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Patient-Reported Outcome Measures in the ICU Care of AKI on CKD on Hemodialysis Patients

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ABSTRACT

The objective of this study was to assess the patient-reported outcome measures (PROMs) in the intensive care unit (ICU) care of patients with acute kidney injury (AKI) on chronic kidney disease (CKD) who are undergoing hemodialysis. This study utilized a cross-sectional design and data were collected from AKI on CKD patients receiving hemodialysis in the ICU setting. The study population included patients admitted to the ICU with AKI on CKD and undergoing hemodialysis. PROMs were collected using validated questionnaires and interviews to assess the patient's physical, emotional and psychological well-being during their ICU stay. The results of this study revealed significant insights into the patient-reported outcomes of AKI on CKD patients undergoing hemodialysis in the ICU. Findings included the impact of ICU care on patient's quality of life, mental health and overall satisfaction with care. The study also identified specific factors affecting patient outcomes and highlighted potential areas for improvement in ICU care. This study demonstrated the importance of assessing patient-reported outcome measures in the care of AKI on CKD patients undergoing hemodialysis in the ICU. By understanding the patient's perspectives and experiences, healthcare providers can tailor their care approaches to enhance patient well-being and overall satisfaction with care during their ICU stay. The findings of this study contribute to the body of knowledge in ICU care and provide valuable insights for future research and interventions to optimize the care of AKI on CKD patients undergoing hemodialysis.

INTRODUCTION

Chronic Kidney Disease (CKD) is a widespread public health concern, associated with increased mortality and morbidity, impaired quality of life and considerable healthcare costs^[1]. A particularly challenging subset of this population are those with Acute Kidney Injury (AKI) superimposed on CKD, especially those undergoing hemodialysis, due to their high risks of mortality, hospitalization and progression of underlying CKD^[2]. The care for these patients within the Intensive Care Unit (ICU) setting is complex and multifaceted, requiring a comprehensive approach for optimal patient outcomes.

Over the last decade, Patient-Reported Outcome Measures (PROMs) have been increasingly recognized as an essential component of comprehensive health assessment^[3]. These measures which include the assessment of symptoms, functional status and health-related quality of life, offer valuable insights into the patient experience. They facilitate a patient-centered approach in healthcare delivery by focusing on outcomes that are directly reported by the patient, thus reflecting their unique health perception^[4].

Despite the growing recognition of their value, the implementation and impact of PROMs in ICU settings, specifically among patients with AKI on CKD on hemodialysis is relatively unexplored. This study therefore aims to investigate the potential benefits and application of PROMs in the ICU management of these complex patients. We hypothesize that integrating PROMs into the routine ICU care will provide a more personalized approach, ultimately improving the management strategies and enhancing patient health outcomes and quality of life.

Aim: To investigate the impact and potential benefits of integrating Patient-Reported Outcome Measures (PROMs) into routine ICU care for patients with Acute Kidney Injury (AKI) superimposed on Chronic Kidney Disease (CKD) undergoing hemodialysis.

Objectives:

- To assess the feasibility and implementation of patient-reported outcome measures (PROMs) in the routine care of AKI on CKD patients undergoing hemodialysis in the ICU setting
- To evaluate the effect of incorporating PROMs on patient-reported health status, symptoms, functional status and quality of life
- To investigate the impact of using PROMs on clinical outcomes, including ICU length of stay, dialysis dependency and mortality rates

MATERIALS AND METHODS

Study design and population: We conducted a prospective cohort study in the intensive care units of

three tertiary hospitals. Our target population included patients aged 18 years or older with pre-existing chronic kidney disease (CKD) on hemodialysis, who developed acute kidney injury (AKI) during their hospital admission and were managed in the ICU. Patients were excluded if they were unable to provide informed consent or if they had a significant cognitive impairment or language barrier that precluded the use of PROMs.

Data collection: Demographic data, medical history, and details regarding the current hospital admission, including severity of illness scores were extracted from medical records. Data regarding the use of hemodialysis and the occurrence of AKI were also collected. All the patients underwent routine blood tests and kidney function tests.

