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SIGNIFICANCE OF FOOD STRATEGY FOR PATIENTS WITH CHRONIC KIDNEY DISEASE: A CASE STUDY

Nowab Md Arif[1*], Dr. Saurabhi Sarmah[2]

[1*]D. Pharm, MSW, Research Scholar, School of Social Science, The Assam Kaziranga University, Jorhat, Assam
[2]PhD, Associate Professor, School of Social Science, The Assam Kaziranga University, Jorhat, Assam

***Corresponding Author:** Nowab Md Arif
*Seri Road, P.O.- Purana Titabar, Jorhat, Assam, Pin – 785632.
E-Mail- nowab2019@gmail.com, Mobile No – 98641-43213 / 98548-21565

ABSTRACT

The serious complications for the patient and rising costs in terms of healthcare have made chronic kidney disease one of the significant global health challenges. Dietary management can slow the progression of CKD, maintain metabolic balance, and improve outcomes. This paper profoundly examines food modification strategies, including protein, sodium, and fluid management restriction, potassium and phosphorus control, and specific diets like the Mediterranean and DASH. A comprehensive literature review emphasizes the personalization of nutritional interventions for preserving renal function, thereby reducing complications from CKD. Personalized nutrition therapy tailors dietary interventions based on the stage of disease, comorbidities, and patient preference. Case studies have been done to illustrate the quality of life that active disease management and adherence to nutritional recommendations could provide. By incorporating evidence-based dietary strategies into practice, healthcare providers can ensure that patients with CKD experience long-term health benefits. Ongoing research was also done on updated dietary recommendations concerning their long-term implications on renal function. Greater attention among healthcare providers and teaching patients to understand the significance of diet therapy is highly applicable to enhance CKD management. Tailored nutrition therapy will assist the patient, slow disease progression, and improve the patient's total well-being.

Keywords: Chronic Kidney Disease, Dietary Modification, Nutritional Therapy, Disease Management, Renal Function

Introduction: Importance of Diet in CKD Patients

Chronic kidney disease (CKD) is a progressive illness that dramatically affects individuals' health and quality of life. Successfully addressing CKD requires a comprehensive strategy, with dietary approaches vital in slowing disease advancement, minimizing complications, and enhancing patient outcomes (Naber et al., 2021). Nutritional strategies assist in managing symptoms, averting additional kidney damage, optimizing metabolic balance, and establishing diet as a fundamental aspect of CKD treatment (Palmer et al., 2017).

Key Dietary Considerations for CKD Patients

1. Nutrient Monitoring

It is important to know the diet when treating CKD patients. Nutrient intake is essential to reduce the risk of hyperkalaemia, hyperphosphatemia, and metabolic acidosis. Recommended dietary modifications should include to decrease the production of uremic toxins and lower cardiovascular risks, protein consumption should be limited to 0.6-0.8 g/kg/day under stress using high-quality protein sources (Kalantar-Zadeh et al). To avoid mineral imbalances, phosphorus and potassium intake should be reduced from processed foods, and potassium-rich foods should be restricted. Limiting sodium and fluid intake to less than 2 g per day and maintaining fluid balance will help manage blood pressure and prevent fluid overload. Keeping an appropriate level of calcium intake is vital to support bone health while reducing the risk of vascular calcification (Apetrii et al., 2021)

2. Dietary Patterns

Specific dietary patterns have shown potential benefits in CKD management:

- Mediterranean Diet: This diet focuses on plant-based foods, whole grains, healthy fats, and limited red meat and is associated with improved kidney function and reduced cardiovascular risk (Chauveau et al., 2018).
- Whole Foods Plant-Based Diet: This diet prioritizes unprocessed, fibre-rich foods and has been linked to reduced dietary acid load and improved metabolic health (Freeman et al., 2023).
- DASH Diet: Originally developed for hypertension, the DASH diet focuses on fruits, vegetables, lean proteins, and whole grains, which may help slow CKD progression (Naber et al., 2021).

3. Food as Medicine

The "food as medicine" notion is gaining recognition as an approach to attack the uremic phenotype of CKD patients. Bioactive nutrients modify gut microbiota, minimize inflammation, and optimize mitochondrial function, potentially ameliorating CKD complications (Mafra et al., 2020). Food therapy geared towards maximizing microbiome wellness—more fibre consumption and decreased processed food consumption—could prove influential in the control of CKD.

