

Effect of BARTOCAR Education on Fluid Restriction Compliance in Chronic Renal Failure Patients

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ABSTRACT

Chronic renal failure (CRF) is a health problem requiring long-term management, including fluid intake restriction. Non-compliance with fluid restriction remains a major problem that can worsen clinical conditions, such as fluid overload, edema, and cardiovascular complications. BARTOCAR method-based education (Brief, Active, Repetitive, Tailored, Observed, Controlled, Assessed, Reinforced) is a structured approach that has the potential to improve patient understanding and compliance. This study aimed to determine the effect of BARTOCAR education on fluid restriction compliance among patients with CRF. This study employed a pre-experimental design with a one-group pretest-posttest approach. The study was conducted at RSUP M. Jamil Padang with 40 CRF patients undergoing hemodialysis, selected using purposive sampling. Data were collected using a fluid restriction compliance questionnaire and fluid balance observation sheets. Data were analyzed using univariate analysis to determine frequency distributions and mean scores, followed by bivariate analysis using a paired t-test. The mean compliance score increased from 57.2 before intervention to 76.8 after BARTOCAR education. Bivariate analysis demonstrated a significant effect of BARTOCAR education on fluid restriction adherence ($p=0.000$; $p<0.05$), with a mean increase of 19.6 points. BARTOCAR education was effective in improving fluid restriction compliance among CRF patients. Integrating BARTOCAR education into standard patient education procedures may improve therapeutic outcomes and quality of life.

Keywords: Education, BARTOCAR, Compliance, Fluids, Hemodialysis



INTRODUCTION

Noncommunicable diseases are a growing global health burden, with chronic kidney disease one of the leading contributors to morbidity and mortality in many countries. This condition is progressive and irreversible, so it requires long-term treatment involving various lines of Health Services. Chronic kidney disease affects more than ten percent of the world's general population, or the equivalent of more than eight hundred million people, and has become one of the few noncommunicable diseases whose mortality rate has steadily increased in the past two decades. The global financing burden for treating this disease is also very large, reaching trillions of dollars annually, making it a serious public health issue that requires attention across sectors (Kovesdy, 2022).

The high prevalence of chronic kidney disease at the global level has direct implications for the increasing need for renal replacement therapy, both in the form of dialysis and transplantation. Nearly four million people worldwide undergo renal replacement therapy, with hemodialysis remaining the most widely used therapeutic modality, accounting for approximately sixty-nine percent of all renal replacement therapy and eighty-nine percent of all dialysis procedures. The number of patients requiring kidney replacement therapy is projected to grow to 5.4 million by 2030. This increase occurred most rapidly in low-and middle-income countries, which generally have limited health care resources and infrastructure to cope with it (Hidayangsih et al, 2023).

Indonesia as a developing country with a large population also faces a similar burden related to chronic kidney disease. The results of the Indonesian Health Survey in 2023 recorded the prevalence of chronic kidney disease that has been diagnosed by health workers in the population aged fifteen and over at 0.18 percent, or equivalent to around 638,178 people. Although this figure shows a downward trend compared to the results of the Rikesdas in 2018, the phenomenon that is actually worrying is the increase in mortality due to this disease, which indicates a delay in early detection and limited access to adequate treatment services. This condition illustrates the gap between epidemiological findings and the real clinical impact experienced by patients in the field (Christa, 2024).

The increase in the number of patients undergoing hemodialysis also occurs consistently in various health facilities in Indonesia. Data from the Health Social Security Agency show that in 2022, about 63,489 new patients with chronic kidney failure were recorded, and in 2024 the number of patients undergoing dialysis reached 134,057 people. The main cause of chronic kidney failure in Indonesia is still dominated by hypertension and diabetes mellitus, two comorbid conditions whose prevalence also continues to increase in the community. Other risk factors such as aging, obesity, and environmental exposure have contributed to the increase in cases, further strengthening the urgency for comprehensive treatment of this disease at the primary and referral health service levels.

For chronic renal failure patients undergoing hemodialysis, fluid intake management is one of the most challenging aspects of therapy to consistently adhere to. This is because kidney function that has decreased is no longer able to excrete excess body fluids adequately, so patients

rely heavily on self-discipline in regulating the amount, type, and schedule of daily drinking. Among all aspects of hemodialysis therapy management, fluid restriction is considered the most difficult component for patients to carry out compared to diet and adherence to therapy schedules. This difficulty is aggravated by excessive thirst, which can be triggered by increased salt levels, decreased potassium, the presence of the hormone angiotensin II, as well as increased plasma urea levels in the patient's body (Adi Husada, 2023).

