



# Impacts of Effective Use of IDWG Calculator on Physical Health of HD Patients

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**Abstract.** The final stage of chronic kidney disease, characterized by kidney dysfunction, needs special treatment, such as dialysis (hemodialysis). However, patients undergoing hemodialysis commonly suffer from excess fluid in their bodies. One innovation proposed to help them measure the amount of fluid in their body is by applying Interdialytic Weight Gains (IDWG) calculator. This study aims to analyze the personal experience of patients with chronic kidney disease using the IDWG calculator. The design used was descriptive qualitative with a phenomenological design. The data collection technique was carried out using open-ended interviews by giving 8 participants the opportunity to use the IDWG calculator to fully explain their experiences. This study revealed that the informants experienced positive impacts from the use of the IDWG calculator. First, most of the patients found the IDWG calculator easy to use. Second, they could control their body fluids. Third, they could anticipate complaints that potentially arise. Fourth, the IDGW measurement result could be used as a consideration to make decisions on the amount of fluid intake needed. The last IDGW measurement results could be used to control the patient's blood pressure. As patients with chronic kidney disease undergoing hemodialysis and using the IDWG calculator, most of the informants found that the IDWG calculator was easy to apply and beneficial in terms of their physical health. On the other hand, it is also necessary to add features that can support the improvement of health for patients with chronic kidney disease.

**Keywords:** Physical Health · Chronic Kidney Disease · IDWG Calculator

## 1 Introduction

Chronic kidney disease (CKD) is the gradual and irreversible decline in kidney function and, to a certain degree, requires replacement therapy to improve the patient's quality of life. Hemodialysis is one of the renal function replacement therapies that is often chosen in the treatment of patients with chronic kidney failure [1]. Hemodialysis in CKD patients aims to remove the remnants of protein metabolism and correct fluid and electrolyte balance disorders [2].

CKD has become a serious health problem in the world. The incidence of chronic kidney failure in Indonesia is 0.38% of the total Indonesian population of 252,124,458

people which means 713,783 people suffer from chronic kidney disease in Indonesia [3]. At dr. Harjono Hospital Ponorogo, there was an increase in the number of CKD patients from 2017, as many as 278 people to 340 people in 2018 [4]. In May 2019, patients undergoing hemodialysis at dr. Harjono Hospital Ponorogo were as many as 250 people [4]. Meanwhile, on October 7, 2021, the number of hemodialysis patients in this hospital was 170 people [5].

A common problem experienced by patients undergoing hemodialysis therapy is related to non-compliance with fluid restrictions. This can trigger excess fluid in the body (overload) [6]. The recommended daily fluid intake for CKD patients is limited to “insensible water loss” plus the amount of urine. Fluid control management will have an impact on weight gain between two dialysis times which is called Interdialytic Weight Gains (IDWG). Weight gain in a short time can mean an increase in the amount of fluid in the body [7].

Excessive IDWG can cause various complications such as hypertension, impaired physical function, and shortness of breath due to pulmonary edema, which can increase the occurrence of hemodialysis emergencies, increase the risk of dilation, ventricular hypertrophy, and heart failure [8]. IDWG can lead to a significant increase in peripheral vascular resistance (PVR). Increased vascular resistance can be triggered by excess predialysis fluid, which will also increase vascular resistance. As a result, the increase in cardiac output causes an increase in blood pressure during dialysis [9]. Limitation of essential fluid intake for health maintenance and prevention of excessive increase in IDWG so as to suppress the occurrence of complications in hemodialysis patients. The monitoring of the body fluids and the determination of IDWG by the nurse needs to be conducted carefully as a measuring tool to predict and prevent the risk of morbidity and mortality [10].

## **2 Method**

### **2.1 Study Design**

This study employed a qualitative descriptive with a phenomenological design with a particular focus on exploring the real experiences of patients with chronic kidney disease who have used the IDWG calculator.

### **2.2 Study Participants**

The participants of this study were patients suffering from CKD. Eight patients with chronic kidney disease that have used the IDWG calculator and undergone Hemodialysis (HD) at dr. Harjono Hospital Ponorogo were involved in sharing their real experience of using the IDWG calculator.

### **2.3 Instrument and Data Collection**

In-depth and semi-structured interviews and written data sources were used to collect the data. The interview data were obtained from informants of patients with CKD who have undergone hemodialysis at dr. Harjono Hospital Ponorogo.

