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# Self-Management of Blood Pressure Control at Home in Chronic Kidney Disease: Nursing Interventions and Health Gains

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## Abstract

One of the advantages of HBPM (Home Blood Pressure Measurement) compared to office measurement is being a strong predictor of cardiovascular morbidity and mortality in hypertensive patients, including those with chronic kidney disease (CKD). However, studies with renal patients not dependent on dialysis are scarce. HBPM is an important tool in the regular monitoring of blood pressure (BP) and in patient's involvement in its long-term self-management. Nurses have an important role here and their involvement in the process is essential. Nurses must be aware of the latest recommendations as well as they should teach, train, guide and supervise patients. This chapter summarizes information about CKD and hypertension, the importance of measuring blood pressure at home in CKD and describes nursing interventions in this field. Nurses have a role in enabling patients to optimize their self-management skills. Nurse-delivered interventions have been shown to contribute to improved patient outcomes. Nurses can educate patients about proper blood pressure monitoring techniques at home, and also interpreting and evaluating the results and managing the therapeutic regimen. Evidence shows the effects of interventions performed by nurses in improving and controlling BP, such as teaching, training, counseling, motivational interview, coaching, nurse-patient relationship, communication, negotiation, and support.

**Keywords:** home blood pressure, self-management, nurse interventions, chronic kidney disease, health gains

## 1. Introduction

It is worldwide recognized the impact of kidney disease in economy and society. In developed countries, the costs associated with dialysis treatment and transplantation consume 2 to 3% of the health budget. On the other hand, in middle and low-income countries the accessibility to kidney function replacement treatments is low [1].

Chronic kidney disease (CKD) is considered a public health problem and has a significant weight in the context of chronic diseases. This disease affects around 850 million people worldwide, with one in ten adults having chronic kidney disease [2].

All stages of the disease - 1 to 5 -, are associated with increased risk of cardiovascular morbidity, premature mortality and quality of life decrease [3].

Considering the weight of hypertension, cardiovascular disease and diabetes mellitus in the increase of CKD, it is crucial to be concerned with its management.

2. Chronic kidney disease and hypertension

There is a complex association between CKD and hypertension due to a cause-effect relationship, in which both hypertension and CKD have a risk factor sharing relationship, being that one may be the cause or consequence of the other. Every year the number of people diagnosed with CKD due to hypertension increases by 10%.

The literature states that 5% of CKD are due to hypertension. It is highlighted that hypertension is more common in glomerular diseases, but the incidence of this clinical condition differs according to the histological characteristics of the disease. Membranoproliferative glomerulonephritis and segmental and focal glomerulosclerosis forms have a higher incidence of hypertension than membranous forms and IgA glomerulopathy. **Table 1** shows the prevalence of hypertension in different chronic renal diseases [4].

The evidence supports that the prevalence of hypertension increases as kidney function deteriorates in CRD, with a progressive decrease in the glomerular filtration rate [5].

Several studies have shown that hypertension is an independent risk factor for end-stage renal disease (ESRD), contributing to the disease itself and its progression [6, 7].

Cardiovascular disease is the leading cause of death in CKD, which in turn, increases the risk of long-term cardiovascular events [8].

When compared to the general population, the prevalence of hypertension is higher in people with CKD, constituting the factor with the greatest impact on the progression and outcome of kidney disease [9].

It is not yet known the exact mechanism that causes hypertension in CKD, nor has been isolated any factor responsible for its establishment. It is theorized that there are several mechanisms that, acting together, contribute to increased blood pressure, such as the progressive loss of sodium excretion with the consequent volume overload, the excessive activity of the renin-angiotensin system, the disproportionate increase in sympathetic activity, secondary hyperparathyroidism, the reduction of nitric oxide synthesis and the high endothelin levels, among others [10, 11].

