to measure an accurate blood pressure. It will also include text which will illustrate how this equipment works in terms of safety and the text will be evidence based. This project-based thesis focus on the blood pressure measurements of adults.

The objective of this project-based thesis is so to adopt a modern manner to taking blood pressure measurement with evidence-based approach and to make Nursing students of SAMK understand ways to taking manual blood pressure step by step. The thesis deals with the human flow of blood in the body, understanding the safety of taking manual blood pressure, the devices used in taking manual blood pressure and how to take manual blood pressure step by step. The objective is to improve the practical skills about the use of sphygmomanometer also, the guidebook will better help the nursing students on how take manual blood pressure with the step-by-step approach.

4 PLAN AND IMPLEMENTATION OF THE PROJECT

When starting to plan a project-based thesis, it is important to first get acquainted with its theoretical basis by understanding what the definition of a project is. A project is defined as consisting of a crowd of people and other resources that have been temporarily assembled to perform a specific task. The project includes key objectives to achieve the desired result. To achieve the goals, the project requires teamwork. After achieving the goals of the project ends, i.e., it has a life cycle. The life cycle first

includes a vision or idea from which everything starts. This is followed by a start-up phase, the need for which may arise in the vision or in addition to the idea of, for example, the need for change or environmental pressure. Next up is the construction phase, the completion phase and finally the result. The start-up, construction and completion phases all involve project management at the same time. (Project Manager, 2021)

The start-up phase includes a preliminary study, project setup, and project planning. The construction phase includes definition, design, implementation, testing, and commissioning. The closure phase includes final approval, maintenance agreement, dissolution of the project organization and termination of the project. The project also includes essentially the schedule, budget and risk and uncertainties and its success; and management requires a workable project plan. In addition, the detailed preparation of the plan is mainly part of the post-start-up construction phase. (Project Manager, 2021)

The resources that appeared in the planning phase of the thesis are a simulation class, camera for taking pictures, hand sanitizer, measuring equipment or mercury blood pressure monitor, aneroid meter, cuff of the right size, stethoscope, and recording instruments. The plan considers that one of the factors will be travel expenses, when the work is mostly done at school, as well as pictures also taken at school. The human resources of the project plan were two for the project implementer and editing editor. In addition, the authors' own knowledge of blood pressure measurement technology is considered as a competence resource.

The implementation of the work started from the fact that the author started to think about everything that belongs to project management and project risk management. After that, started researching what the different risks were in the project. With this, the author chose some of the risks for the thesis. Next, the author started looking for what kind of tools are available to manage the different risks in the project. There were a wide variety of tools from which was chosen to fit the risks selected in the work. After choosing the risks and the tools to manage them, the author started working on

the work. The project was implemented by making a theoretical basis and an educational guidebook on manual blood pressure measurement for SAMK nursing students. The final product of the thesis is the educational guidebook. The guidebook includes pictures of the most common manual methods of measuring blood pressure, general instructions for measuring blood pressure manually.

The planning of the thesis began in its entirety in September 2020, the topic manual blood pressure measurement was chosen which is being made as a teaching material for SAMK nursing students. The form of the thesis became project-based thesis. When the thesis plan was completed, it was presented at a design seminar in December 2020. The final thesis plan was completed in March 2021, the final plan was sent for evaluation to the supervising teacher of this thesis, and the plan was accepted in March 2021. This guidebook includes pictures of the various equipment use when taking blood pressure measurement manually. It contains the instructional text on how well to take the blood pressure measurement using the manual method.

4.1 Project methodology

This project is done using Waterfall model. A waterfall model involves the designing, implementation process, progresses, step-by-step throughout the end of the project's initial life cycle. At the end of every step, preparation for the next step will be considered and reviewed before moving on to the next step. In the Waterfall model, only one-step will be reserved for testing, and this will only be carried out at the end of the project. (Westland Jason, 2016)

The method of the thesis is to plan, implement and evaluate an educational guidebook on the use of manual blood pressure measurement which will be available for use to the nursing students and teachers at the Satakunta University of Applied Sciences.