The researchers studied the identity data of prospective informants. After determining the prospective informants according to the criteria, the researchers set up a meeting with the prospective informants to explain the objectives, benefits, research procedures, as well as the roles and rights of informants in this study. After establishing a trusting relationship, the researchers asked about the willingness of the prospective informants to become the informants in this study. After their agreement to become informants, the researchers set up interview sessions with them.

Validation of the data in this study used data triangulation and confirmability. Data triangulation was conducted by involving the use of different sources of data. The data triangulation in this study was performed by collecting the data from the patients' families and then compared with the data taken from the informants. Confirmability was carried out by the researchers at the second interview to confirm the temporary themes that had been made in the textural description to further increase the accuracy of the research data.

## 2.4 Data Analysis

Qualitative data analysis is related to data reduction and data interpretation, including information description, transcription, data organization, data category, summarizing data into a matrix, identifying variables and relationships between variables, and drawing conclusions.

## 3 Results

Based on Table 1, the number of informants is eight people consisting of patients with Chronic Kidney Failure who have undergone hemodialysis and used the IDWG calculator. Reviews of the results of interviews with patients on the IDWG calculator include:

**Table 1.** Demographic Characteristics of the Respondents.

Respondent Code	Gender	Age (years)	Profession	Time HD	HD Frequency (week)
I1	Male	57	Private	4 years	2
I2	Male	53	Retired (Immigration Staff)	7 years	2
I3	Female	52	Private	6 years	2
I4	Male	33	Private	2.5 years	2
I5	Female	63	Farmer	4 years	2
I6	Female	58	Retired (Civil Servant)	10 years	2
I7	Male	38	Private	5 years	2
I8	Female	63	Farmer	2 months	2

### 3.1 Use of the IDWG Calculator

All informants stated that they had used the IDWG calculator for two weeks.

Of the eight informants, 4 of them said that it was easy to use the IDWG calculator. Their statements include the following:

“In terms of how to use, the IDWG Calculator is easy, but patients often forget to use the application because the family is busy.” (Respondent 2)

“So far, there is no problem, and easy to use.” (Respondent 3)

“Easy to see weight gain percentage, practically no difficulty to use it.” (Respondent 6)

“Easy to check weight gain increase every day.” (Respondent 7).

### 3.2 Differences in Physical Health Prior to the Use of the IDWG Calculator

Some informants had some health complaints before using the IDWG calculator. Their complaints differed from one another, such as shortness of breath, weakness, fatigue, difficulty sleeping, and blood pressure instability. The informants commented as follows:

“Before using the IDWG calculator, I often felt short of breath and weak.” (Respondent 1)

“I rarely do activities at home, rarely cook and clean around the house.” (Respondent 3)

“At first, I was easily tired.” (Respondent 3)

“I find it hard to sleep.” (Respondent 6)

“Before using the IDWG calculator, my blood pressure was up and down.” (Respondent 6)

After using the IDWG calculator, patients felt positive changes in their physical health status, among others their blood pressure started to stabilize, their fatigue began to disappear so they could do light activities at home, their cough and shortness of breath got reduced, edema got reduced, and the need for sleep was adequately fulfilled.

There were also some changes to the patients, especially with their physical health complaints, as found in the following statements:

“Using IDGW calculator, now the blood pressure is getting better. Before it was 150/110 mmHg, and now it is 120/80 mmHg”. (Respondent 8)

“...easy to get tired. After using it, I can carry out light activities”. (Respondent 3)

“The shortness of breath when coughing begins to subside. The cough is not too severe. Usually assisted with oxygen cylinders, but now it’s not anymore”. (Respondent 3)

“Complaints of shortness of breath and weakness are reduced.” (Respondent 5)

“Sleep and daily activities have changed after hospitalization, such as shortness of breath began to decrease.” (Respondent 5)

“Edema reduced from 50 kg to 46 kg”. (Respondent 8)

“...no congestion anymore.” (Respondent 5)

“I started to be able to do light activities.” (Respondent 5)

“...can sleep well.” (Respondent 8)

### 3.3 Benefits of Using the IDWG Calculator for Physical Health

One of the benefits felt after using the IDWG calculator in physical health was being able to control blood pressure, as stated by the informants in the following statements:

“...can control blood pressure and daily needs.” (Respondent 7)

In addition to controlling blood pressure, the IDWG calculator was also useful in fluid intake, based on the informant’s statement below:

“...a consideration for making decisions about fluid intake.” (Respondent 2)

Another benefit that the informant felt after using the IDWG calculator was that it could detect complaints, as in the informants’ statements:

