Assessment of Fall Risk, Dependency, and Stroke Knowledge in a Chronic Kidney Disease Patient with Diabetes and Glaucoma: A Case Report

Tika Rifa Luthfiyah Pebriana, Titis Kurniawan, Nursiswati
Faculty of Nursing, Universitas Padjadjaran.
Email: tika20003@mail.unpad.ac.id

Abstract

Chronic kidney disease (CKD) is a global health problem that can lead to serious complications. In patient with CKD and diabetes mellitus (DM), there is an increased risk of falls, dependence in daily activities, and stroke. Although these risks are often associated with the elderly population, the phenomenon of multimorbidity is now also increasingly observed among individuals of productive age. This case report aims to describe changes in fall risk levels, dependency levels, and stroke risk knowledge among CKD patients with DM and glaucoma during hospitalization. Data collection was conducted through observation, interviews, physical examinations, and medical record reviews. The sample used was a 43-year-old woman, selected using purposive sampling based on clinical diagnosis. Fall risk, dependency level, and stroke knowledge were assessed using the Morse Fall Scale (MFS), Care Dependency Scale (CDS), and Stroke Recognition Questionnaire (SRQ). Data were analyzed descriptively by comparing assessment scores before and after interventions. During hospital care, the patient received pharmacological and non-pharmacological interventions, including hemodialysis, wound care, medical therapy, and structured education. The results showed a reduction in fall risk (MFS: 35 to 25), an improvement in dependency level (CDS: 53 to 66), and increased stroke knowledge (SRQ: 28 to 40). Although the findings are based on a single case and cannot be generalized, this report highlights the importance of comprehensive assessment and integrated care in productive-age patients with CKD and complex multimorbidity. Further studies involving larger samples and post-discharge follow-up are recommended to confirm their effectiveness.

Keywords: Care Dependency Scale, Chronic Kidney Disease, Morse Fall Scale, Stroke Recognition Questionnaire

Introduction

Chronic kidney disease (CKD) is a global health problem with high mortality rate. Chronic kidney disease (CKD) is a disorder of kidney function or structure that affects health at least three months (KDIGO, 2024). Globally, the prevalence of CKD reaches 843.6 million people or >10% of the population worldwide (Kovesdy, 2022). In Indonesia, the incidence rate reached 638,178 people, with West Java having the highest rate at 114,619 (17.96%) (Badan Kebijakan Pembangunan Kesehatan, 2023). One of the main underlying causes of CKD is diabetic nephropathy (29%) (Indonesian Renal Registry, 2020).

Diabetic nephropathy as a complication of diabetes mellitus (DM) triggers progressive renal damage through the mechanism of glycation and the formation of AGEs (Advanced Glycation End Products) leading to glomerulosclerosis and microalbuminuria (American Diabetes Association, 2022). This condition stimulates inflammation and fibrosis in the kidney tissue (Latif et al., 2017). In addition, DM also increases the risk of complications such as glaucoma with an incidence in 2020 of 80 million people worldwide (GFR, 2024).

The presence of CKD disease accompanied by DM and glaucoma complications in a person can reduce body function in daily activities. According to Hinkle et al., (2021) manifestations include anemia, metabolic acidosis, electrolyte imbalances, and fluid retention, leading to edema and heart failure. These conditions can have a direct impact on the patient's functional abilities, including mobility, independence and overall quality of life.

Assessment of fall risk is commonly associated with advanced age due to degenerative decline in body functions, such as balance, muscle strength, and cognition that can increase the risk of falls even without comorbidities. Research by Chowdhury et al., (2017) states that advanced age is a major factor affecting the risk of falls and dependence in CKD patients. However, in clinical practice, a shift in epidemiology has begun to emerge, with productive-age individuals also prone to severe chronic disease and multimorbidity. Watson et al., (2025) reported an increase in multimorbidity in the productive age group in 2023 by 21.8% from 2013 and as many as 27.1% of them experienced two or more chronic diseases. Modifiable factors such as unhealthy lifestyle, obesity, and high blood pressure accelerate the onset of chronic diseases in this age group (Ryan et al., 2020).

Within the scope of the nursing process, a thorough assessment is required to identify the patient's risk of harm and care needs. Decreased physical and sensory function in CKD patients with DM and glaucoma leads to mobility vulnerability. This makes them a population at high risk of falls. According to Lin et al., (2024), the prevalence of falls in CKD patients has a percentage of 24.7% higher than the prevalence of falls in the group without CKD (17.1%). Therefore, fall risk assessment is one of the important elements in the care of patients with CKD with DM and glaucoma to prevent falls. According to Nurhayati et al., (2020), fall risk prevention can be done by conducting repeated assessments to determine changes in patient conditions, one of the instruments that can be used is the Morse Fall Scale (MFS).