Non-compliance with fluid restriction in hemodialysis patients can provoke an excessive condition of interdialytic weight gain, that is, an increase in body weight between two hemodialysis sessions due to the accumulation of fluid in the body. Consistently high Interdialytic weight gain is associated with a variety of adverse clinical outcomes, including cardiovascular complications, hemodynamic instability while on dialysis, increased hospitalization rates, and increased risk of mortality. Other common complications found as a result of this non-compliance include hypertension, left ventricular hypertrophy, pulmonary edema, muscle cramps, shortness of breath, and nausea and vomiting. This confirms that fluid management is not just an administrative aspect of therapy, but a clinical determinant that directly affects the success and safety of patients during hemodialysis (Suparmo and Hasibuan, 2021).

Recent studies in Indonesia have consistently reported high levels of fluid restriction non-compliance in hemodialysis patients. Research at a hospital in Padang found that out of 63 respondents, as many as 40 people or 63.5 percent did not comply with fluid restrictions, and more than half of the non-compliant group experienced second-degree edema. Another study in Jombang also reported that as many as 59.1 percent of hemodialysis patients were classified as less compliant with fluid restriction, with almost half of them experiencing mild hypervolemia. These findings illustrate that the problem of non-compliance with fluid restriction is not a local phenomenon in one health facility, but a recurring problem in various regions and types of hemodialysis service institutions in Indonesia (Dina. et al, 2024).

The consistency of the findings of non-compliance is also illustrated from research in Medan conducted on outpatients undergoing hemodialysis therapy. Of the 59 respondents studied, the distribution of adherence was found to be almost balanced, with only 50.85 percent of patients classified as compliant with fluid restriction, while almost half of the remaining were still non-compliant. The demographic characteristics of the patients in the study were dominated by the middle adult age group, with education levels varying from elementary school to college. This condition confirms that non-compliance with fluid restriction can occur in various age groups and educational backgrounds, so that the educational strategy provided needs to be designed flexibly and can be adjusted to the individual characteristics of the patient (Gaol. et al, 2025).

Factors contributing to non-compliance with fluid restriction in hemodialysis patients are multidimensional and interact with each other. These factors include age, level of education, knowledge, beliefs and health culture, socioeconomic conditions, as well as psychological aspects of patients undergoing long-term therapy. In addition to clinical and behavioral factors, psychosocial dimensions such as self-efficacy, thirst perception, and stress levels also influence the



patient's ability to maintain adherence to fluid restriction. The complexity of this determinant indicates that an educational approach that is a one-time delivery of information without repetition and continuous evaluation will not be effective enough to change patient behavior in a persistent manner (Trisnaningtyas et al, 2023).

Optimal adherence to fluid restriction essentially requires close cooperation between the patient and the health professional in order to ensure a comprehensive understanding of the therapy plan, the accompanying risks as well as the consistency of implementation in the patient's everyday life. Without adequate understanding, patients tend to have difficulty translating the recommendation for fluid restriction into real habits, especially when faced with intense thirst or social pressure when gathering with family or the environment. The active involvement of health workers in providing sustainable education is the key to bridging the gap between knowledge and behavior. Therefore, educational interventions that are structured and involve active patient participation are seen as a more promising approach than conventional counseling that is one-way (Anggraini & Nurvinanda, 2021).

Various educational efforts have been developed to address the issue of fluid restriction compliance, one of which is through a structured educational approach accompanied by periodic mentoring and evaluation. Studies that apply structured education to hemodialysis patients show that the intervention can improve patient self-efficacy in regulating fluid intake between two dialysis sessions. This increased self-efficacy is in line with patients' belief that they are able to control their drinking patterns independently, thus contributing to a decrease in the value of interdialytic weight gain. This shows that the success of fluid management depends not only on cognitive knowledge alone, but also on strengthening the patient's self-confidence through a continuous and participatory educational process (Wayunah, Saefulloh, & Nuraeni, (2020).