4. Protein Intake and CKD Progression

A plant-dominated low-protein diet (PLADO), with more than 50% of the protein consumed in plant-based sources, has been linked with the slowing of CKD progression and lower cardiovascular risk (Kalantar-Zadeh et al., 2020). Plant proteins produce less uremic toxins compared to animal proteins; thus, they are a better option for patients with CKD (Adair et al., 2020).

5. Adherence and Patient Education

Dietary adherence is a great challenge in the management of patients with CKD. Ways of improving adherence include:

•Personalized Nutrition Plans: Personalized meal plans that are specific to patient likes and cultural identities enhance long-term adherence (Beto et al., 2016).
•Integration of Technology: Mobile devices and diet tracking gadgets help patients make the most of their nutrient intake and stay compliant with nutrition guidelines (Hu et al., 2020).
•Patient Education Programs: Organized counseling regarding CKD-specific nutrition enables patients to make better-informed dietary decisions (Zheng et al., 2023).

Dietary Interventions and Their Impact on CKD Progression

Dietary changes are central to the management of chronic kidney disease (CKD), as they reflect directly on metabolic derangements, cardiovascular hazards, and renal function overall. There is an increasing body of evidence favouring the use of tailored dietary strategies in retarding CKD progression and enhancing outcomes in patients (Naber et al., 2021).

The following discussions are how nutritional interventions affect CKD complications, adherence to guidelines, and the direction of future studies.

Protein Restriction and Quality Considerations

Protein consumption is a vital element in CKD care since excess protein intake augments nitrogenous waste, further deteriorating renal function loss (Apetrii et al., 2021). Research indicates that a low-protein diet dominated by plants (PLADO), with plant-based proteins accounting for over 50% of overall intake, could mitigate cardiovascular hazards and decelerate CKD development (Kalantar-Zadeh et al., 2020). Controlled protein restriction (0.6–0.8 g/kg/day) has been associated with decreased production of uremic toxins and better metabolic stability (Carrero et al., 2020).

Sodium and Fluid Management

Restriction of sodium is critical during CKD care to avoid hypertension, fluid accumulation, and cardiac complications (Chauveau et al., 2018). Present guidelines are to restrict dietary sodium to <2.3 g/day in order to uphold optimal blood pressure and minimize edema (Palmer et al., 2017). Even fluid intake requires individualization such that hydration demand is balanced with the potential risk of fluid overload, particularly during late stages of CKD (Rysz et al., 2017).

Potassium and Phosphorus Control

Hyperphosphatemia and hyperkalaemia are frequent CKD complications resulting from compromised renal excretion (Mafra et al., 2020). Patients need to regulate potassium intake carefully by eating low-potassium vegetables and fruits and not consuming processed foods with excessive phosphate additives. Literature shows that if well planned, plant-based diets can supply adequate protein while achieving potassium and phosphorus balance (Freeman et al., 2023).

The Role of Dietary Patterns in CKD Management

There is evidence that adherence to healthy eating habits such as the Mediterranean diet and the Dietary Approaches to Stop Hypertension (DASH) can be highly favourable for patients with CKD (Hu et al., 2020). These diets focus on whole grains, lean meats, and healthy fats with decreases in sodium and processed foods consumption, which may reduce mortality due to CKD (Ko et al., 2017). Studies cite that these types of diets decrease oxidative stress, correct metabolic acidosis, and promote cardiovascular health (Zarantonello et al., 2023).

Adherence Strategies and Patient Education

Despite the widely documented advantages of dietary changes, compliance is difficult (Beto et al., 2016). Research shows that individualized nutritional guidance, mobile health software, and planned meal planning enhance compliance and patient participation (Kim et al., 2020). Patient educational activities, such as dietary workshops and one-on-one consultations, promote long-term dietary compliance (Adair et al., 2020).

Future Research and Clinical Integration

Continuing research is focused on further optimizing dietary guidelines and assessing their long-term effects on renal function and quality of life (Hahn et al., 2018). The incorporation of evidence-based dietary approaches into clinical practice guidelines guarantees CKD patients appropriate nutrition therapy (Zheng et al., 2023). Future research must also investigate the interaction between diet, gut microbiota, and CKD progression, potentially opening new therapeutic avenues (Mafra et al., 2020).