On the other hand, prolonged chronic conditions in patients with CKD accompanied by DM and glaucoma also have an impact on the level of dependence of patients in carrying out daily life activities. According to CKD patients undergoing hemodialysis therapy experience a decrease in independence in carrying out activities, such as fulfilling physical activities, nutritional and fluid needs, treatment regimens, interaction skills, use of health services, reporting symptoms experienced and healthy living behavior. In this case, the patient is dependent on others to fulfill their needs.

Most assessments of fall risk or dependency rates are focused on the elderly population, while the productive age group with severe complications is often missed or has not been the main focus of screening targets. In fact, their clinical risk is equal to or even higher than the elderly due to the burden of multiple diseases suffered. Research by Yan et al., (2022) showed that there was an increased risk of falling by 37% in individuals with one chronic disease, by 85% in individuals with two chronic diseases,

and 175% in individuals with more than three chronic diseases compared to individuals without chronic diseases. This is influenced by difficulties with daily activities, muscle and physical weakness, and polypharmacy (Jacob et al., 2022).

Basic activities such as bathing, dressing, walking and transferring are limited, which reduces individual independence and increases dependency. Each additional chronic disease increases the risk of care dependency by 20% (Bao et al., 2019). Therefore, measuring the level of dependency is necessary to design a nursing intervention plan, one of which is by using the Care Dependency Scale (CDS). This instrument consists of 15 questions that cover physical and psychosocial aspects, so it is considered to be able to evaluate the level of dependence of patients as a whole (Nursiswati et al., 2017). In addition, individuals with vascular problems due to CKD and DM have a higher risk of stroke.

Stroke is a condition when blood flow to the brain is interrupted or broken due to a blockage, causing the brain to lack oxygen and brain cells to die (Bushnell et al., 2024). Ghani et al., (2016) showed that DM was a factor in the 2.96-fold increased risk of stroke compared to individuals without a history of diabetes. In patients with CKD, the kidney condition contributes to an increased risk of stroke due to hemodynamic disturbances and atherosclerosis (Toyoda & Ninomiya, 2014). However, many high-risk patients still have limited knowledge about the signs and symptoms of stroke and its risk factors. Research by Chen et al., (2021) showed that low levels of education and knowledge are associated with care readiness, such as delayed therapy and increased risk of complications. According to Abate et al., (2019) Out of 278 patients, only 18.3% of patients had good knowledge about stroke. Meanwhile, 77% (214 patients) were unable to identify stroke risk factors, and 72.3% (201 patients) were unable to recognize the signs or symptoms of stroke.

Assessment of patient knowledge about stroke is important to support preventive efforts and increase awareness if a stroke occurs. One of the measurement tools that can be used to assess the level of knowledge about stroke is the Stroke Recognition Questionnaire (SRQ). This instrument can help individuals recognize symptoms early and allow interventions to be given quickly and is expected to reduce morbidity (Nursiswati et al., 2023).

No study has simultaneously assessed fall risk, dependency level, and stroke knowledge in productive-age patients with CKD accompanied by DM and glaucoma using three different instruments. This approach not only improves the quality of nursing care, but also contributes to the prevention of complications that could potentially reduce the patient's health status. Therefore, this case report aims to describe daily changes in fall risk, care dependency, and stroke risk knowledge scores during four days of hospitalization in a patient with CKD, DM, and glaucoma.

Research Method

This study is a case report conducted in one of the hospitals on October 1- 4, 2024. Patient was a productive age patient with a diagnosis of CKD accompanied by DM and glaucoma. Data was collected through observation, patient and family interviews, physical examination and medical records. The technique used was purposive sampling with inclusion criteria according to clinical diagnosis. The assessment was conducted from admission to discharge, using three Indonesian-language instruments: Morse Fall Scale (MFS) to measure fall risk, Care Dependency Scale (CDS) to assess dependency level, and Stroke Recognition Questionnaire (SRQ) to assess stroke knowledge.

The MFS instrument consists of six items and is classified into three risk categories based on scores: low (0-24), moderate (25-50), and high (≥51). The CDS instrument covers 15 aspects of basic human needs with a likert scale of 1-5 and produces a final score that is classified into five classifications, namely scores 15-24 = completely dependent; scores 25-44 = mostly dependent; scores 45-59 = partially dependent; scores 60-69 = somewhat independent; and scores 70-75 = almost independent (Nursiswati et al., 2017). Meanwhile, the SRQ uses a Guttman scale

with two answer options "Yes" and "No" on 40 question items divided into two sub-categories, namely signs of symptoms and risk factors for stroke. Scoring based on the appropriateness of answers to the positive and negative keys, where higher scores indicate better knowledge (Nursiswati et al., 2023).
This study has obtained ethical approval from patients and families through the signing of informed consent sheets. Confidentiality was maintained, and participants were given the freedom to stop at any time if they felt uncomfortable. The study poses no physical or emotional risks. Data is used for scientific purposes and the development of nursing care.