In addition to the self-efficacy approach, various educational media innovations have also been developed and tested to improve patient adherence to fluid restriction. Research using video-based educational media reported an increase in knowledge, attitudes, and behavior of hemodialysis patients after attending counseling, with the delivery of visually and interactively packaged materials considered more effective in attracting patient attention than conventional lecture methods. Another study using e-booklets also reported an increase in knowledge and adherence to fluid restriction in chronic renal failure patients undergoing hemodialysis. These findings consistently confirm that interactive education delivery methods that involve active involvement of patients tend to provide better results than passive education that is only informative in one direction (Darmawati et al, 2025).

The implementation of the BARTOCAR method in the field shows promising results in helping hemodialysis patients overcome the difficulties of monitoring daily fluid intake at home. Before being given this intervention, patients generally have difficulty accurately measuring and recording the amount of fluid they consume, so an increase in body weight due to fluid buildup is often not detected early. In fact, uncontrolled weight gain in hemodialysis patients can increase the risk of various serious complications, such as heart failure, lung swelling, and accumulation of

toxins in the body due to kidney function that is not able to excrete metabolic waste optimally. The BARTOCAR approach, which involves self-recording and regular reporting to nurses at each hemodialysis session, is considered able to help patients build awareness and personal responsibility for their fluid management (arofiati & Sriyati, 2019).

Although a variety of educational methods have been developed and tested for effectiveness, most existing research has focused on single interventions such as the use of audiovisual media, booklets, or individualized counseling, without incorporating the principles of repetition and comprehensively structured evaluation offered by BARTOCAR's approach. Descriptive research conducted at a hospital in Medan in 2025 explicitly recommends the need for a comprehensive intervention strategy through continuing education programs, multidisciplinary approaches, and effective monitoring systems to optimize the clinical outcomes of hemodialysis patients. These recommendations underscore the gap between the need for a structured educational approach and the availability of empirically tested models of such education in health care facilities, particularly in referral hospitals that treat large numbers of chronic kidney failure patients. This gap is both an opportunity and a challenge for the development and testing of the BARTOCAR method more broadly in different clinical contexts (Gaol. Et al, 2025).

Central General Hospital (RSUP) DR. M. Djamil Padang, as one of the main referral hospitals in West Sumatra, handles a large number of chronic kidney failure patients who undergo hemodialysis every year, in line with the increasing trend of chronic kidney failure cases that also occur in various other hospitals in Indonesia. As a health care institution with a significant burden of hemodialysis patients, RSUP DR. M. Djamil Padang faces similar challenges related to low patient adherence to fluid restriction, as also reported by various other hemodialysis facilities in West Sumatra. This condition makes the hospital a relevant location to test the effectiveness of structured education methods such as BARTOCAR, given the characteristics of the patient population that are representative of the condition of hemodialysis patients in the region in general. Application and evaluation of BARTOCAR method in the context of RSUP M. Jamil Padang is expected to provide a more concrete picture of its effectiveness in the real Order of hemodialysis services (Dina. Et al, 2024).

If the problem of fluid restriction non-compliance is not addressed in a structured and sustainable manner, the impact will not only be felt by patients in the form of clinical complications such as fluid overload, edema, and cardiovascular disorders, but will also burden the health care system more broadly through increasing hospitalization rates and treatment financing that continues to surge. Given the catastrophic financial burden borne by the national health insurance system due to chronic kidney disease, efforts to prevent complications through improving patient compliance are strategic steps that can have a significant impact on overall health financing efficiency. Therefore, an educational model is needed that is not only effective in increasing patient knowledge in the short term, but is also able to encourage persistent and sustainable behavior change in the long term.



Based on this description, the researchers examined in depth the effect of BARTOCAR method-based education on fluid restriction compliance in chronic renal failure patients undergoing hemodialysis at Dr. M. Djamil Padang. In addition, the educational methods used today are not optimal. Therefore, this study is expected to provide an applicable and scientifically evidence-based solution in improving patient compliance with CFS.