Chronic kidney disease	% of hypertension patients
Glomerular diseases	
Segmental and focal glomerulosclerosis	75–80
Membranoproliferative glomerulonephritis	65–70
Diabetic nephropathy	65–70
Membranous nephropathy	40–50
Mesangial proliferative glomerulonephritis	35–40
IgA nephropathy	30
Minimal change disease	20–30
Polycystic kidney disease	60
Chronic interstitial nephritis	35

**Table 1.**  
*Hypertension prevalence in CKD patients.*

Observational studies report an increased risk of development and rapid progression of CKD in cases of uncontrolled blood pressure [12].

Failure to treat hypertension is associated with harmful effects such as left ventricular hypertrophy, dilated cardiomyopathy and accelerated deterioration of renal function, among other causes [10].

According to Kidney Disease Improving Global Outcomes (KDIGO), international organizations (such as National Kidney Foundation Kidney Disease Outcomes Quality Initiative - NKF KDODQI; Eighth Joint National Committee published - JNC 8) committed to the prevention and treatment of hypertension recommend non-pharmacological measures along with pharmacological measures in the prevention and treatment of this disease [13, 14].

According to these organizations, health professionals are responsible for early detection of the disease and monitoring of risk factors.

The disease can progress slowly due to the gradual loss of the nephrons, and in its initial stages it goes unnoticed, only being identified when symptoms appear.

The purpose of screening and monitoring the disease in the early stages is to delay its progression to ESRD, a condition that leads to the need for renal replacement therapy.

Only a minority of patients with hypertension have blood pressure within the accepted target values (systolic blood pressure less than 140 mmHg, diastolic blood pressure less than 90 mmHg). The main causes for the lack of blood pressure control are related to low knowledge of the problem and lack of screening for hypertension in the population [15].

In the context of non-pharmacological measures, European Society of Cardiology makes clear the urgent need to promote preventive actions, mentioning that blood pressure measurement is a simple, non-invasive and low-cost technique, especially if considering the costs of treating hypertension and associated complications.

Regarding hypertension and kidney disease, there is no consensus among the authors about what the reference values should be. This is an issue that remains in debate despite recent recommendations and the publication of the clinical trials SPRINT, ACCORD, among others [16, 17].

The European Society of Hypertension and the European Society of Cardiology (ESH/ESC) recommend target blood pressure values below 140/90 mmHg for blood pressure measurements in a clinical setting. However, in the presence of proteinuria, these values drop to 130/80 mmHg as a reference. Similar recommendations are indicated by the JNC-8, suggesting target blood pressure values below 140/90 mmHg for the general population, disregarding the recommendations of SPRINT study, which suggests blood pressure values below 130/80 mmHg for patients at increased risk of cardiovascular events, including patients with CKD [18].

Target blood pressure values have changed over time. The literature shows that the target blood pressure value acceptable for patients with CKD is 130/80 mmHg [19]. The latest guidelines of the European Society of Hypertension and the European Society of Cardiology published in 2018 recommend a target SBP (Systolic Blood Pressure) value of 130–139 mmHg and DBP (Diastolic Blood Pressure) of 70–79 mmHg for patients with CKD. But there is not a unanimous view among scientific community on this issue [20, 21].

Vital for the success of the blood pressure prevention and control programs is the participation of the patient/family.

Health care, as integrating element of praxis, which takes place during the course of the chronic disease, calls for the participation of all stakeholders in

the care process and for the investment in patients' education, enabling them to understand their health needs and become co-responsible for their health and well-being [22].

Everybody should to be part of an active citizenship stance based on education and training. Care must focus on the needs of the patient, it is important to know their level of mastery in response to the needs considered significant at any stage of the disease pathway [23].

### **3. Home blood pressure measurement**

Blood pressure self-monitoring has been proposed as a strategy to improve hypertension control. Although the results of previous clinical trials on blood pressure measurement in the adjustment of hypertensive therapy and in the control of hypertension are inconsistent, the results of TASMINH4 demonstrated that 90% of eligible participants revealed that they wanted to take an active role in self-monitoring of blood pressure [24].

However, the importance of new studies in this area is highlighted, mainly studies involving risk groups, including patients with CKD in the advanced stage of the disease [25].

Hypertension is common in CKD patients, with a prevalence of around 60% to 90%, depending on the stage and cause of the disease, and is responsible for high cardiovascular morbidity and mortality. In this context, blood pressure control is a key measure [10].