Results

A 43-year-old woman was admitted to the hospital on October 1, 2024 with complaints of fever, nausea, weakness, headache (scale 5/10), and swelling of the right lower extremity. The patient had a history of chronic kidney disease since two years ago and underwent hemodialysis twice a week for the past 1.5 years. She also has a history of hypertension (12 years) and DM (8 years) and is on regular insulin and antihypertensive medication. The patient had visual impairment due to glaucoma with an IOP of 26 mmHg, and habitually consumed foods high in sugar and salt. Based on the results of the American Stroke Association's stroke risk assessment, the patient scored 6 out of 10, indicating high risk.

The results of the physical examination obtained Composmentis (E4M6V5), BP 160/88 mmHg, HR 93x/min, RR 20x/min, SpO2 98%, and Temperature 38.2°C. Patient's weight was 53 kg, height 160 cm, and BMI 20.7 (Normal). Nursing problems were found in the form of signs of hypervolemia and impaired skin integrity. Laboratory results showed anemia, hyperglycemia, hyperkalemia, dyslipidemia, and decreased renal function (Table 1).

Table 1. Laboratory examination results

Examination	Result	Normal Value	Interpretation
Hematology (1 October 2024)			
Hemoglobin	**7,9**	**12,3-15,3**	**Low**
Clinical Chemistry			
Urea	**66**	**20-40**	**High**
Creatinine	**3,71**	**0,5-1,1**	**High**
Blood Glucose			
Fasting Blood Glucose	**165**	**100-150**	**High**

In addition, the patient was given pharmacological therapy as a treatment regimen to the patient during the treatment period, which is presented in Table 2.

Table 2: Pharmacologic therapy

Drug Name	Drug Class	Dose
Sodium Chloride 0,9%	**Isotonic Rehydration Fluid**	**500cc/24 hours**
Paracetamol	**Analgesic, Antipyretic**	**500mg/8 hours**
Amplodipine	**Antihypertensive**	**10mg/24 hours**
Furosemid	**Diuretic**	**40mg/24 hours**
Calitoz kaplet	**Vitamin D**	**1 kaplet/24 hours**
Sansulin log-g	**Insulin**	**6 units every other day**

For four days, patients received pharmacologic and non-pharmacologic interventions. Patients received pain management, external cooling, edema monitoring, fluid and salt restriction, diuretic administration, hemodialysis, wound care, and collaborative antibiotic administration,

as well as education. The intervention results showed a decrease in the risk of falls, a decrease in the level of dependence, and an increase in patient knowledge about stroke. The progress of the patient's condition can be seen in Table 3.

Table 3. Patient condition progress (1 – 4 October 2024)

Indicator	Assessment Results				
	Day 1 of Treatment	Day 2 of Treatment	Day 3 of Treatment	Day 4 of Treatment (Discharge)	Final Category
MFS	35 (Moderate Fall Risk)	55 (High Fall Risk)	45 (Moderate Fall Risk)	25 (Moderate Fall Risk)	Moderate fall risk
CDS	53 (Partially dependent)	58 (Partially dependent)	65 (Somewhat independent)	66 (Somewhat independent)	Somewhat independent
SRQ	28 (Moderate level of knowledge)	-	-	40 (High level of knowledge)	High level of knowledge
Pitting edema	Grade II	Grade I	Grade I	Grade I	Edema reduction
Hemoglobin	7,9	-	8,2	-	Low
Urea	66	-	42	-	High
Creatinine	3,71	-	2,92	-	High
Blood Glucose	165	-	130	-	Normal
Blood Pressure	160/88	147/74	139/80	135/89	Stable
Body Weight	53 kg	51 kg	-	-	Stable

At admission, the patient demonstrated a moderate risk of falls, with a Morse Fall Scale score of 35. On the second day of hospitalization, the score increased to 55, indicating a high fall risk, coinciding with increased mobility and gait instability. Following clinical stabilization and ongoing interventions, the fall risk gradually decreased, with a final score of 25 at discharge, categorized as moderate fall risk.

Assessment of care dependency using the Care Dependency Scale showed that the patient was partially dependent at admission (score: 53). Progressive improvement was observed during hospitalization, with the score increasing to 66 at discharge, indicating a transition to somewhat independent, particularly in domains related to mobility, self-care, and daily activities.

Stroke knowledge assessment using the Stroke Recognition Questionnaire revealed a moderate level of knowledge at baseline (score: 28). After receiving structured education during hospitalization, the patient's score increased to 40, reflecting a high level of stroke knowledge at discharge.

Patient CDS change is shown in Diagram 1.