“The calculator can anticipate so that there are no complaints.” (Respondent 1)

“The results from the calculator support the assumptions when there are complaints.” (Respondent 4)

The benefits of controlling body fluids can also be felt through the use of this IDWG calculator, as conveyed by the informants through their statements:

“The calculator can tell the lack or excess of fluid.” (Respondent 1)

“IDWG calculator can find out excess or lack of body fluids.” (Respondent 1)

Using the IDWG calculator indeed requires patience and routine for the patients to become more accustomed to using the IDWG calculator. It was found that some informants have not felt the benefits because they have not been able to use it, as informed by the informants below:

“The perceived benefits have not been felt because it is new and I am not familiar with it.” (Respondent 2)

“The calculator is not used. I am away from family” (Respondent 5)

### 3.4 Sustainable Use of IDWG Calculator

The benefits of using the IDWG calculator have been felt by the community, such as it is easy to use, can control fluids, and can anticipate complaints. However, this tool needs improvement to improve its functions. Therefore, additional features that can support health improvement are needed, as in the statements of the informants below:

“IDWG calculator can measure liquid from food.” (Respondent 1)

“...help healing, control complaints, and increase awareness about body intake”. (Respondent 3)

“.... Better to hit and guide.” (Respondent 7)

## 4 Discussion

The patients’ experience while being hospitalized is the result of the interaction between the hospital and the patient. This interaction can be in the form of services provided by the hospital to patients, one of which is information that supports the patient’s health. Patient experience is a valuable experience evaluation of one’s satisfaction with processes and services that reflect the service process from the patient’s point of view.

#### 4.1 Use of the IDWG Calculator

Of the eight informants, 4 of them said it was easy to use the IDWG calculator. The use of IDWG Calculator is only used after HD. In terms of using the IDWG Calculator, it is easy, but patients often forget to use the calculator because the family accompanying the patient is busy with daily activities, so there is a lack of family assistance to use the IDWG calculator as a routine way in controlling the patient's fluid intake.

This shows that education is one of the important functions of nurses in meeting patient needs for information related to patient health to achieve optimal health [11]. The management of IDWG is not only influenced by the level of education but can also be generated from the patient's knowledge, attitudes, and actions towards diet management, fluids obtained by patients from their own or other people's experiences, and other sources of information such as the media [12].

One of the learning theories for education that uses an interpersonal approach to patients is the Theory of Planned Behavior (TPB). This theory was developed by Ajzen in 1967 and includes three things, namely beliefs about possible outcomes and evaluation of the behavior (behavioral beliefs), beliefs about the expected norms and motivation to meet these expectations (normative beliefs), and beliefs about the existence of factors that can support or hinder behavior and awareness of the strength of these factors (control belief) [13].

Family can be a very influential factor and determine individual health beliefs and values and can also determine the treatment program received by kidney failure patients. Family support is one of the factors that influence patient compliance which can have an impact on client failure in undergoing kidney failure therapy programs.

#### 4.2 Differences in Physical Health Before Using the IDWG Calculator

Edema can also affect muscle strength. If the body tissue is edematous, the amount of free fluid in the interstitium can reach half or more of the interstitium volume. This will extend the diffusion distance of food and oxygen from the capillaries to the tissue, which is manifested by weakness in the patient, either general fatigue, weakness due to sleep disturbances, weakness due to uremia, or fatigue due to insufficient physical energy [14].

The results of an interview with one of the informants who had edema showed that the patient only knew that fluid restriction was necessary, but the patient did not do strict fluid restriction because he had only undergone hemodialysis for two months. In line with research conducted by Bayhakki, new CKD patients undergoing hemodialysis tend to be maladaptive towards fluid restriction programs, which is the reason for the high IDWG of patients [14].

The decrease in IDWG values can also have an impact on decreasing the degree of edema in hemodialysis patients. In healthy conditions, the quality of human life will always be maintained. However, it will be different if humans are in a sick condition, especially in patients with chronic diseases, one of which is kidney failure [15]. In patients with kidney failure, there is a decrease in physical condition.

### 4.3 The Patients' Experience During Treatment

The patients' experiences during treatment of self-concept, roles, and extrinsic factors (medical conditions, access to information, adaptation process, socio-economic and therapeutic communication) can affect client anxiety [2]. The more access to information about the disease they suffer, the better the patient's adaptation process will be. In this case, well-planned and successive therapeutic communication will help patients always remember to improve their quality of life [3].