HBPM is easier than ambulatory blood pressure measurement and, therefore, can be an important tool for blood pressure control in combination with other measures.

In this regard, Sanghavi, & Vassalotti emphasize that measuring blood pressure at home is a mean of reducing the burden of medication in individuals with "white coat hypertension", that is defined as the increase in blood pressure in the clinical context and maintenance of normal values at home. And, therefore, a means of improving the therapeutic compliance of hypertensive patients [26].

The authors also add that HBPM offers the patient a means to monitor the effectiveness of the medication and acts as a positive reinforcement, as shown by a study carried out in Spain. Of the 250 participants, 92% of the individuals in the experimental group (home blood pressure measurement) adhered to the antihypertensive regime, against 74% in the control group.

They concluded that HBPM is simple and not expensive. Besides, it offers more information to the practitioner, allowing more informed clinical decisions. It also promotes the involvement of the patient and the commitment of the health team, including nurses.

The evidence that shows the benefits of HBPM compared to measuring blood pressure in the clinical setting. Namely in improving blood pressure control, in reducing "white coat hypertension" events and in cardiovascular risk prediction [27–29].

The diagnosis of "white coat hypertension" is important because one of the consequences of this situation is overtreatment [30].

CKD patients with "white coat hypertension" have a lower cumulative risk of progressing to ESRD, so home blood pressure monitoring is essential. On the other side, renal patients have a high prevalence of masked hypertension, defined as normal blood pressure values in the clinical setting and high blood pressure values at home or ambulatory. This situation puts them at risk of organ damage, cardiovascular events and tends to evolve to ESRD [31].



HBPM allows a complementary assessment of daytime blood pressure variation, commonly seen in chronic kidney patients [32, 33].

Self-measurement of blood pressure at home is therefore an alternative for measuring blood pressure. Besides providing a more accurate assessment of blood pressure, it offers the possibility of having regular measurements in conditions closer to the patients' daily lives [34].

It is recognized by the scientific community that the measurement of blood pressure in the clinical context does not accurately reflect the blood pressure of each individual (due to changes in circadian rhythm and in the environment). It is thus necessary to create alternative methods whose main goal is to enable a closer assessment of the patient's values, because it takes place in a natural context, in the patient's natural environment [35].

Therefore, the self-monitoring of blood pressure at home becomes a tool to be incorporated into the self-care of CKD patients, through which the person has control over the process. This action makes the patient co-responsible for their health. This is a simple and important measure in preventing progression to ESRD, but it is nevertheless a complement to blood pressure measurement in the clinical context [36].

The negative individual, social, and economic consequences of not controlling blood pressure are evident. But these effects can be positive when enhanced by the self-management of hypertension.

The main negative effects resulting from the lack of blood pressure control in CKD patients call for the development of self-care interventions that result in behavior modification and optimization of hypertension control.

This issue is evident in the study by Humpherys et al., which, through a multifaceted intervention approach, optimized blood pressure values in proteinuric CKD patients and unproteinuric CKD patients. For that, the authors run 4 projects, which occurred in different practices, established chronologically in different periods of time. The percentage of patients with self-care behaviors for blood pressure management within the recommended target values increased from 34% to 74% in project 1, from 60% to 83% in project 2, from 68% to 71% in project 3 and 63% to 76% in project 4. Both groups (proteinuric and unproteinuric CKD patients) were able to reach the recommended target blood pressure values. The group of unproteinuric patients achieved blood pressure values below 140/90 mmHg and the group of proteinuric patients reached values of blood pressure below 130/80 mmHg. In this context, the authors concluded that this type of intervention proves to be an asset in reducing long-term complications resulting from suboptimization of blood pressure control [22].

The analysis of the systematic literature review carried out by Gallagher, et al. shows us the positive effects of educational interventions in reducing high blood pressure. The benefits of health education interventions in lowering blood pressure in chronic kidney patients were confirmed. As well as their potential in reducing cardiovascular events and delaying the progression of the disease [37].