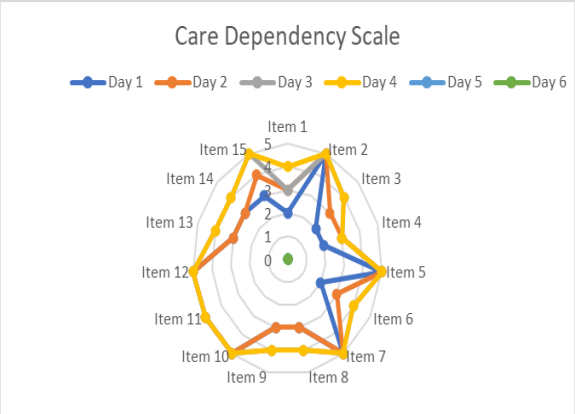

Diagram 1. Change in CDS Level During Treatment

Discussion

In this case, the researcher first assessed the level of risk of falls in patients. On the first day of assessment, the total MFS score was 35 or moderate fall risk. CKD patients

in productive age with vitamin D deficiency have an increased risk of early falls and experience muscle weakness and mobility difficulties even though they are not elderly (Liao et al., 2024). This is due to low sun exposure, decreased vitamin D production in the skin, and loss of vitamin D-binding proteins (Delgado et al., 2015). This condition can worsen the patient's condition with brittle and easily broken bones, muscle weakness, and increased risk of falls (Beaudart et al., 2017).

On the second day of treatment, there was an increase in the total MFS score to 55 with a high fall risk category. This happened because the patient, who was previously on bed rest, walked to the bathroom with the help of family the next day and experienced gait disturbance due to pain. In the elderly with CKD (>65 years) the increased risk of falls is significantly aggravated by sarcopenia and weakened vascular conditions (Papakonstantinopoulou & Sofianos, 2017). Whereas in productive age, psychological impacts contribute to fall risk events such as anxiety.

At the time of discharge planning process, MFS score was 25 with a moderate risk of falling. This decrease in score resulted from the removal of intravenous therapy and increased gait. Research by Schafthuizen et al., (2024) states that the installation of infusions and catheters is an obstacle to physical activity so that the removal of intravenous therapy can reduce the risk of falls because patients are more free to move without the obstacle of tools. In addition, the patient's condition began to stabilize and the reduction of pain improved the gait although it was still weak. However, fall prevention does not only depend on reducing physical symptoms but regular monitoring also plays an important role. According to Satriawan et al., (2024), repeated assessments can reduce the risk of falls in CKD patients in both low and high risk groups.

Next, the researcher assessed the patient's level of dependency using the Care Dependency Scale (CDS) instrument. On day one, the patient had a total score of 53, categorized as mostly dependent. Domains with independence issues include eating and drinking, posture, mobility, putting on and taking off clothes, hygiene, avoiding danger, daily activities, and recreation. Anemia, which was evident from the patient's low hemoglobin level (7.9 g/dL), is a common complication of CKD and contributes significantly to physical fatigue, decreased mobility, and increased care dependency (Stauffer & Fan, 2014). Physical conditions such as weakness and decreased muscle strength in CKD patients can lead to decreased focus, disturbances in sleep patterns, emotional instability, and reduced individual capacity to carry out daily activities independently such as eating, mobility, and hygiene (Natashia et al., 2020).

In the elderly, decreased muscle strength and sarcopenia are the main causes of increased physical dependence and fall risk with an average incidence of 1.18-1.60 times per year (López-Soto et al., 2015). Whereas in the productive age group, even though they have not experienced tissue degeneration like the elderly, patients with early CKD due to diabetes still experience vitamin D deficiency and diabetic neuropathy, which leads to muscle weakness and dependence in daily activities. Troutman et al., (2022) stated that complications due to CKD, such as fatigue, loss of muscle strength, and electrolyte imbalance are functional barriers in younger age groups. This condition is exacerbated by the presence of glaucoma in the patient. Visual impairment significantly reduces the patient's ability to avoid danger and fulfill daily activities without relying on others (Siswoyo et al., 2019).

At discharge, the patient's total CDS score was 66 (somewhat independent). Notably, improvements were observed in the domains of eating, posture, dressing, and learning ability, each increasing from a score of 2 (highly dependent) to a score of 4 (almost independent). These functional gains reflect clinical stabilization, likely supported by comprehensive nursing and medical interventions. Specifically, the administration of furosemide may have contributed to edema reduction, thereby enhancing mobility and reducing the need for assistance in daily activities Vitamin D supplementation potentially supported muscle function and fall risk mitigation, as deficiency is common among CKD patients and is associated with poor functional

outcomes (Huang et al., 2023). Additionally, insulin therapy played a key role in glycemic control, which is essential in reducing stroke risk and metabolic complications in diabetic CKD patients (Rahhal et al., 2019).

In particular, enhanced metabolic control and effective dialysis may have contributed to this outcome. Reductions in serum urea and creatinine levels are commonly associated with improved clinical status in patients with chronic kidney disease. Elevated blood urea nitrogen (BUN) and creatinine levels have been linked to poor outcomes, while their reduction following dialysis is often indicative of better prognosis (Brookes & Power, 2022).

In the elderly, improvement in dependency scores is usually slower and requires a longer recovery time due to degenerative factors and decreased cognitive function. Studies show that elderly patients with advanced CKD remain highly dependent despite multidisciplinary interventions due to limited tissue regeneration and decreased brain function involvement (Yaffe et al., 2009). In contrast, in the productive age group, functional recovery can be faster if metabolic conditions are well controlled.