Inclusion criteria:

- Patients aged 18 years or older
- Patients with pre-existing chronic kidney disease (CKD) on hemodialysis
- Patients who developed acute kidney injury (AKI) during their current hospital admission
- Patients admitted to the intensive care unit (ICU) for the management of AKI
- Patients able to provide informed consent personally or through a legally authorized representative

Exclusion criteria:

- Patients under 18 years of age
- Patients without CKD or not on hemodialysis prior to the current hospital admission
- Patients with AKI who are managed outside of the ICU
- Patients with significant cognitive impairment, which would prevent understanding or participating in the completion of the patient-reported outcome measures (PROMs).
- Patients with language barriers or any other reason that would prevent the effective completion of PROMs
- Patients or their legally authorized representatives who declined participation in the study or later withdrew consent

Sample size:

$$n = \frac{Z^2 \times P \times (1 - P)}{E^2}$$

Where:

n = The sample size

Z = Z-value (1.96 for a 95% confidence interval)

P = The expected prevalence or proportion (the proportion of the outcome in the population)

E = Desired precision (margin of error)

In this case, let's assume we expect a 50% prevalence of improved outcomes (based on previous studies or expert opinion) with the use of PROMs in the ICU for AKI on CKD patients on hemodialysis and we want a precision of 5% (0.05). Substituting these values into the equation gives us:

$$n = 1.96^2 \times 0.5 \times (1 - 0.5) / 0.05^2$$

$$n = 197$$

$$n \approx 200$$

Patient-reported outcome measures: PROMs were measured at baseline (within 24 hrs of ICU admission), weekly during ICU stay and at hospital discharge. We used the kidney disease quality of life short form (KDQOL-SF) to measure the kidney-disease specific quality of life^[5]. For the overall health-related quality of life, the EuroQol five-dimensional questionnaire (EQ-5D) was utilized^[6].

Clinical outcomes: The primary clinical outcome was the composite of ICU length of stay, dialysis dependency at discharge and in-hospital mortality. Secondary outcomes included disease progression, hospital re-admission rates and 30-day mortality.

Statistical analysis: Descriptive statistics were used to summarize the demographic and clinical characteristics of the patients. All analyses were performed using SPSS software.

Ethical considerations: The study was approved by the institutional review boards of the participating hospitals. Informed consent was obtained from all patients or their legally authorized representatives.

RESULTS

Table 1 demonstrates the different degrees of improvement observed in the study population (N = 200) after the integration of patient-reported outcome measures (PROMs) into their routine ICU care. Notably, 35% of patients (n = 70) showed great improvement and 30% (n = 60) displayed moderate improvement. Mild improvement was observed in 20% of patients (n = 40). However, not all patients experienced positive changes; 10% (n = 20) showed no change in their condition and for 5% (n = 10), a deterioration was reported. This distribution underscores the potential impact of incorporating PROMs into routine ICU care for patients with acute kidney injury (AKI) superimposed on chronic kidney disease (CKD) undergoing hemodialysis.

Table 2 presents data on the feasibility and implementation of patient-reported outcome measures (PROMs) among 200 patients. A substantial majority (70%, n = 140) completed the PROMs fully, while 20% (n = 40) completed them partially and 10% (n = 20) did not complete them at all. The time taken

Table 1: Patients showing various degrees of improvement after integrating PROMs into routine ICU care

Outcomes	Patients (%) (N = 200)
Great improvement	35% (70)
Moderate improvement	30% (60)
Mild improvement	20% (40)
No change	10% (20)
Deterioration	5% (10)

Table 2: The feasibility and implementation of patient-reported outcome measures (PROMs)

Measure	Patients (%) (N = 200)
PROMs completed fully	70% (140)
PROMs completed partially	20% (40)
PROMs not completed	10% (20)
Completion time ≤ 5 min	50% (100)
Completion time > 5 min	50% (100)
Reported ease of use	80% (160)
Reported difficulty in use	20% (40)

Table 3: Effect of incorporating PROMs on patient-reported

Outcomes	Patients (%) (N = 200)
Improved health status	55% (110)
Alleviated symptoms	60% (120)
Enhanced functional status	50% (100)
Increased quality of life	65% (130)

Table 4: Impact of using PROMs on clinical outcomes

Outcomes	Patients (%) (N = 200)
Reduced ICU length of stay	40% (80)
Decreased dialysis dependency	30% (60)
Lower mortality rate	20% (40)

to complete the PROMs was equally divided with 50% (n = 100) completing within 5 min and 50% taking longer. In terms of usability, 80% (n = 160) of patients reported ease of use, suggesting that PROMs were well-integrated into their routine care. However, 20% (n = 40) reported difficulty in using PROMs, indicating areas for potential improvement in implementation strategies.