Nutritional control is also a critical element of CKD management, with overwhelming evidence demonstrating slowing disease progression, decreased complications, and improved patient well-being. Monitoring nutrition in the restriction of protein, sodium, and fluid intake and equilibrium of potassium and phosphorus concentrations is necessary to prevent metabolic imbalances and preserve renal function. Vegetarian diets such as DASH and Mediterranean diets have been shown to reduce cardiovascular risks tremendously and enhance renal function. Further, bioactive food components

are increasingly contributing towards the correction of the uraemic phenotype, along with inducing inflammation and intestinal microbiota balance.

Tailored dietetic interventions based on patient-specific needs must be implemented to optimize clinical outcomes. Systematic education of the patient, concordance principles, and instituting nutritional alterations in clinical guidelines will optimize long-term disease control. With further investigation, ongoing research into emerging nutritional interventions, case series, and newer food fads will continue to shape CKD dietary management. Healthcare providers should emphasize more patient-specific strategies to enable the patient to be a self-activator of his or her health, delaying dialysis and improving his or her quality of life. The healthcare community can achieve optimal CKD outcomes using evidence-based nutrition and by fostering long-term, patient-centred care.

RESULTS AND DISCUSSION

Research was revealed that the low levels of kidney function are to blame for the dramatic drop in life expectancy. Women survive longer than men with different levels of kidney function and ages. Chronic kidney disease must be treated in order to improve the outcomes of health. (Turin et al., 2012).

CKD patients present with absolute as well as functional iron deficiency. CKD related anaemia is associated with increased morbidity and mortality. Screening of anaemia should be performed in CKD patients and iron therapy should be given to all the anaemic patients. (Gafter-Gvili et al., 2019). Vitamin D deficiency occurs in children and adults worldwide. Vitamin D is a part of a healthy musculoskeletal system. Vitamin D level is decreased in CKD patients and that may cause secondary hyperparathyroidism and other disease states. Normal 25-hydroxyvitamin D level is needed for health and well-being. (Holick, 2005).

Low baseline serum calcium also correlated with quicker decline in renal function in stage 3b, 4, and 5 CKD patients in a study. Serum calcium did not correlate with decline in eGFR in stage 3a CKD patients. Significance of results: Measurement of serum calcium in CKD patients, particularly in its progressive phases, may yield significant leads to the renal disease pathogenesis and may help to govern the process of therapy management with a view to slow down the rate of diminution of renal function. (Janmaat et al., 2018)

While all of these foods are normally wholesome for kidney function, a few of them would not be suitable for CKD patients because of either of their characteristics, i.e., their very high nutritional value or texture that would be inducing renal insult or complication. A few of such normally healthy foods for kidneys but not very healthy for CKD patients are given below. These are difficult to recognize every time. They are bananas, avocados, oranges, tomatoes, milk, potatoes, spinach, nuts, chocolate, whole grains, apricots, kiwi, dates, beetroot, sweet potatoes, honey, pumpkin seeds, and pineapple, all of which contain potassium and phosphorus. Intake of these foods may lead to hyperkalaemia and electrolyte disturbance in CKD patients. Restriction or avoidance of these foods can avert complications such as mineral and bone disorders and cardiovascular complications in CKD patients.

Food is a part of man's life and a necessity for CKD patients. There are, however, some very interesting facts about food that are misleading to CKD patients. They are misleading and ambiguous in relation to the nutritional needs and restrictions of CKD patients. One has to be cautious in approaching these facts when manipulating them and their effects on CKD patients to give them their requirements nutritionally.

Water is needed for normal kidneys but the patients suffering from CKD need to restrain water consumption. The water requirement of a normal person is 2.5 litters daily, but patients with CKD should regulate the quantum of water consumption to maintain the symptoms and prevent the aggravation of kidneys. They should consult doctors and specialists to know the optimal amount of water consumption based on their condition.

CKD patients are compelled to limit protein intake as a form of dietary restriction. But while undergoing haemodialysis or peritoneal dialysis, protein must be consumed in greater amounts to meet the body's nutritional requirements.

Coconut water is usually a very good beverage to be consumed by human beings. Coconut will not be prescribed to CKD patients because coconut contains a lot of phosphorus. It will be highly unlikely for CKD patients to control their diet in such a manner that phosphorus because too much phosphorus will hinder the functioning of kidneys. Coconut water cannot be consumed by CKD patients as a precautionary measure.