In terms of learning ability, an educational approach to patients can improve their understanding and participation in their self-care. Although productive age has the potential for faster recovery, the ability to learn is highly dependent on education that is tailored to the patient's level of understanding and psychosocial condition. According to Ibrahim et al., (2017) revealed the importance of considering the cognitive capacity of patients in educational programs to improve self-management skills. Improvements in CDS scores showed that the intervention was effective in improving body function and reducing dependency.

Based on the screening of stroke risk factors in patients using the Stroke Risk Assessment of the American Stroke Association, patients have a higher risk value due to multifactor risk. The patient's stroke risk factors included hypertension, hyperglycemia, eating habits with a high sugar and salt diet, high cholesterol, diagnosed DM, and lack of physical. Hyperglycemia is a modifiable risk factor for stroke that exacerbates vascular inflammation and endothelial dysfunction. Patient education on glucose control is essential in stroke prevention among diabetic CKD patients (American Diabetes Association, 2022). Although advanced age is associated with an increased risk of stroke, individuals aged <40 years with chronic kidney disease also have a higher risk of stroke. The comparison of stroke risk in young people with CKD is even sharper because the body at productive age has not undergone normal physiological decline, so the presence of CKD and other comorbidities increases the risk drastically (Nakayama et al., 2021). Young patients with advanced CKD have up to 11 times the risk of stroke compared to their peers without CKD (Wyld & Webster, 2021).

The number of risk factors for stroke events owned by patients is not proportional to knowledge of signs and symptoms and risk factors. According to Carolina & Amiati (2023), said there are several studies that state the low knowledge of stroke in populations that have a high risk. Based on the research, there is a relationship between the level of individual knowledge and stroke risk factors, which shows that the better a person's knowledge of stroke, the smaller the risk they have (Sidabutar, 2021).

At the time of the first assessment, SRQ score was 28. In the subcategory of risk factors, misperceptions were found in lifestyle, where patients did not consider alcohol consumption, lack of exercise, and smoking as risk factors for stroke. This is in line with research by Maniatunufus et al., (2021), knowledge about stroke risk factors that are still widely unknown are DM, smoking, and alcohol consumption. Meanwhile, in the symptom sub-category, statement items that are misperceptions include headaches and sudden dizziness. This is in line with research by Maniatunufus et al., (2021), knowledge about stroke symptoms that are still widely unknown is visual disturbances in one or both eyes, confusion, and sudden dizziness.

At discharge, the SRQ score increased to 40. This shows that repeated education is effective in strengthening patient understanding (Nury et al., 2022). However, according to Abbasian et al., (2024) although young patients (<50 years old) are more

likely to understand education, they tend to be less disciplined in implementing a healthy lifestyle than the elderly (>65 years old). Therefore, structured post-discharge follow-up is required to obtain more comprehensive data and clinical picture.

Based on the combined findings of fall risk, dependency level, and stroke knowledge assessments, this case report highlights important implications for nursing practice. The reduction in fall risk emphasizes the need for continuous fall risk assessment, safe mobility support, pain management, and environmental safety measures, even in productive-age patients. Improvements in dependency level indicate that early mobilization, assistance with self-care activities, and functional training should be prioritized to promote independence during hospitalization. Furthermore, the increase in stroke knowledge underscores the essential role of nurses in providing repeated, structured, and patient-centered education tailored to the patient's cognitive and psychosocial condition. These findings suggest that nursing care for productive-age patients with chronic kidney disease and multiple comorbidities should be based on comprehensive functional and educational assessments rather than age-related assumptions alone, to prevent complications and support long-term self-management.

Conclusion

This case report illustrates that improvements in body functionality were observed in a productive-age patient with a diagnosis of CKD accompanied by DM and glaucoma during hospitalization. Notable progress was seen in the reduction of fall risk, decreased care dependency, and enhanced stroke risk knowledge. These improvements may have been associated with the combination of hemodialysis, pharmacological therapy, wound care, and rehabilitative support provided during treatment. The main limitation of this study is the absence of post-discharge follow-up. Future research is recommended to explore specific clinical factors and involve long-term follow-up to obtain more comprehensive clinical and developmental data. Another suggestion is to conduct a study that focuses on the prevalence of the productive age population to identify the burden of disease and the tendency of chronic disease conditions at this age.