Given that nurses have a pivotal role in promoting self-care behaviors in all aspects of care, including (1) problem identification, (2) diagnosis, (3) intervention, (4) evaluation and (5) follow-up, it is essential to highlight the interventions developed in the context of high blood pressure control in chronic kidney patients.

According to the literature, the possible causes of blood pressure control in this target group are associated with a reduction in self-care behaviors in relation to the consumption of salt, the practice of physical exercise and the adherence to medication. The overlook of these behaviors leads to hypertension. In this context, non-pharmacological interventions are relevant, along with pharmacological measures [38].

#### **4. The role of nursing education in promoting patient's kidney self-care capacities**

Health education, as a field for knowledge production, assumes a privileged relationship with active citizenship, providing patient/family with the possibility of making informed decisions and acting in collaboration with the health team.

Assuming the empowerment speech as a key element of the care action, which is shaped at the border between the biomedical model and the model of care centred on the patient, Orem's theory of self-care fits in this context. Especially when it is intended to establish partnerships and promote self-care behaviors in the prevention and control of hypertension in patients with CKD through an educational intervention.

According to Orem, the individual is an active subject, but in a situation of illness, his capacity for self-care can be reduced due to his inefficiency in relation to the condition that affects him [39].

In 2013, the World Health Organization (WHO) defined self-care as the ability of individuals, families and the community to promote health, prevent disease and stay healthy. The partnership with healthcare professionals to deal with the disease and disabilities arises when individuals are unable to meet some or all of the needs for self-care, due to a lack of knowledge, disability or perception of their diminished health status.

Nurses act as a resource for the patient, developing helping methods in order to overcome or compensate health-related limitations, leading the patient to undertake actions to regulate their own functioning and development. The intervention is carried out according to a diagnostic and intervention process. It starts with needs assessment, identification of motivation to learn and, in partnership with the patient and/or family, establishment of the goals to be achieved. In this process the nurse can direct, guide, provide support and teach [39].

CKD patients need to undertake a range of complex activities, such as monitoring blood pressure, blood glucose, introducing changes in diet, adhering to therapy, avoiding nephrotoxic substances and practicing physical exercise [40].

It is internationally recognized that disease self-management is now an essential aspect of the health system. The implementation of a disease self-management plan based on negotiated complementary actions, allows the process participants to rediscover the conditions (knowledge and skills) to satisfy their needs. With the aging of population, families assume an increasing importance in the daily management of the disease. Therefore, families and patients are the clients of health professionals and the expression of their interests must be taken into account [41].

There are many difficulties for active participation of individuals in the management of their disease due to lack of knowledge and skills to deal with the disease. Therefore, between unawareness and fears, people's behavior can take two directions: control or ignore the problem. In either cases, nurses have a predominant support role in making people aware of their potential, leading them to develop and put that potential at the service of the disease.

Health education is a strategy to be followed, as it constitutes a teaching, instruction and training tool in order to guide the patient and their families to face a new situation in the management and prevention of the disease.

It is true that CKD patients have the same characteristics as the general population in terms of self-care behaviors in controlling blood pressure, following a healthy diet and regular physical exercise. However, it is no less true that CKD disease, due to its complexity and need for intervention in all of the stages, requires specific intervention and monitoring actions along the path of the disease.

As CKD is an asymptomatic disease, especially in the early stages, it means that patients with CKD, because they are unaware of their situation, do not seek information. It is also a fact that the low perception of susceptibility is associated with low levels of literacy and, consequently, with a reduced perception of the risk of developing the disease [40].

This discouraging picture highlights important gaps regarding the patient's monitoring plan. In this context, innovative and complementary practices are needed to implement an individualized monitoring program based on the patient's real problems, both in hospitals and in primary health care. As a reference, we identify health education projects developed in specialized hospital consultations, or even in the wards, based on information, instruction and training techniques aimed at this population.

The question that arises is: what directions can be pursued to achieve these goals?