METHODS

This study used a pre - experimental design with a one group pretest-posttest approach, which is a research design that measures fluid restriction compliance variables in the same group of subjects before and after being given an educational intervention based on the BARTOCAR method, without using a comparison group (control). The study was conducted at the hemodialysis Unit of Dr. M. Djamil Padang. The study population was all chronic renal failure (CFS) patients undergoing routine hemodialysis therapy in the unit, with a sample of 40 respondents selected using purposive sampling techniques based on inclusion and exclusion criteria that have been set. Inclusion criteria in this study include patients with GGK who have undergone routine hemodialysis for at least three months, aged 18-65 years, in a compos mentis condition and able to communicate well, willing to be a respondent, and attending the entire series of BARTOCAR education sessions from the beginning to the end of the study. Exclusion criteria included patients with cognitive impairment or decreased consciousness, experiencing acute complications requiring intensive care during the study period, as well as patients who withdrew or did not follow posttest measurements completely (lost to follow-up). Data collection was conducted through two instruments, namely the fluid restriction compliance questionnaire that measures aspects of knowledge, attitudes, and behavior of patients to regulate the amount, type, and schedule of fluid intake (3J), as well as fluid balance observation sheets used to record the patient's daily fluid intake and output including the calculation of interdialytic weight gain (IDWG). Both instruments have gone through validity and reliability tests before being used in data collection, in order to ensure the accuracy and consistency of measuring instruments in assessing the variables studied.

The research procedure was carried out through three stages, namely pretest measurement of fluid restriction compliance and fluid balance before the intervention was given, education based on BARTOCAR method (Brief, Active, Repetitive, Tailored, Observed, Controlled, Assessed, Reinforced) which was delivered gradually and continuously by the researcher and the room nurse during the hemodialysis period, and posttest measurement which was carried out after the entire series of interventions was completed to see changes in patient compliance scores. The collected Data were then analyzed in a univariate manner to describe the frequency distribution of respondent characteristics and the average fluid restriction compliance score before and after the intervention, and continued with bivariate analysis using paired t-test to test the significance of differences in the average compliance score before and after BARTOCAR education, with data normality prerequisite test using Shapiro-Wilk test before hypothesis testing. This study has paid

attention to the ethical principles of research involving humans as subjects, namely respect for autonomy (autonomy), provide benefits (beneficence), not harm (non-maleficence), and justice (justice) for all respondents. Before the data collection begins, the researcher provides a complete explanation of the objectives, procedures, benefits, and potential risks of research to prospective respondents, which is then followed by the signing of a consent sheet to become a respondent (informed consent) as a form of a statement of willingness to participate voluntarily without coercion, and guaranteed confidentiality of identity and personal data of respondents (confidentiality) during the research process and in the publication of research results.

RESULTS

1. Characteristics of Respondents

Before discussing the effect of BARTOCAR education on adherence to fluid restriction, an overview of the demographic characteristics of 40 respondents of chronic renal failure (CRF) patients undergoing hemodialysis at Dr. M. Djamil Padang is the subject of this study. These characteristics include age, gender, level of education, and length of hemodialysis.

Table 1. Frequency Distribution Characteristics of Respondents (n=40)

Characteristics	Categories	Frequency (n)	Percentage (%)
Age	Early adulthood (26-35 years)	6	15
	Late adulthood (36-45 years)	10	25
	Early elderly (46-55 years old)	14	35
	Late elderly (56-65 years old)	10	25
Gender	Men	22	55
	Girls	18	45
Education Level	ELEMENTARY/JUNIOR HIGH SCHOOL	9	22.5
	High school / equivalent	21	52.5
	College	10	25
Duration Of Hemodialysis	< 1 year	11	27.5
	1-3 years	19	47.5
	> 3 years	10	25
Total		40	100

Based on Table 1, it can be seen that most of the respondents were in the early elderly age group (46-55 years) as many as 14 people (35%), with the majority of respondents being male, namely 22 people (55%). The education level of respondents was dominated by high school graduates / equivalent as many as 21 people (52.5%), while based on the length of hemodialysis, most respondents had undergone therapy for 1-3 years, namely 19 people (47.5%). This



characteristic describes that patients undergoing hemodialysis at RSUP DR. M. Djamil Padang is mostly in middle to advanced age with a long period of therapy, so that the education provided needs to be adjusted to the level of understanding and therapeutic experience that patients have previously had.

2. Distribution of Mean Fluid Restriction Compliance Score Before and after BARTOCAR Education

Univariate analysis was conducted to determine the frequency distribution and the average value of fluid restriction compliance scores in respondents before (pretest) and after (posttest) given BARTOCAR method-based education. The results of the univariate analysis are presented in table 2.