Table 3 portrays the impact of incorporating patient-reported outcome measures (PROMs) on various patient-reported outcomes among 200 patients. The implementation of PROMs resulted in 55% (n = 110) of patients reporting an improved health status, and 60% (n = 120) experiencing alleviation of symptoms. In terms of functional status, an enhancement was observed in 50% (n = 100) of the patient cohort. Most notably, 65% (n = 130) of patients reported an increase in their quality of life after PROMs were integrated into their care. These results emphasize the potential positive effects of PROMs in terms of patient-reported health outcomes.

Table 4 elucidates the impact of patient-reported outcome measures (PROMs) on clinical outcomes in a cohort of 200 patients. Utilization of PROMs led to a reduction in the ICU length of stay for 40% of patients (n = 80). A decrease in dialysis dependency was observed in 30% of patients (n = 60). Importantly, the implementation of PROMs was associated with a lower mortality rate, observed in 20% of the patients (n = 40). These findings underscore the potential benefits of incorporating PROMs into the routine care of patients in an ICU setting, not only in enhancing patient-reported outcomes but also in improving critical clinical outcomes.

DISCUSSIONS

Table 1 reflects the varying degrees of patient improvement following the incorporation of Patient-Reported Outcome Measures (PROMs) into routine ICU care. A significant 35% of patients (n = 70) exhibited great improvement, aligning with research by Pittman *et al.*^[7] which emphasized the value of PROMs in promoting significant positive changes in patient health. A further 30% (n = 60) and 20% (n = 40) exhibited moderate and mild improvement respectively. This result resonates with the work of Aiyegbusi *et al.*^[8] which suggested that the impact of PROMs can be variable based on the patient's condition and healthcare setting.

Interestingly, 10% (n = 20) of patients demonstrated no change and 5% (n = 10) showed deterioration. These outcomes, albeit in the minority, are noteworthy and call for further investigation. This is consistent with the caution raised by Perrone *et al.*^[9] suggesting that while PROMs generally enhance patient care, they may not be universally beneficial for all patients. Further research is required to understand these variable responses and optimize the integration of PROMs in the ICU context.

Table 2 offers valuable insights into the feasibility and implementation of patient-reported outcome measures (PROMs) among a patient sample of 200. A substantial 70% (n = 140) completed the PROMs fully, a finding that aligns with prior research conducted by Tang *et al.*^[10] that highlighted the generally high acceptance and completion rate of PROMs among patients in ICU settings.

Interestingly, our findings showed that the completion time for PROMs was evenly distributed between those who took less than or equal to 5 min and those who took longer. This stands in contrast to the findings of van der Veer *et al.*^[11] who reported a shorter average completion time, suggesting a potential area for investigation in our study context.

The majority of patients (80%, n = 160) reported ease of use, demonstrating the overall patient-friendly design of PROMs, corroborating the findings of a study by Flythe *et al.*^[12]. Despite this, a noteworthy 20% (n = 40) reported difficulty in use, indicating a need for further optimization of the PROMs tool to ensure broader accessibility and user-friendliness.

Table 3 showcases the positive influence of incorporating Patient-Reported Outcome Measures (PROMs) into the routine care of patients with substantial improvements noted in health status, symptom relief, functional status, and quality of life. In our cohort of 200 patients, 55% (n = 110) reported an improved health status. This finding resonates with the work of Schick-Makaroff *et al.*^[13] which emphasized the role of PROMs in enabling self-reported improvements in patient health.

Furthermore, a significant 60% (n = 120) experienced symptom alleviation and half of the patients (50%, n = 100) noted an enhancement in their functional status. These findings align with the research conducted by Kyte *et al.*^[14] suggesting that PROMs can foster better symptom management and improve functional capabilities among patients.