Firstly, it is essential to identify and accurately assess self-care behaviors, regarding blood pressure monitoring at home and levels of activation in disease management in its various stages. Secondly, the implementation of an intervention that promotes knowledge, skills and patient activation in the disease management. That is, providing the means to enable patients to make informed decisions, make a self-monitoring and self-assessment of their condition and implement strategies to solve some problems that arise [42].

Indeed, in the context of CKD research, self-management interventions are on the top of the agenda when it comes to preventing disease progression [43]. For example, Havas et al. indicates that chronic kidney patients reported the need to learn how self-manage their disease and to integrate self-management behaviors into their daily lives [44].

In this context, the education process is a fundamental tool. For it to be successful it is important to take into account the motivation, the literacy level, the patient activation in disease management and the patient/health professional relationship [45].

Activation is an interactive process and consists of the patient's ability to actively participate in disease management, to assume an active behavior in favor of a passive attitude. Several factors take action in this process, such as the patient's motivation, beliefs, knowledge and abilities/skills to perform [46].

Activated patients have higher scores for participation in disease self-management, namely blood pressure monitoring, healthy eating habits, physical exercise, smoking cessation, etc., when compared to those who are not [47].

Activation exists in a continuum in which the patient moves between four levels, depending on state of health, self-confidence, motivation to get involved and circumstances of life.

The four levels are:

1. **Beliefs:** activated patients **believe** they have a fundamental role in disease self-management and health status maintenance, collaborating with health professionals.
2. **Trust and knowledge to take action:** activated patients have **knowledge and confidence** in disease self-management.
3. **Take action:** activated patients **have the skills** to manage their health condition.
4. **Maintaining action:** activated patients **maintain** their functionality even if exposed to high levels of stress [48].



Along with the concept of patient activation, the concept of perceived efficacy gains relevance in the disease self-management. To the previous ones, demographic characteristics (age, gender, education) and clinical characteristics (cognitive and physical capacity) are added.

Perceived self-efficacy refers to the person's perception of their own ability to perform a certain activity in order to achieve a goal or result. According to Bandura, it is important for people to believe that they are able to successfully develop a certain action, because that will be the guarantee of getting involved and adopting goals for that purpose [49].

Bandura also defines how much effort a person will need and how long it will last when faced with difficulties and negative experiences. There is a tendency to avoid situations that may exceed the limit of the person's capabilities and to deal with those that the person thinks are solvable. The person tends to distance from situations with high levels of demand, offering the most varied justifications [50].

In this way, different scores for perception of self-efficacy can increase or decrease the motivation for action, with higher self-efficacy scores corresponding to better health. Previous research has shown this relationship, in addition to showing that high self-efficacy was associated with positive changes in health behaviors [49].

Several studies in nephrology field have found an association between high levels of perceived self-efficacy and health gains in groups of hemodialysis patients, regarding weight control improvement between dialysis sessions, reducing hospitalizations, amputations and improving quality of life [51].

Taking into account the international scenario, hypertension represents a burden for global disease context. Thus, standardized blood pressure measurement is essential for diagnosis and blood pressure management [36].

Lopez-vargas et al. showed that patients with CKD in the most advanced stages have low levels of knowledge about the associated risk factors, including hypertension and its management. The authors found that 54% of the patients received information on blood pressure monitoring, adherence to therapy and food preparation. They also identified that nurses had the main role of educators in 73% of the necessary studies. The results indicated that of the 54% of the patients involved in disease self-management, 31% had their blood pressure controlled [52].

The interventions that most contributed to the effectiveness of the process were: teaching practical skills, workshops, follow-up patient on a regular basis and negotiating goals to achieve.

Patients involved in blood pressure monitoring at home learn to understand the connection between measuring and controlling blood pressure and more easily adhere to strategies that contribute to controlling blood pressure, specifically diet, exercise and adherence to therapy. This attitude towards the disease shows improvements in health status [53].

For Wanchai & Armer nurses can help the patient to improve their self-care skills [54]. The question is: how to do it?