Table 2. Distribution of Mean Fluid Restriction Compliance Score Before and After BARTOCAR Education (n=40)

Variable	Mean	SD	Minimum	Maximum
Pre-Intervention Compliance Score (Pretest)	57.2	6.84	45	70
Compliance Score After Intervention (Posttest)	76.8	5.92	65	90

Table 2 shows that the average fluid restriction Compliance Score of respondents before being given BARTOCAR education was 57.2, which describes the level of compliance of GKG patients with fluid restriction was still in the medium to low category before the intervention was carried out. After being given BARTOCAR education, the average compliance score increased to 76.8, which indicates an improvement in patient understanding and behavior in implementing fluid restriction after receiving structured, repetitive, and tailored to individual needs (tailored) education. This increase in the mean score descriptively indicates a trend towards improved compliance, although its statistical significance can only be ascertained through the results of bivariate analysis.

3. Paired Sample T-Test Effect Of BARTOCAR Education on Fluid Restriction Compliance

Bivariate analysis was conducted to examine the significance of the effect of BARTOCAR education on fluid restriction compliance of GKG patients, by comparing the mean compliance score before and after the intervention using paired sample t-test, after the data were confirmed to be normally distributed through the Shapiro-Wilk test. The results of bivariate analysis are presented in table 3.

Table 3. Paired Sample T-Test Effect Of BARTOCAR Education on Fluid Restriction Compliance (n=40)

Variable	Mean	SD	Mean Difference	t	df	p-value
Compliance Before Intervention	57.2	6.84	19.6	14.732	39	0.000

Variable	Mean	SD	Mean Difference	t	df	p-value
Compliance After Intervention	76.8	5.92				

The paired sample t-test results in Table 3 showed a value of $p=0.000$ ($p<0.05$), which means that there is a statistically significant difference in the average score of fluid restriction compliance between before and after BARTOCAR education. The average difference of 19.6 points with a calculated t-score of 14,732 confirms that the increase in compliance scores is not accidental, but a real impact of the educational interventions provided. Thus, it can be concluded that BARTOCAR method-based education is significantly effective in improving fluid restriction compliance in GGK patients undergoing hemodialysis at Dr. M. Djamil Padang, thus supporting the research hypothesis that the provision of structured, active, repetitive, and monitored education can improve patient compliance behavior in the short term.

DISCUSSION

1. Distribution of Mean Fluid Restriction Compliance Score Before and After BARTOCAR Education

The results in Table 2 showed that the average fluid restriction Compliance Score of patients with chronic renal failure (CRF) who underwent hemodialysis at RSUP M. Jamil Padang before being given BARTOCAR education was 57.2, with a minimum score range of 45 and a maximum of 70. This average value illustrates that in general, the level of adherence of respondents to fluid restriction is still in the medium to low category before getting the intervention. A fairly wide variation in scores between the minimum and maximum values also indicates a heterogeneity in the level of compliance among respondents, where some patients already have relatively good awareness, while others are still far from the expected standard of compliance. This pretest condition is an important baseline to assess the extent of changes that occur after patients receive structured education based on the BARTOCAR method.

The finding of low adherence to fluid restriction prior to the intervention is in line with previous studies that consistently reported similar problems in hemodialysis patients in various health facilities in Indonesia. A descriptive study in a hospital in Medan in 2025, reported that almost half of the respondents were classified as non-compliant with fluid restriction, with an almost equal distribution of compliance between the obedient and non-obedient groups. This non-compliance can theoretically be explained through the Health Belief Model framework, where a person's compliance behavior is strongly influenced by perceptions of the threat of disease, the benefits of preventive measures, and perceived obstacles in carrying out these health recommendations. Low pretest scores in this study indicate that prior to structured education, patients' perceptions of the importance of fluid restriction may not have been strong enough to drive consistent behavior change (Fadilah et al, 2020).

The high variation of adherence score in pretest condition can be understood as a reflection of the patients' not optimal understanding of the clinical consequences of non-compliance with



fluid restriction, considering that some patients in this study had only undergone hemodialysis for less than one year so their experience and learning on fluid management was still relatively limited. Researchers assume that patients with shorter periods of hemodialysis tend not to have enough experience in feeling the direct impact of non-compliance, such as edema or shortness of breath, so their motivation for discipline in limiting fluids has not been fully formed. On the other hand, patients who have been on hemodialysis for longer are likely to have experienced the consequences of excess fluid on their own, so they naturally have a higher level of awareness although not necessarily accompanied by the technical ability to control it. This variation in clinical experience is what researchers suspect contributes to a fairly wide range of compliance scores in conditions prior to intervention.