References

(KDIGO), K. D. I. G. O. (2024). *KDIGO 2024 clinical practice guideline for the evaluation and management of chronic kidney disease* (Vol. 105, Nomor 4). https://doi.org/10.1007/978-3-031-09131-5_10

Abate, A. T., Bayu, N., & Mariam, T. G. (2019). Hypertensive Patients' Knowledge of Risk Factors and Warning Signs of Stroke at Felege Hiwot Referral Hospital, Northwest Ethiopia: A Cross-Sectional Study. *Neurology Research International*, 1(1), 1–7. https://doi.org/10.1155/2019/8570428

Abbasian, M., Rashidi Birgani, H., Khabiri, R., Namvar, L., & Jahangiry, L. (2024). Exploring Education Interventions for Stroke Prevention Among Adults and Older Individuals: A Scoping Review. *Health Science Reports*, 7(11). https://doi.org/10.1002/hsr2.70167

Association, A. D. (2022). 1. Improving Care and Promoting Health in Populations: Standards of Medical Care in Diabetes—2022. *Diabetes Care*, 45(1), S8–S16. https://doi.org/10.2337/dc22-S001

Badan Kebijakan Pembangunan Kesehatan. (2023). *Survei Kesehatan Indonesia* (SKI) 2023. In Kementrian Kesehatan RI. https://www.badankebijakan.kemkes.go.id/ski-2023-dalam-angka/

Bao, J., Chua, K. C., Prina, M., & Prince, M. (2019). Multimorbidity and care dependence in older adults: A longitudinal analysis of findings from the 10/66 study. *BMC Public Health*, 19(1), 1–10. https://doi.org/10.1186/s12889-019-6961-4

Beaudart, C., Dawson, A., Shaw, S. C., Harvey, N. C., Kanis, J. A., Binkley, N., Reginster, J. Y., Chapurlat, R., Chan, D. C., Bruyère, O., Rizzoli, R., Cooper, C., Dennison, E. M., Adib, G., Brandi, M. L., Chevalley, T., Clark,

P., Dawson-Hughes, B., El Maghraoui, A., … Veronese, N. (2017). Nutrition and physical activity in the prevention and treatment of sarcopenia: systematic review. *Osteoporosis International*, 28(6), 1817–1833. https://doi.org/10.1007/s00198-017-3980-9

Brookes, E. M., & Power, D. A. (2022). Elevated serum urea-to-creatinine ratio is associated with adverse inpatient clinical outcomes in non-end stage chronic kidney disease. *Scientific Reports*, 12(1), 1–10. https://doi.org/10.1038/s41598-022-25254-7

Bushnell, C., Kernan, W. N., Sharrief, A. Z., Chaturvedi, S., Cole, J. W., Cornwell, W. K., Cosby-Gaither, C., Doyle, S., Goldstein, L. B., Lennon, O., Levine, D. A., Love, M., Miller, E., Nguyen-Huynh, M., Rasmussen-Winkler, J., Rexrode, K. M., Rosendale, N., Sarma, S., Shimbo, D., … Whelton, P. (2024). 2024 Guideline for the Primary Prevention of Stroke: *A Guideline From the American Heart Association/American Stroke Association. Stroke*, 55(December), 344–424. https://doi.org/10.1161/STR.0000000000000475

Carolina, D., & Amiati, R. (2023). Pengaruh Pendidikan Kesehatan (Penkes) Terhadap Tingkat Pengetahuan Masyarakat Umur 45- 64 Tahun Mengenai Pencegahan Stroke Di RT. 04 RW. 03 Kelurahan Pulau Tidung. *Jurnal Pengabdian Kesehatan Masyarakat Akademi Keperawatan Husada Karya Jaya,* 5(2), 4–7.

Chen, H. C., Lai, M. J., Wu, W. C., Lee, C. Y., Lin, H. J., Lin, C. C., Chang, C. T., Wang, C. C. N., & Chou, C. Y. (2021). Association of diabetes, education level, and care dependency with use of temporary vascular access in patients with chronic kidney disease. *Seminars in Dialysis*, 34(2), 130–136. https://doi.org/10.1111/sdi.12930

Chowdhury, R., Peel, N. M., Krosch, M., & Hubbard, R. E. (2017). Frailty and chronic kidney disease: A systematic review. *Archives of Gerontology and Geriatrics*, 68, 135–142. https://doi.org/10.1016/j.archger.2016.10.007

Delgado, C., Shieh, S., Grimes, B., Chertow, G. M., Dalrymple, L. S., Kaysen, G. A., Kornak, J., & Johansen, K. L. (2015). Association of Self-Reported Frailty with Falls and Fractures among Patients New to Dialysis. *American Journal of Nephrology*, 42(2), 134–140. https://doi.org/10.1159/000439000

GFR, G. R. F. (2024). Glaucoma Facts and Stats. Glaucoma Research Foundation. https://glaucoma.org/articles/glaucoma-facts-and-stats

Ghani, L., Mihardja, L. K., & Delima, D. (2016). Faktor Risiko Dominan Penderita Stroke di Indonesia. *Buletin Penelitian Kesehatan*, 44(1), 49–58. https://doi.org/10.22435/bpk.v44i1.4949.49-58

Hinkle, J. L., Cheever, K. H., & Overbaugh, K. J. (2021). Brunner & Suddarth's Textbook of Medical-Surgical Nursing 15th Edition. *In Wolters Kluwer* (Vol. 1, Nomor 1). http://scioteca.caf.com/bitstream/handle/123456789/1091/RED2017-Eng-8ene.pdf?sequence=12&isAllowed=y%0Ahttp://dx.doi.org/10.1016/j.regsciurbeco.2008.06.005%0Ahttps://www.researchgate.net/publication/305320484_SISTEM_PEMBETUNGAN_TERPUSAT_STRATEGI_MELESTARI