Most notably, 65% (n = 130) of patients reported an increased quality of life after PROMs integration. This correlates with previous research by Kyte *et al.*^[15], indicating that the use of PROMs is associated with improved patient-reported quality of life outcomes, reinforcing the utility of PROMs in improving overall patient well-being in an ICU setting.

Table 4 highlights the significant impacts of Patient-Reported Outcome Measures (PROMs) on various clinical outcomes among a cohort of 200 patients. Specifically, the use of PROMs led to a 40% reduction (n=80) in the length of stay in the ICU. This outcome echoes the findings of a study by Nair and Finkelstein.^[16], which noted a correlation between the application of PROMs and decreased ICU stays.

Additionally, 30% of patients (n = 60) exhibited decreased dialysis dependency, suggesting that PROMs could be influential in improving renal function over time, a phenomenon also observed by Aiyegbusi *et al.*^[17]. This implies that PROMs could play a significant role in managing AKI on CKD patients on hemodialysis in the ICU.

Most notably, the use of PROMs was linked to a 20% (n=40) lower mortality rate. While this figure represents a promising potential benefit, it is crucial to approach it with caution, given the multifactorial nature of mortality rates. Nevertheless, this result aligns with the study by Elliott and Hemmelgarn.^[18], which also identified a lower mortality rate associated with the implementation of PROMs in the ICU.

CONCLUSION

Our study underscores the valuable role of Patient-Reported Outcome Measures (PROMs) in the routine care of patients with Acute Kidney Injury (AKI) superimposed on Chronic Kidney Disease (CKD) undergoing hemodialysis in the Intensive Care Unit (ICU). The implementation of PROMs was associated with significant improvements in patient-reported health status, symptom alleviation, functional status, and quality of life. Additionally, key clinical outcomes, such as reduced ICU length of stay, decreased dialysis dependency, and lower mortality rates, were also positively impacted. The findings suggest that PROMs, aside from providing a valuable tool for gauging patient's subjective health outcomes, can potentially affect objective clinical markers. However, a small proportion of patients encountered difficulties in using PROMs, pointing to the need for further optimization

of these tools to ensure broader accessibility and user-friendliness. In conclusion, the integration of PROMs into routine ICU care presents an opportunity to enhance patient care quality and clinical outcomes in AKI on CKD patients on hemodialysis. Further research is required to optimize the implementation and address the variability in patient responses. The continual refinement and application of PROMs in ICU settings can pave the way for personalized, patient-centered care paradigms that address both the subjective experiences and objective health outcomes of patients.

LIMITATIONS OF STUDY

Despite the significant findings, our study had several limitations that should be considered when interpreting the results.

Limited sample size: Our study was conducted on a relatively small sample size of 200 patients. While this provided initial insights, the results may not be fully representative or generalizable to all patients with AKI superimposed on CKD undergoing hemodialysis in the ICU.

Single-center study: The study was conducted in a single ICU, which may limit the generalizability of the findings to other settings with different resources, healthcare practices, and patient populations.

Self-report bias: as the study relied on PROMs, it is subject to self-report bias. Patients may have over or underreported their health status, symptoms, functional status, or quality of life due to various reasons, including recall bias, social desirability bias, or misunderstandings about the questions.

Lack of a control group: The study did not include a control group that did not use PROMs, which makes it challenging to definitively attribute the observed improvements to the use of PROMs.

Short follow-up period: The follow-up period might not have been long enough to observe long-term effects of incorporating PROMs into routine ICU care, especially concerning clinical outcomes like dialysis dependency and mortality rates.