After being given BARTOCAR education, the results in Table 2 showed an increase in the average score of compliance with fluid restriction respondents to 76.8, with a minimum score range of 65 and a maximum of 90. This improvement illustrates that overall, the majority of respondents experienced improved levels of compliance after receiving a structured educational intervention, with a relatively narrow range of scores compared to conditions before the intervention. This narrowing of the range of posttest scores also indicates that BARTOCAR education not only improves the average compliance in general, but also homogenizes the level of understanding and compliance behavior among respondents who were previously quite heterogeneous. This is an early indication that a structured and repeatable educational approach is able to reach the learning needs of patients more evenly than conventional one-way education.

This improvement in adherence score after structured education is consistent with the findings of studies applying therapeutic education to patients with chronic renal failure, who reported significant improvements in fluid restriction compliance after patients received education delivered systematically and continuously. Another study using a theory-based approach to self-efficacy in hemodialysis patients also showed that education designed to strengthen patients' self-confidence can significantly reduce the value of interdialytic weight gain. BARTOCAR's emphasis on active and reinforced components aligns with Bandura's self-efficacy theory, in which a person's confidence in his or her ability to manage a behavior increases with repeated experiences of success and positive reinforcement from the surrounding environment. An educational approach that involves the active participation of patients in monitoring and reporting their own fluid intake, as is the main characteristic of BARTOCAR, thus has a strong theoretical foundation to explain its success in improving compliance (Ansani & Samsir, 2022).

The repetitive and observed components of the BARTOCAR method play an important role in explaining the increase in compliance scores found in this study, because the repetition of information accompanied by direct supervision from health workers allows patients to gradually correct misunderstandings throughout the educational process. In contrast to conventional education that is only delivered once orally, the repetition mechanism in BARTOCAR provides an opportunity for patients to consolidate information into long-term memory, so that the resulting behavioral changes are potentially more persistent than education that is momentary. Research on

video-based educational interventions accompanied by discussions in hemodialysis patients also reported that repetition of material combined with direct interaction was able to integrate aspects of knowledge, attitudes, and patient behavior more synergistically than single counseling. This further reinforces the argument that the repetitive and monitored educational structure, as implemented in BARTOCAR, is an important determinant behind the improved adherence found in this study (Darmawati. et al, 2025).

The researchers assume that the tailored component or individual adjustments in the BARTOCAR method are also key factors that explain why the increase in compliance occurred consistently in almost all respondents, although the characteristics of their age, education, and length of hemodialysis were quite diverse. Education tailored to the comprehension skills, drinking habits, and clinical conditions of each patient is thought to make educational materials more relevant and easy to apply in everyday life than generic education that is uniform for all patients. Researchers also argue that family involvement indirectly contributes to the successful implementation of BARTOCAR, considering that most respondents likely live with families who can help remind and supervise the implementation of fluid restrictions at home. This assumption is based on the researchers' observations during the research process, where patients who received support from those closest to them tended to show a more consistent increase in compliance scores than patients who appeared to be educated independently.

The difference in Mean adherence score of 19.6 points between the condition before and after the intervention found in this study indicates the magnitude of the change is quite large and clinically meaningful, considering that the scale of adherence assessment generally moves in a limited range. The magnitude of this difference indicates that BARTOCAR education not only provides a statistically significant change, but also has a practical impact on improving the behavior of patients on their daily fluid management. These findings are in line with studies on the effect of education on chronic renal failure patients' adherence to fluid restriction in the hemodialysis room, which also reported substantial improvements in adherence after patients received programmed and continuous education. The consistency of the findings between these studies reinforces the belief that educational interventions that are designed in a structured manner, with clear repetition and evaluation elements, are empirically able to produce greater changes in compliance behavior than single education that is not accompanied by continued monitoring (Hermayerni Simanullang, 2022).

From the perspective of the theory of health behavior change, this significant increase in compliance scores can be interpreted as evidence that the BARTOCAR method successfully bridges the gap between knowledge and real actions of patients, which has been a major challenge in various conventional health education programs. Patients who previously had only theoretical knowledge of the importance of fluid restriction, through the BARTOCAR approach are encouraged to actually practice regular recording and reporting of their fluid intake, so that the knowledge is internalized into more concrete habits. The controlled and assessed mechanism in the BARTOCAR structure ensures that any progress in patient compliance can be monitored and



evaluated periodically by health workers, so that deviations from the target fluid restriction can be corrected immediately before causing more serious complications. This gives an idea that the advantage of BARTOCAR lies not only in the delivery of information, but also in the accountability system inherent in the entire process, which ultimately encourages patients to be more disciplined in carrying out therapeutic recommendations.