Huang, H. Y., Lin, T. W., Hong, Z. X., & Lim, L. M. (2023). Vitamin D and Diabetic Kidney Disease. *International Journal of Molecular Sciences*, 24(4), 1–18. https://doi.org/10.3390/ijms24043751

Ibrahim, J. E., Anderson, L. J., MacPhail, A., Lovell, J. J., Davis, M. C., & Winbolt, M. (2017). Chronic disease self-management support for persons with dementia, in a clinical setting. *Journal of Multidisciplinary Healthcare*, 10(1), 49–58. https://doi.org/10.2147/JMDH.S121626

Jacob, L., Shin, J. Il, Kostev, K., Haro, J. M., López-Sánchez, G. F., Smith, L., & Koyanagi, A. (2022). Prospective Association between Multimorbidity and Falls and Its Mediators: Findings from the Irish Longitudinal Study on Ageing. *Journal of Clinical Medicine,* 11(15). https://doi.org/10.3390/jcm11154470

Kovesdy, C. P. (2022). Epidemiology of chronic kidney disease: an update 2022. *Kidney International Supplements*, 12(1), 7–11. https://doi.org/10.1016/j.kisu.2021.11.003

Latif, H., Iqbal, A., Rathore, R., & Butt, N. F. (2017). Correlation between Serum Uric Acid Level and Microalbuminuria in Type-2 Diabetic Nephropathy. *Pakistan Journal of Medical Sciences*, 33(6), 1371–1375. https://doi.org/10.12669/pjms.336.13224

Liao, Y., Wang, A., Sui, W., Khan, A., Xiong, Z., & Yang, G. (2024). Involuntary Falls in Patients with Chronic Kidney Diseases on Nephrology Wards: Research Advances and Future Perspectives. *Nursing: Research and Reviews*, Volume 14(May), 69–80. https://doi.org/10.2147/nrr.s440182

Lin, P., Wan, B., Zhong, J., Wang, M., Tang, F., Wang, L., Guo, J., Ye, Y., Liu, X., Peng, L., & Deng, L. (2024). Risk of fall in patients with chronic kidney disease: results from the China health and retirement longitudinal study (CHARLS). *BMC Public Health*, 24(499), 1–7. https://doi.org/10.1186/s12889-024-17982-4

López-Soto, P. J., De Giorgi, A., Senno, E., Tiseo, R., Ferraresi, A., Canella, C., Rodríguez-Borrego, M. A., Manfredini, R., & Fabbian, F. (2015). Renal disease and accidental falls: A review of published evidence. *BMC Nephrology*, 16(1). https://doi.org/10.1186/s12882-015-0173-7

Maniatunufus, Nursiswati, & Herliani, Y. K. (2021). Gambaran Pengetahuan Tentang Faktor Risiko dan Gejala Stroke pada Pasien Hipertensi, Diabetes Melitus, dan Penyakit Jantung di RSUD Cilegon.

Nakayama, S., Satoh, M., Metoki, H., Murakami, T., Asayama, K., Hara, A., Hirose, T., Kanno, A., Inoue, R., Tsubota-Utsugi, M., Kikuya, M., Mori, T., Hozawa, A., Imai, Y., & Ohkubo, T. (2021). Lifetime risk of stroke stratified by chronic kidney disease and hypertension in the general Asian population: the Ohasama study. *Hypertension Research*, 44(7), 866–873. https://doi.org/10.1038/s41440-021-00635-z

Natashia, D., Irawati, D., & Hidayat, F. (2020). Fatigue Dan Kualitas Hidup Pada Pasien Gagal Ginjal Kronis Dengan Terapi Hemodialisa. *Jurnal Keperawatan Muhammadiyah*, 5(2), 209–218. https://doi.org/10.30651/jkm.v5i2.6540

Nurhayati, S., Rahmadiyanti, M., & Hapsari, S. (2020). Kepatuhan Perawat Melakukan Assessment Resiko Jatuh Dengan Pelaksanaan Intervensi Pada Pasien Resiko Jatuh. *Jurnal Ilmiah Keperawatan Stikes Hang Tuah Surbaya*, 15(2), 278–284. https://doi.org/10.30643/jiksht.v15i2.97

Nursiswati, Maniatunufus, & Herliani, Y. K. (2023). Psychometric Properties Indonesian Stroke Recognition Questionnaire (Srq) Untuk Pasien Dengan Hipertensi ,. *Jurnal Keperawatan Sriwijaya,* 10(1), 1–9.