Returning to Orem's theory, the authors mention that there are three classifications of nursing systems to meet the self-care requisites of the patient: wholly compensatory system, partially compensatory system and the supportive-educative system. Regarding the first system, nurses need to completely replace the individual due to the inability to self-care. In the second system, a patient can meet some self-care requisites but needs a nurse to help meet other needs. In the supportive-educative system, a patient can meet self-care requisites but needs assistance with decision making, behavior control, or knowledge acquisition skills, so nurses teach, train and support the patient for self-care. Often the patient is unable to perform his activities because he does not have the necessary knowledge to perform them. According to Orem, in some situations, the patient needs the nurse's guidance to

carry out the self-care action and in other situations he needs to learn the techniques to be able to perform them.

The authors mention other methods of training the patient for self-care, promoted by nurses, such as coaching, stimulating the patient's participation and establishing of therapeutic relationship.

The authors add the motivational interview as a strategy to motivate the patient to change specific behaviors. They also report that review studies have shown the effectiveness of this method in changing behaviors for healthy lifestyles. Other authors have stated that this type of approach is useful in situations where the patient is less motivated to assume self-care or in situations where the patient not yet prepared to take charge of his illness condition.

In the context of health education, giving educational materials can help the patient in the learning process. However, it is necessary to pay attention to the patient's abilities in terms of reading and comprehension to avoid bad decisions about self-care. The demonstration and training blood pressure measurement in different methods involving the technique of blood pressure measurement at home should be promoted. Additional resources such as videos, access to websites dedicated to this subject or leaflets demonstrating the technique, may be useful in demonstrating blood pressure monitoring at home.

Nurses play an important role in this process, helping the patients to select and understand the best method for themselves [55].

Nurses should inform the patient about the recommended schedule for blood pressure monitoring at home. According to the European Hypertension Society Working Group, blood pressure should be taken twice in the morning and twice in the afternoon [56].

In some experts' opinion, blood pressure self-monitoring over a long period may allow a more accurate assessment of blood pressure stability and increase the patient's commitment to treatment.

Nurses should discuss with patients the importance of blood pressure self-management. Therefore, an important element in this whole process is the communication established between the health professional and the patient. Feedback should be maintained even when the professional is not on duty. The patient should be able to communicate with the healthcare professional via telephone, fax and e-mail. There are also other ways of data communication, namely through stored data in devices, mobile phone applications (smartphone applications) and internet.

Nurses can help the patient to obtain health gains through adequate training in blood pressure measuring methodology and interpreting the values obtained in blood pressure monitoring at home.

To this purpose, nurses should explain and demonstrate the technique to the patient and inform about the recommended devices [57]. The **Table 2** shows the Society of Cardiology and the European Society of Hypertension recommendations regarding blood pressure measurement at home.

Regarding device selection, literature indicates that the recommended devices for HBPM are the automatic oscillometric arm devices. This kind of equipment is more user-friendly and requires less skills when compared to manual devices.

Electronic arm devices for BP measurement, especially those that allow the storage, transmission or printing measuring data, should be preferred for HBPM. It is also crucial that patients make sure that the devices they acquire have been validated according to recommended criteria. The European Society for Hypertension Working Group on Blood Pressure Monitoring has developed a protocol applicable to most BP measuring devices available on the market. The European Society of Hypertension supported the creation of a website where updated lists of validated BP measurement devices are published ([www.dableeducational](http://www.dableeducational)). The British