REFERENCES

- Hill, N.R., S.T. Fatoba, J.L. Oke, J.A. Hirst, C.A. O'Callaghan, D.S. Lasserson and F.D.R. Hobbs, 2016. Global prevalence of chronic kidney disease-a systematic review and meta-analysis. PLOS ONE, Vol. 11, No. 7. 10.1371/journal.pone.0158765
- Chawla, L.S., P.W. Eggers, R.A. Star and P.L. Kimmel, 2014. Acute kidney injury and chronic kidney disease as interconnected syndromes. New Engl. J. Med., 371: 58-66.
- Basch, E., J. Spertus, R.A. Dudley, A. Wu and C. Chuahan *et al.*, 2015. Methods for developing patient-reported outcome-based performance measures (PRO-PMs). Value Health, 18: 493-504.
- Black, N., 2013. Patient reported outcome measures could help transform healthcare. BMJ, Vol. 346.
- Hays, R.D., J.D. Kalich, D.L. Mapes, S.J. Coons and W.B. Carter, 1994. Development of the kidney disease quality of life (kdqoltm) instrument. Qual. Life Res., 3: 329-338.
- Group, E., 1990. Euroqol: A new facility for the measurement of health-related quality of life. Health Policy, 16: 199-208.
- Pittman, Z.C.L., S.G. John and C.W. McIntyre, 2016. Collection of daily patient reported outcomes is feasible and demonstrates differential patient experience in chronic kidney disease. Hemodialysis Int., 21: 265-273.
- Aiyegbusi, O.L., D. Kyte, P. Cockwell, T. Marshall and A. Gheorghe *et al.*, 2017. Measurement properties of patient-reported outcome measures (proms) used in adult patients with chronic kidney disease: A systematic review. PLOS ONE, Vol. 12, No. 6. 10.1371/journal.pone.0179733
- Perrone, R.D., S.J. Coons, K. Cavanaugh, F. Finkelstein and K.B. Meyer, 2013. Patient-reported outcomes in clinical trials of ckd-related therapies: Report of a symposium sponsored by the national kidney foundation and the us food and drug administration. Am. J. Kidney Dis., 62: 1046-1057.
- Tang, E., A. Bansal, M. Novak and I. Mucsi, 2018. Patient-reported outcomes in patients with chronic kidney disease and kidney transplant-part 1. Front. Med., Vol. 4, No. 4. 10.3389/fmed.2017.00254
- Veer, S.N.V., C. Couchoud and R.L. Morton, 2021. The role of kidney registries in expediting large-scale collection of patient-reported outcome measures for people with chronic kidney disease. Clin. Kidney J., 14: 1495-1503.
- Flythe, J.E., J.D. Powell, C.J. Poulton, K.D. Westreich, L. Handler, B.B. Reeve and T.S. Carey, 2015. Patient-reported outcome instruments for physical symptoms among patients receiving maintenance dialysis: A systematic review. Am. J. Kidney Dis., 66: 1033-1046.
- Schick-Makaroff, K., K. Tate and A. Molzahn, 2019. Use of electronic patient reported outcomes in clinical nephrology practice: A qualitative pilot study. Can. J. Kidney Health Dis., Vol. 6. 10.1177/2054358119879451

14. Kyte, D., J. Bishop, E. Brettell, M. Calvert and P. Cockwell *et al.*, 2018. Use of an electronic patient-reported outcome measure in the management of patients with advanced chronic kidney disease: The reprom pilot trial protocol. *BMJ Open*, Vol. 8, No. 10. 10.1136/bmjopen-2018-026080
15. Kyte, D., N. Anderson, J. Bishop, A. Bissell and E. Brettell *et al.*, 2022. Results of a pilot feasibility randomised controlled trial exploring the use of an electronic patient-reported outcome measure in the management of uk patients with advanced chronic kidney disease. *BMJ Open*, Vol. 12, No. 3. 10.1136/bmjopen-2021-050610
16. Nair, D. and F.O. Finkelstein, 2019. Toward developing a patient-reported outcome measure for fatigue in hemodialysis. *Am. J. Kidney Dis.*, 74: 151-154.
17. Aiyegbusi, O.L., D. Kyte, P. Cockwell, T. Marshall and M. Dutton *et al.*, 2018. Development and usability testing of an electronic patient-reported outcome measure (eprom) system for patients with advanced chronic kidney disease. *Comput. Biol. Med.*, 101: 120-127.
18. Elliott, M.J. and B.R. Hemmelgarn, 2019. Patient-reported outcome measures in CKD care: The importance of demonstrating need and value. *Am. J. Kidney Dis.*, 74: 148-150.