Nursiswati, N., Halfens, R. J. G., & Lohrmann, C. (2017). Change in Care Dependency of Stroke Patients: A Longitudinal and Multicenter Study. *Asian Nursing Research*, 11(2), 113–118. https://doi.org/10.1016/j.anr.2017.05.005

Nury, V., Kusyani, A., & Nurjanah, S. (2022). Pengaruh Pendidikan Kesehatan Deteksi Dini Stroke terhadap Tingkat Pengetahuan pada Penderita Hipertensi. *Jurnal Insan Cendekia,* 9(1), 20–25. https://doi.org/10.35874/jic.v9i1.979

Papakonstantinopoulou, K., & Sofianos, I. (2017). Risk of falls in chronic kidney disease. *Journal of Frailty, Sarcopenia and Falls,* 02(02), 33–38. https://doi.org/10.22540/jfsf-02-033

Rahhal, M. N., Gharaibeh, N. E., Rahimi, L., & Ismail-Beigi, F. (2019). Disturbances in Insulin-Glucose Metabolism in Patients with Advanced Renal Disease with and Without Diabetes. *Journal of Clinical Endocrinology and Metabolism*, 104(11), 4949–4966. https://doi.org/10.1210/jc.2019-00286

Registry, I. R. (2020). 13th Annual Report Of Indonesian Renal Registry 2020 (S. P.-K.

DR. Afiatin dr. (ed.)). PSPDS Perisai Husada. Ryan, Sutradhar, R., Yao, Z., Wodchis, W. P., & Rosella, L. C. (2020). Smoking, drinking, diet and physical activity - Modifiable lifestyle risk factors and their associations with age to first chronic disease. International *Journal of Epidemiology*, 49(1), 113–130. https://doi.org/10.1093/ije/dyz078

Satriawan, H. D., Wijaya, D., Kurniawati, Y., & Siswoyo. (2024). PENERAPAN ASESMEN RISIKO JATUH BERBASIS FALL MORSE SCALE PADA PASIEN CHRONIC KIDNEY DISEASE. *Jurnal Kesehatan Tambusai*, 5(3), 10105–10115.

Schafthuizen, L., van Dijk, M., van Rosmalen, J., & Ista, E. (2024). Mobility level and factors affecting mobility status in hospitalized patients admitted in single-occupancy patient rooms. *BMC Nursing,* 23(11), 1–10. https://doi.org/10.1186/s12912-023-01648-4

Sidabutar, J. D. R. (2021). Hubungan Tingkat Pengetahuan Masyarakat Dengan Faktor Risiko Stroke di Kelurahan Mangga Kecamatan Medan Tuntungan Tahun 2020 [Universitas Sumatera Utara]. https://repositori.usu.ac.id/handle/123456789/30917

Siswoyo, S., Kushariyadi, K., & Purwitasari, D. F. (2019). Gambaran Kualitas Hidup - Fungsi Penglihatan Pasien dengan Glaukoma di Poli Mata Rumah Sakit di Kabupaten Jember (Description of Quality of Life - Vision Function of Glaucoma Patients in the Eye Clinics in Jember Regency). *Pustaka Kesehatan*, 7(3), 187–194.

Stauffer, M. E., & Fan, T. (2014). Prevalence of anemia in chronic kidney disease in the United States. PLoS ONE, 9(1), 2–5. https://doi.org/10.1371/journal.pone.0084943

Toyoda, K., & Ninomiya, T. (2014). Stroke and cerebrovascular diseases in patients with chronic kidney disease. *The Lancet Neurology*, 13(8), 823–833. https://doi.org/10.1016/S1474-4422(14)70026-2

Troutman, A. D., Arroyo, E., Lim, K., Moorthi, R. N., & Avin, K. G. (2022). Skeletal Muscle Complications in Chronic Kidney Disease. *Current Osteoporosis Reports*, 20(6), 410–421. https://doi.org/10.1007/s11914-022-00751-w

Watson, K. B., Wiltz, J. L., Nhim, K., Kaufmann, R. B., Thomas, C. W., & Greenlund, K. J. (2025). Trends in Multiple Chronic Conditions Among US Adults, By Life Stage, Behavioral Risk Factor Surveillance System, 2013-2023. *Preventing chronic disease,* 22, E15. https://doi.org/10.5888/pcd22.240539

Wyld, M., & Webster, A. C. (2021). Chronic Kidney Disease is a Risk Factor for Stroke. *Journal of Stroke and Cerebrovascular Diseases,* 30(9), 105730. https://doi.org/10.1016/j.jstrokecerebrovasdis.2021.105730

Yaffe, K., Landefeld, C. S., Charles, E., & Ph, D. (2009). Functional status of elderly adults before an dafte rinitiation of dialysis_NIH manuscript_Read. *N England J Med*, 361(16), 1539–1547. https://doi.org/10.1056/NEJMoa0904655.Functional

Yan, J., Wang, M., & Cao, Y. (2022). Patterns of multimorbidity in association with falls among the middle-aged and older adults: results from the China Health and Retirement Longitudinal Study. *BMC Public Health,* 22(1), 1–7. https://doi.org/10.1186/s12889-022-14124-6