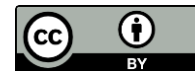
Based on the overall results of the univariate analysis that has been presented, the researcher argues that the success of BARTOCAR education in improving adherence to fluid restriction in this study cannot be separated from its multicomponent character, which simultaneously touches the cognitive, behavioral, and social aspects of patients in a series of integrated interventions. Researchers also suspect that this success is also influenced by the suitability of the BARTOCAR method with the cultural context and characteristics of GGK patients in Dr. M. Djamil Padang, who generally has a strong attachment to family support and adherence to the direction of health workers as an authority figure in treatment.

2. Difference in Average Fluid Restriction Compliance Score Between Before and After BARTOCAR Education

The results of bivariate analysis using paired sample t-test presented in Table 3 showed the value of $p=0.000$ ($p<0.05$), with a mean difference of 19.6 points and a calculated t value of 14.732 at degrees of freedom (df) 39. This p value, which is much smaller than the significance limit of 0.05, statistically proves that the difference in the average fluid restriction compliance score between before and after BARTOCAR education is not accidental, but a real impact of the intervention. The relatively large calculated t value also indicates that the strength of the difference between the two measurement conditions is strong enough, so that confidence in the rejection of the null hypothesis can be held with a high degree of confidence. Thus, it can be concluded that BARTOCAR method-based education has a significant effect on improving fluid restriction compliance in GGK patients undergoing hemodialysis at Dr. M. Djamil Padang.

The findings of statistical significance are consistent with previous studies using a similar design, namely one group pretest-posttest with paired t-test analysis, in the context of hemodialysis patient compliance education. A study analyzing the effect of education on chronic kidney disease patient compliance in fluid intake restriction in the hemodialysis room of a hospital in 2021 also reported a significance value of $p=0.000$ ($p<0.05$) using a paired sample t-test identical to this study. The similarity of the pattern of results in the two studies with comparable methodological designs reinforces the external validity of the findings, while demonstrating that the effectiveness of structured education on fluid restriction compliance is not a single, coincidental finding, but is likely to be replicated in different populations of hemodialysis patients. Consistency across this kind of research is one of the important indicators in assessing the strength of scientific evidence for a nursing intervention (Siskawati & Simanullang, 2022)

The mean difference of 19.6 points found in this study is also in line with the pattern of improvement reported in the study on the effect of comprehensive education on dietary adherence



of hemodialysis patients, who reported significant differences in the group receiving education ($p=0.000$) compared to the control group that did not show significant differences ($p=0.103$). This comparison confirms that structured educational interventions and active mentoring are indeed the main determinants of changes in patient compliance behavior, not solely due to time factors or the patient's natural experience during therapy. From the perspective of research design, although this study used a single group without comparison so that it cannot directly control confounding factors such as the measurement repetition effect (testing effect), the magnitude of the changes found still provides a strong indication that BARTOCAR education is the main factor underlying the increase in compliance. This is further reinforced by the consistency of the direction and magnitude of the effect in various similar studies that use the control group as a comparison.

The researchers assume that the magnitude of the calculated t value and the very strong significance level ($p=0.000$) in this study are also influenced by the relative homogeneity of the clinical experience experienced by respondents during hemodialysis, where almost all patients are likely to have experienced the impact of non-compliance with fluid restriction, such as shortness of breath or swelling in the limbs, so that BARTOCAR's educational material becomes easier to relate to their real experiences. This kind of personal experience is thought to accelerate the process of internalizing educational messages, since patients not only receive information in the abstract but can also validate it based on their own bodily experiences. Researchers also suspect that the intensity of contact between researchers and patients during the BARTOCAR education process, which took place repeatedly throughout several hemodialysis sessions, helped strengthen the therapeutic relationship that ultimately encourages patient confidence in the recommendations given. This assumption is based on the observation that patients who interact with researchers more frequently during the study appear to be more responsive in implementing fluid intake recording than patients whose interaction is more limited.