Potassium food is not recommended in the CKD patient but recommended in the hypertension patient. Therefore, the CKD patient should completely abstain from taking potassium food. The physician has to remember the patient's history of disease and health while prescribing a medicine. Some of the real cases are discussed below, explaining the importance of dietary change in successful control of chronic kidney disease. The case studies indicate the importance of modifying the necessary dietary changes for successful control of the disease.

Case Study: 1. Mr. W- Managing Chronic Kidney Disease with Multimorbidity

Patient Profile: Name: Mr. W, Age: 72 years Gender: Male, Medical History: Chronic Kidney Disease (since 2015), Diabetes, Hypertension, Hypothyroidism, Cardiac Problems. Initial Creatinine Level (2015): 1.5 mg/dL Current Creatinine Level: 1.6 mg/Dl

Background:

Mr. W is a 72-year-old male who has had CKD since the year 2015. He also has a very complex profile of comorbidities involving diabetes, high blood pressure, hypothyroidism, and cardiac conditions previously. In the midst of all the issues precipitated by these conditions, Mr. W remains a very firm and compliant patient in taking care of himself.

Medical History: Mr. W had CKD in 2015 when his creatinine was 1.5 mg/dL. Familiar with the degree of his illness, he strictly adhered to his medical regimen, regularly consulting his physician and taking scrupulous care of his diabetes and hypertension to keep them within normal ranges. Due to early treatment by a physician and modification of lifestyle, he managed to keep his blood glucose and blood pressure levels within normal ranges and thereby prevented further kidney damage.

Importance of Dietary Management: One of the foundations of Mr W's success at managing CKD has been his total commitment to consuming the correct diet. From the time of his diagnosis, he appreciated the very important role dietary modification has to offer in preserving renal function and optimizing health gain in CKD patients. With the recommendation of his treatment physician, he adopted a renal-appropriate diet tailored to his individual nutritional needs with emphasis laid on not limiting protein, sodium, and potassium intake while highlighting nutrient-dense, kidney-friendly foods.

Current Status: At the time of the last evaluation, Mr W's creatinine value remains normal at 1.6 mg/dL, like in well-managed CKD progression. Being with the multifaceted aspect of his illnesses, he still shows resilience and active engagement with his healthcare process. Through tracking, adherence to medical recommendations, and active modification of lifestyle, Mr W proves the important impact of patient empowerment and self-management on chronic illness outcomes.

The instance of Mr. W accentuates the requirement of an intensive and patient-centred model to handle multimorbidity-associated chronic kidney disease. Through full engagement, concordance with health recommendations, and vigorous regulation of diet, Mr. W has shown that the complexity of CKD could be efficiently dealt with under the guise of excellent quality of life. His story is testimony to the resilience, empowerment, and self-activating care potential that achieves the best results for health with chronic illness.

This case study highlights the need for holistic and patient-specific care approaches involving medical management, lifestyle modification, and patient education to deal with the challenges of CKD and comorbidities efficiently.

Case Study: 2. Mr. X- Managing Chronic Kidney Disease and Chronic Liver Disease with Multimorbidity

Patients Profile: Name: Mr. X, Age: 77 years, Gender: Male, Medical History: Chronic Kidney Disease (since 2016), Diabetes, Hypertension, Hypothyroidism, Chronic Liver Disease, Cardiac Problems. Initial Creatinine Level (2016): 1.8 mg/dL, Current Creatinine Level: 2.4 mg/dL

Background: Mr. X is a 77-year-old man and has been carrying a double burden of chronic liver and kidney disease since 2016. He is diabetic, hypertensive, hypothyroid, and has cardiac disease. Despite his disease morbidity, Mr. X has also been demonstrating grit and active coping by getting early medical treatment and having the right food consumed properly from the start.

Medical History: Apart from CKD, Mr. X also had CKD in 2016 with creatinine level 1.8 mg/dL. Liver disease also initiated then, so once more there was an aspect of added intricacy in his medical history. Mr. X has been managing diabetes and high blood pressure with all these conditions. He took normal blood sugar and blood pressure as much as possible. He has also followed up with his medical care provider on a regular basis and dietary and medication regimen changes as prescribed.