4.2 Stages of the project, schedule, resources, and risks

The thesis was planned to involve the theoretical section and the instructional guidebook for manual blood pressure measurement. The theoretical part includes evidence base information from other researchers on the subject. The guidebook will be produced as an educational material to nursing students of Satakunta University of applied sciences. The guidebook will include pictures, which was planned to be shoot by the author. The author also planned to work on the thesis each day for about (4 hours) as well as contacting the supervising teacher when necessary. The goal was to complete the thesis by May 2021 but due to circumstances, the thesis should be ready before the end of the first quarter of 2022. The guidebook will be available as an electronic material which will be less expensive as there will be not needed to print a hard copy, this also will save time. The target group of the project is the nursing students of Satakunta University of Applied Sciences. Satakunta University of Applied Sciences which happens to be the co-operation company to this project-base thesis, has about 6,111 students, of which about 640 is studying to be a nurse or nurse. SAMK has 416 employees. SAMK is an internationally oriented university of applied sciences and the school's vision is that every student will be employed. (Satakunnan ammattikorkeakoulu, 2021)

The main risk of this thesis was presumed that the shooting of the photos might fail due to poor capturing. In this situation, enough time to take the photos as many times as possible until good pictures for the guidebook were taken was allocated. In addition, the shooting location might not be available when the author is ready to shoot the photos. In such a case, another shooting room will be booked or have alternatives shooting location, and the equipment for taking blood pressure manually.

Manual blood pressure measurement has been extensively studied by other researchers. Theoretical information was retrieved electronically from various databases, such as PubMed, Cinahl, Medical Finna. Sources with publication year between 2016–2021 were used. Information was also sought from textbooks, journals, studies, the Current Care Recommendation, and various scientific publications. Thesis

from polytechnics were used also as sources. Sources such as paid sources were excluded as well as sources other than English or Finnish were excluded.

4.3 Clinical guidebook as an educational material

4.3.1 Nursing education

In Finland, nursing education is classified under the university of applied sciences. They deal with multidisciplinary education which aims at working life kind of education. A Bachelor's degree is in health care after a completion of the nursing education course which last for a duration of 3.5 years (Ammattikorkeakouluopintojen Rakenne, 2020) For example, at Satakunta University of Applied Sciences, the nursing the program and its curriculum requires students to get 210 credits so as to get qualified as registered nurses in Finland. This nursing course comprises of set of courses like basic studies 27 credits, elective studies 10 credits and professional studies 83 credits, Internships 75 credits and thesis 15 credits. These courses help the nursing students to advance and improve in different areas like health promotion, ethical care, theoretical and clinical competence, research, and development in nursing. (Satakunta University of Applied Sciences, 2020)

4.3.2 Clinical guidebook

Part of the product of the thesis is a guidebook. A guidebook is an effectual way to convey information. Guidebook can adequately present important information. Guidebook when used resourcefully, can be a means of expression when it thus includes pictures. Guidebook is an infinite way of motivation and gives a memorable experience. A clinical guidebook is an action or practice expected to give written instructions, which stands as a pattern for the users to develop their knowledge and guidance as regards undertaking tasks. (Staff Writer, 2016)

As a guidebook includes visuals, for making a guidebook there are many aspects to consider when shooting. The important thing is that the camera is straight and stable, the image should be sharp and clear, there should be enough light, and the colours should be natural. Selecting the image size is important when planning shots. Importantly, the closer the cropping must be. The day before, all the tools needed for the shoot were collected and kept ready for the shoot.(Staff Writer, 2016)

After the shooting of the photos are made, then comes editing. Editing means collating, preparing, arranging the materials for publication. When editing, all materials are selected for the final output and the selected ones are compiled into a finished output. Editing happens when the first step which is taking the photos is done. Editing enables a smooth flow of images. Editing can combine different places and times and editing is an important step of the guidebook.(MasterClass, 2021)

When This step is completed, the guidebook is ready. After editing, the finished guidebook will be uploaded to the Satakunta University of Applied Sciences system for download or use.