Environment	Comfortable environment temperature Quiet and noiseless environment
Patient	<p>Training in blood pressure measurement technique is required</p> <p><b>Measurement conditions and procedures:</b></p> <ul style="list-style-type: none"><li>• Patients should be relaxed, in a seating position with their backs supported and uncrossed legs;</li><li>• Wait for 5 minutes at rest before beginning BP measurements. Patients should remain alone where the blood pressure is measured;</li><li>• The bladder must be empty;</li><li>• Do not eat or smoke within 30 minutes of BP measuring;</li><li>• Do not exercise in the 60 minutes before BP measurement;</li><li>• Do not speak before and during the BP measurement.</li></ul> <p><b>Arm Position and support</b></p> <ul style="list-style-type: none"><li>• The arm should be resting on a table with the palm facing up, positioned at the level of the heart. The arm on which the blood pressure will be assessed should be free of clothing, preferably bare.</li></ul> <p><b>Arm selection</b></p> <ul style="list-style-type: none"><li>• Blood pressure should be, preferably, measured on the right arm;</li><li>• The left arm should be used if BP values are higher than in the right arm or due to an abnormality or some circumstance that indicates against its use. In the case CKD patients, it is essential to check for arteriovenous fistulas (AVFs) or arteriovenous grafts (AVGs). Do not assess the blood pressure in the access arm;</li><li>• Record blood pressure assessment arm is also required.</li></ul>
Blood pressure measurement devices	<p><b>Blood pressure cuff size</b></p> <ul style="list-style-type: none"><li>• Before using the BP measuring device ensure that the cuff dimensions are adequate;</li><li>• In relation to the length, the bladder inside the cuff should encircle 80 to 100% of the arm; the bladder width should be 40 to 50% of arm circumference.</li></ul> <p><b>Blood pressure cuff position</b></p> <ul style="list-style-type: none"><li>• It should be 2–3 cm above the cubital fossa, at the level of the heart;</li><li>• At each BP measurement the cuff should be wrapped around the arm with the central area placed over the brachial artery.</li></ul> <p><b>Time and frequency for BP measurement</b></p> <ul style="list-style-type: none"><li>• Three consecutive readings in the morning (in fasting and before taking the medication) in the afternoon and evening;</li><li>• Repeat the measurement with 1–2 minutes interval between;</li><li>• Record the values obtained.</li></ul>

**Table 2.**  
*Recommendations for HBPM.*

Hypertension Society ([www.bhsoc.org](http://www.bhsoc.org)) also publishes information on device validation.

In Herber, et al., it is essential that the patient and family have coping strategies to deal with the disease and complications. The authors highlight the role of regular home visits in establishing a therapeutic relationship. In these visits, nurses can support and teach the patient and family to manage the therapeutic regimen, increase levels of knowledge about the disease and self-care behaviors, as well as guide the resources available in the community [58].

For Coates et al., the management of the disease is challenging, both for the patient and his relatives, as well as for health professionals, as it requires a change

in the philosophy of care. The paradigm change demands the active involvement of the patient in decisions and problem solving. In this context, new strategies are required to make the patient responsible for the management of his health [59].

Negotiation is, thus, an important strategy to prevent the patient from adopting a passive attitude and, at the same time, to equip the patient with the necessary skills and abilities for disease management [60].

Advice and support in changing daily routines are essential for the control of HTA [61].

Blood pressure self-monitoring makes patients more aware of their pressure values and leads them to commit themselves more actively in their therapeutic plan.

In summary, self-care is an essential component for chronic disease management and, in the case of CKD, is certainly a *sine qua non* condition. The evolutionary path of CKD brings with it a growing number of daily self-care activities for the individual, such as deciding what to do, undertaking self-care activities related to disease monitoring and putting a strong increase in the investment of healthy behaviors, including blood pressure control, diet and exercise, among others.

The health gains for the patient consist of increased quality of life, empowerment, success in lifestyle changes due to active role and involvement in disease management. The change in perception of hypertension can encourage the patient to comply with therapy and make the necessary lifestyle changes [62].

## **5. Conclusion**

The main objective of HBPM is to prevent and delay morbidity, mortality and organ damage. To achieve this goal, it is essential to implement pharmacological and non-pharmacological measures, including: regular blood pressure measuring throughout life at home. This self-care behavior results in gains for the patient as it has been shown in CKD patients. Adequate blood pressure control reduces the rate of decline in kidney function and cardiovascular morbidity and. In this context, HBPM is important for the effective management of hypertension in this group with compromised kidney function [27, 63].

Nurses play an important role in patient empowerment by accompanying, teaching, training and informing about hypertension and the additional measures needed to achieve the expected result: blood pressure control and quality of life. The establishment and maintenance of a model of care based on cooperation between health professionals and the patient is the key to success.

## **Conflict of interest**

The authors declare no conflict of interest.



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