This success can also be interpreted through the Theory of Planned Behavior, which explains that a person's intention to perform a behavior is influenced by attitudes towards that behavior, perceived subjective norms, and perceptions of behavior control or belief in one's ability to carry it out. The controlled and assessed components in the BARTOCAR method directly reinforce the perception of patient behavior control, as they are given a concrete measuring tool in the form of a fluid monitoring sheet that allows them to independently monitor their progress over time. Research on the analysis of factors of adherence to hemodialysis reported a significant correlation between the level of knowledge of patients with their adherence to therapy, which underlines that increased understanding through structured education directly contributes to improved adherence behavior. This confirms that the significant changes found in this study are in line with the theoretical framework that explains how interventions targeting the perception of behavioral control can produce statistically significant changes in health behavior (Pratiwi, Sari, & Kurniawan, 2019).

The researchers also assume that the statistical significance found in this study is also influenced by an adequate sample size, namely 40 respondents, which is statistically sufficient to



detect differences in the mean with a good power in the paired t-test design. In addition, the researchers suspect that the relatively short span of time between BARTOCAR education and posttest measurement contributes to the magnitude of the observed effect, because patients are still in a state of high motivation posteducation and have not experienced a decrease in compliance due to emotional fatigue (fatigue) in undergoing long-term therapy. The researcher needs to underline that these very significant results in the early stages of post-education do not automatically guarantee the sustainability of compliance in the long term, so follow-up evaluations over a longer period will be necessary to ensure the durability of the effects of these interventions. Nonetheless, the results at this point in time of measurement still provide strong preliminary evidence of the effectiveness of the BARTOCAR method as a short-term nursing intervention.

The significant effect of BARTOCAR education on fluid restriction compliance in this study is also relevant to the theory of social support in the context of health care, where the involvement of health workers consistently throughout the educational process can serve as a form of instrumental and emotional support that strengthens the motivation of patients to comply with therapeutic recommendations. Research on the self-efficacy and social support of hemodialysis patients in improving fluid restriction compliance found that the combination of patient self-confidence and support from the surrounding environment, including health workers, together contributed significantly to improving patient compliance. The BARTOCAR structure that involves continuous supervision (observed) and reinforcement (reinforced) by nurses can be viewed as a form of operationalization of the theory of social support in real nursing practice. Thus, the statistical significance found in this study also confirms that education that incorporates elements of structured professional support has a strong theoretical basis to explain its success (Susilawati, Latief, & Khomarudin, 2018).

Researchers assume that in addition to the educational factor itself, the institutional characteristics of Dr. M. Djamil Padang as a referral hospital with relatively adequate health resources also affects the quality of the implementation of BARTOCAR education, so that interventions can be given consistently and monitored in accordance with the principles of the method. Researchers also suspect that the hemodialysis unit environment that allows regular interaction between patients and health workers each time undergoing therapy provides a natural opportunity for the application of repetitive and controlled components in BARTOCAR without requiring additional visits outside the existing therapy schedule. This condition is different from educational interventions in other chronic diseases that require special visits separately from the patient's routine treatment schedule, so the researchers are of the view that the context of hemodialysis that is inherently routine and scheduled structurally supports the successful application of repeated education methods such as BARTOCAR.

The researchers are of the view that these results provide a sufficiently strong empirical basis to consider the integration of the BARTOCAR method as part of the standard hemodialysis patient education procedure in health care facilities, although further studies with designs involving control groups and longer follow-up periods are needed to ensure the sustainability of

the effects of this intervention over a longer period of time. Thus, the results of this study are expected to be one of the scientific references for the development of nursing policies and practices that are more effective in addressing the problem of non-compliance with fluid restriction in chronic kidney failure patients in Indonesia.

CONCLUSIONS

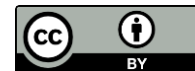
This study aims to determine the effect of BARTOCAR method-based education on fluid restriction compliance in patients with chronic renal failure (CRF) undergoing hemodialysis in RSUP M. Jamil Field. The results of univariate analysis showed that the average fluid restriction Compliance Score of respondents before the intervention was given was 57.2, where the average compliance score increased to 76.8, which indicates an improvement in understanding and behavior of patients in implementing fluid restrictions after receiving education that is structured, repetitive, and tailored to individual needs. The results of the bivariate analysis proved that the differences in compliance scores before and after the intervention were statistically significant and did not occur by chance. Based on these findings, it can be concluded that BARTOCAR method-based education is effective in improving fluid restriction compliance in CRF patients undergoing hemodialysis, so this method has the potential to be integrated as part of the standard of CRF patient education procedure to support the success of therapy and improve the quality of life of patients on an ongoing basis.

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