Significance of Dietary Control: Adherence to Mr. X's diet has been the major impetus in controlling his CKD and liver disease. Having an understanding of dietary change as the pivotal role in maintaining renal and liver function, he has strictly followed dietary advice for optimal health gain. Mr. X's diet involves protein, sodium, and potassium limitation for the maintenance of renal function and the inclusion of liver-compatible food for the prevention of liver complications.

Present Status: The latest reading in the level of creatinine in Mr. X reached a level of 2.4 mg/dL, which reflects the severity of CKD disease. But still, nevertheless, his reactivity and aggression against health never lose their virility. Aside from complexity to which CKD-related is his, and indeed even chronic liver disease itself, Mr. X is making an extra effort to be in compliance with his medical treatment in the way of obtaining an early consultant's advice medically, taking all his prescribed therapies, and a diet plan of balance based on his customized medical need.

Mr. X's case presentation illustrates the complexity of multimorbidity in chronic kidney and chronic liver disease management. In spite of all his illnesses, diabetes, hypertension, hypothyroidism, and heart disease, he has been stable and totally dedicated to his medical process. By stressing regular medical check-ups, adherence to drug therapy, and eating habits, Mr. X is a common example of the patient-centred and holistic way to the best outcome in multimorbid patients.

The case presentation demonstrates the vast promise of active self-management, medication adherence, and dietetic intervention in preventing chronic kidney disease and progression of additional liver disease, particularly in multimorbidity.

Case Study: 3. Mr. Y- Chronic Kidney Disease Progression with Multimorbidity

Patients Profile: Name: Mr. Y, Age: 45 years, Gender: Male, Medical History: Chronic Kidney Disease (since 2021), Diabetes, Hypertension, Hypothyroidism, Cardiac Problems. Initial Creatinine Level (2021): 1.8 mg/dL, Current Status: On Dialysis

Background: Mr. Y, a 45-year-old male patient, was diagnosed with chronic kidney disease (CKD) since 2021. His history included diabetes, hypertension, hypothyroidism, and cardiac disease. Severe disease in the dialysis history of Mr. Y has been marred with poor disease control and hence renal function deterioration and dialysis requirement followed.

Medical History: Mr. Y was diagnosed with CKD in 2021 with a creatinine level of 1.8 mg/dL. He later developed comorbidities of diabetes, hypertension, hypothyroidism, and cardiovascular disease. His disease condition at the time of diagnosis was poor. His adherence to his chronic illness management was poor. He was not able to control his diabetes and hypertension to target, most times taking the opposite of medical advice and failing to follow up on treatment as recommended.

Need for Diet Control: The second most important reason for worsening CKD of Mr. Y was not being able to exercise diet control as required by the condition. Despite understanding very clearly why diet control is required in CKD, Mr. Y was not able to utilize nutritional counseling properly. His diet had no restriction at all regarding protein, sodium, and potassium intake, and these led to deterioration and dialysis requirement in the kidneys. His failure to maintain proper control over his diet led to his CKD progressing very rapidly to the point of requiring renal replacement therapy within a very short period.

Current Status: At the latest follow-up, Mr. Y was on dialysis since his CKD was very far advanced at presentation. Even after treatment, his prognosis for his disease is bleak, and numerous dialysis sessions have to be tolerated with hopes of having working kidneys. These setbacks in CKD as well as his need for dialysis are both direct consequences of loss of disease control due to non-adherence to clinic guidelines and staying away from nutritional programs.

The case of Mr. Y serves as a sharp reminder of the absolute need for active disease control and compliance with medical treatment in multimorbidity and chronic kidney disease. Regardless of the level of comorbidities among diabetes mellitus, hypertension, hypothyroidism, and cardiovascular disease, Mr. Y's failure of disease control, especially nutritional control, resulted in the aggressive presentation of his CKD and dialysis.

Case study is most appropriate in articulating the most imperative human need of care planning, ongoing care, and patient education for realizing the best health outcome among chronic sick patients. Rajib case demonstrates how critical human need is in finishing and multi-disciplinary treatment of the disease causative medical condition and disease determinants in an attempt to modify the behaviour and lifestyle.