The main concept to overcome this anxiety is to reduce the fear in the patient's mind by providing structured and routine education so that the patient can express the fear in his mind and can reduce his anxiety [16], emphasizing that there is an effect of education on anxiety levels in hemodialysis clients [17].

### 4.4 Sustainable Use of IDWG Calculator

Providing periodic and continuous education raises a sense of care for patients because they are always reminded and cared for so that patients become aware of how to take care of themselves by maintaining their health and complying with the hemodialysis diet [1].

## 5 Conclusion

Most of the informants' experiences as patients with kidney failure undergoing hemodialysis and using the IDWG calculator found that the IDWG calculator was easy to apply and beneficial for their physical and psychological health.

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**Ethical Consideration.** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants involved in the study.

**Declaration.** The authors declare that they have no conflicts of interest.

## References

1. Devins GM, Binik YM, Mandin H, et al. The Kidney Disease Questionnaire: a test for measuring patient knowledge about end-stage renal disease. *J Clin Epidemiol* 1990; 43: 297–307.
2. Briscoe GT, MAJ AN, Beth Quatrara DNP. Nursing telephone follow-up to reduce 30-day readmissions and post-discharge complications for the Adult Hemodialysis Patient.
3. Winarti R, Retnaningsih D, Wulandari P. Management of Discharge Planning Implementation on Chronic Renal Failure Patients. *Indones J Glob Heal Res* 2021; 3: 101–108.
4. Halasyamani L, Kripalani S, Coleman E, et al. Transition of care for hospitalized elderly patients—development of a discharge checklist for hospitalists. *J Hosp Med* 2006; 1: 354–360.
5. Nursalam N, Kurniawati ND, Putri IRP, et al. Automatic reminder for fluids management on confidence and compliance with fluid restrictions in hemodialysis patients. *Syst Rev Pharm* 2020; 11: 226–233.
6. Maf'ula D, Nursalam N, Sukartini T. Quality of nursing worklife based on caring model for improving nurse performance in hospitals. *Indones Nurs J Educ Clin* 2020; 5: 172–184.
7. Trillini M, Perico N, Remuzzi G. Epidemiology of end-stage renal failure: the burden of kidney diseases to global health. In: *Kidney Transplantation, Bioengineering and Regeneration*. Elsevier, 2017, pp. 5–11.
8. Robinson BM, Akizawa T, Jager KJ, et al. Factors affecting outcomes in patients reaching end-stage kidney disease worldwide: differences in access to renal replacement therapy, modality use, and haemodialysis practices. *Lancet* 2016; 388: 294–306.
9. Chiaranai C. The lived experience of patients receiving hemodialysis treatment for end-stage renal disease: a qualitative study. *J Nurs Res* 2016; 24: 101–108.
10. Kim Y, Evangelista LS, Phillips LR, et al. The End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ): testing the psychometric properties in patients receiving in-center hemodialysis. *Nephrol Nurs J J Am Nephrol Nurses' Assoc* 2010; 37: 377.
11. Nugent RA, Fathima SF, Feigl AB, et al. The burden of chronic kidney disease on developing nations: a 21st century challenge in global health. *Nephron Clin Pract* 2011; 118: c269–c277.
12. Eckardt K-U, Coresh J, Devuyst O, et al. Evolving importance of kidney disease: from subspecialty to global health burden. *Lancet* 2013; 382: 158–169.
13. Agustiyowati THR. The Effectiveness of Roy's adaptation model for patients with chronic kidney disease undergoing pre-dialysis in Indonesia. *J Ners, Eff Roy's Adapt Model patients with chronic kidney Dis undergoing pre-dialysis Indones* 2018; 13: 150–155.
14. Weisbord SD, Carmody SS, Bruns FJ, et al. Symptom burden, quality of life, advance care planning and the potential value of palliative care in severely ill haemodialysis patients. *Nephrol Dial Transplant* 2003; 18: 1345–1352.
15. Codd C, Martinusen D, Cardone KE, et al. Preparing for implementation of a medication reconciliation measure for dialysis: expanding the role of pharmacy technicians. *Am J Heal Pharm* 2020; 77: 892–896.
16. Byrd EJ. Discharge from Hospital to Home: Implementation and Use of the AHRQ IDEAL CHF Discharge Planning and AHA CHF Discharge Checklist.



17. Feizalahzadeh H, Tafreshi MZ, Moghaddasi H, et al. Development and validation of a theory-based multimedia application for educating Persian patients on hemodialysis. *CIN Comput Informatics, Nurs* 2014; 32: 242–247.

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