5 EVALUATION OF THE THESIS

The project schedule did not materialize as intended. There were long breaks in between writing as the writing process progressed. The longest break in the theoretical part of the project was summer due to circumstances, but in the fall writing continued again. The supervising teacher evaluated the thesis plan, then the author proceeded in writing of the thesis. The thesis consists of the theoretical knowledge and the guidebook. After the guidebook was ready, it was sent to the supervising teacher of the thesis who evaluated both the theoretical part and the guidebook then gave her feedback, gave corrections where necessary and gave guides on how to make the necessary corrections needed. After all corrections was made to both the theoretical part of the thesis and the guidebook, the author got encouraging feedback from the supervising teacher stating how the content of the guidebook is clear and consistent, also gave suggestions on how to have included more exciting and existing pictures in the guidebook.

6 DISCUSSION

At each stage of writing this thesis, the learning skills of the author increased greatly both in understanding and in competence. At the beginning of the thesis, the author imagined the topic to be an easy one i mean who cannot take blood pressure measurements either manually or automatically. But the author discovered that the topic was not as easy as imagined. There were lot to learn about blood pressure measurement, the demands of producing a guidebook. However, the author decided to put in all efforts possible so that the information the students will get from the guidebook will help them at taking manual blood pressure measurement. Overall, the supervising teacher gave encouraging feedback on the guidebook.

6.1 Ethical point of view of the project

Research ethics involve broad range of moral practices and principles that govern researchers when conducting research, so that the research will not be detrimental to the participants. These principles are very essential in every aspect of research. Research ethics comprises of principles and integrity to which researchers use to carrying out research to prevent harm to the research subjects. Research ethics are very important in every step of a research work. There are issues that must be considered appropriately during a research ethics which includes confidentiality, no form of plagiarism, privacy, liability.(TENK, 2019)

Ethical principles in a research work deals with esteem value for the autonomy of the research subject. In other words, as a researcher, I must keep in mind to respect the research subject matter. In the basics of ethical principles in research, it deals with the fact that no harm no matter how small must be done to my research dependent. In my project-based thesis, I must make sure there is autonomy when dealing with the research subjects, and there must be confidentiality.(Claus Tonsberg, 2020)

The sources used in this project were scientific and reliable. Information was gotten from good and comprehensive theoretical basis and the sources were not more than 5 years old. There is no plagiarism in the thesis sources. The source entries were made to follow the instructions as much as possible exactly according to the institution's source labelling guidelines. Standards of scientific practices and knowledge was adhered to during the planning, implementing and evaluation of the project. There was Respect for anonymity, confidentially.(TENK, 2019)

Finally, permission was obtained from the institution where pictures were taken. Since an actual human being was used during the shooting of the photos, we made sure no face was shown as to hide the identity of the subject. (TENK, 2019)

In the future, the author suggests using of the guidebook to review the skills of measuring blood pressure manually for nursing professionals, for example in hospitals,

during clinical placements, during simulation because it is easy to return to it at any time. as it should be used to recall manual measurement of blood pressure.

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APPENDIX 1

LITERATURE REVIEW

Maker of research publication year, country	The purpose of the research	Target groups of participants , collection method/An alysed method/Pro ject method	Results
Michael Roerecke, Janusz Kaczorowski, Martin G. Myers 2019 Comparing automated office blood pressure readings with other methods of blood pressure measurement for identifying patients	To perform a systematic review and meta-analysis to examine the association between AOBP and office BP readings measured in routine clinical practice and in research studies, and ambulatory BP recorded during awake hours, as the latter is a standard for predicting		

with possible hypertension	future cardiovascular events.		
Riku Tervonen, Eeva-Maria Viik. 2016 Manuaalisen verenpaineen mittaaminen tarkistuslista sairaanhoitajaopiskelijoille. Suomi	Tämän opinnäytetyön tavoitteena oli tehdä tarkistuslista manuaalisesta verenpaineen mittaamisesta sairaanhoitajaopiskelijoille	Nursing students of Häme University of Applied Sciences	The target groups benefited greatly from the project because it was of good use not only during studies but also as professional nurses in working life
Salminen, S. & Kandolin, A. 2019 Opetusvideo Verenpaineen Manuaalisesta Mittaustavasta	The purpose of the thesis was to produce a video about manual blood pressure measurement for the	Nursing students of Satakunta University of Applied Sciences	The target groups benefited from the instructional video because it was easy to follow and implement.

Hoitotyön Opiskelijoille. Suomi	purpose of nursing student in SAMK		
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