Case Study: 4. Mr. Z- Chronic Kidney Disease Progression with Multimorbidity

Patient Profile: Name: Mr. Z, Age: 60 years, Sex: Male, History: Chronic Kidney Disease (2019 onwards), Diabetes, Hypertension, Hypothyroidism, Cardiac Issues, Baseline Creatinine Result (2019): 1.7 mg/dL**,** Current Status: On Haemodialysis.

Background: Mr. Z is a 60-year-old male patient with CKD since 2019. He also has other comorbidities such as diabetes, hypertension, hypothyroidism, and cardiovascular disease. Due to the severity of his disease, the course of CKD has progressed after an uncontrolled history of his disease.

Medical History: Mr. Z also had CKD in 2019 when his creatinine was 1.7 mg/dL. He was also later diagnosed with diabetes, hypertension, hypothyroidism, and cardiovascular disease, all of which compounded his medical condition. But Mr. Z had trouble with controlling his chronic diseases as well. He repeatedly failed to keep his diabetes and blood pressure well controlled and chronic failure to comply with medications prescribed. Poor drug compliance also compounded his CKD in the long term.

Dietary Management Role: One of the best indicators of Mr. Z's ultimate development of CKD is that he could not follow a diet that would optimize kidney function. Not only is Mr. Z highly educated in terms of dietary modification in managing CKD, he could not follow dietary suggestions. His intake was not restricted in protein, sodium, and potassium as required, with resulting worsening of his renal insufficiency and requirement for dialysis. Lack of proper control of his diet played a crucial role in progressing his CKD, with requirement of renal replacement therapy in fairly short intervals.

Current Status: At the most recent time of assessment, Mr. Z was on dialysis for end-stage CKD. His prognosis despite his therapy is guarded and will be based on further dialysis therapy to keep renal function ongoing. His CKD advancement to the extent that he required dialysis is evidence of the effect of bad control of the disease, i.e., nonadherence to physician's treatment, nonadherence to appropriate feeding, and stop-and-go ingestion of medication.

Mr. Z's case is a classic illustration of the price of lousy disease control in chronic kidney disease and multimorbidity. Following the diagnosis of a bundle of chronic diseases, including diabetes mellitus, hypertension, hypothyroidism, and cardiovascular disease, Mr. Z's refusal to adhere to medical counsel and diet resulted in his CKD progression to the extent that dialysis was necessary.

This case presentation demonstrates the role of patient education, follow-up support, and patient-centred care strategies in maximizing the chance of health outcomes among patients with chronic diseases. The Mr. Z case depicts multidisciplinary interventions to target disease conditions and the behaviour and lifestyle factors of disease exacerbation.

CONCLUSION

The entire discourse of the current research paper has emphasized the pivotal role that is being performed by food modification in the case of CKD management. The current research has presented

pertinent facts under the scenario of optimizing the modalities of nutrition for improvement in the patient's care and well-being, as well as quality outcomes through research studies in various approaches towards food modification and examining how and why they are suitable in the case of CKD management.

Nutritional modification is also an important part of CKD care, a drug-free treatment to reduce the advancement of the disease and ease symptoms. Fundamental nutrition practices such as protein, sodium, and fluid restriction, potassium and phosphorus management, caloric restriction, and nutrition therapy initiated by the patient are fundamental to the maintenance of renal function and the health of patients.

Case considerations promoted disease active management, compliance with medicine treatment, and follow-up dietary for maximal improvement in multimorbid CKD patients. This is typical of the gain achieved from worldwide standard care, and this is that of individualized interventions to compensate for individualized management strategies within each patient's own specific need. Evidence-based nutrition management would be integrated as a part of practice guidelines and knowledge regarding the importance of the correction of nutrition in CKD treatment in the future. Patient empowerment and education would remain a primary concern in CKD treatment with diet compliance and self-management capabilities being a highest priority.

Moreover, studies must continue to find the most useful diet interventions, compare their long-term effects on kidney function and clinical status, and provide evidence-based recommendations for practice. Putting diet at the centre of CKD management makes it possible to maximize patient outcomes and improve patients' quality of life with this chronic disease.

Finally, the best dietary management interventions individually applied to the individual patient are key to CKD and outcome control. From a more general viewpoint in regard to dietetic intervention functions in CKD regulation and intervention at the patient level, clinicians can engage patients and empower them as active participants in their care and welfare toward clinical outcomes and quality-of-life improvement.

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