

The Association of Medication Adherence and Dietary Adherence with Quality of Life among Patients with Hypertension: A Cross-Sectional Study

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ABSTRACT

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Hypertension is a prevalent chronic disease globally and has a substantial impact on patients' quality of life. Both medication and dietary adherence are critical for effective hypertension management; however, the extent of their respective contributions to quality of life is not well established, especially in community-based settings in Indonesia. This study investigated the associations between medication adherence, dietary adherence, and quality of life among individuals with hypertension. An analytical cross-sectional study was conducted with 172 patients registered at Ngasem Primary Health Center in Kediri, Indonesia. Participants were selected using simple random sampling. Medication adherence was measured with the eight-item Morisky Medication Adherence Scale, dietary adherence with a DASH-based questionnaire, and quality of life with the WHOQOL-BREF. Descriptive statistics summarized participant characteristics. Associations between categorical variables were analyzed using the chi-square test, and ordinal logistic regression was performed to identify the strongest predictor of quality of life. Medication and dietary adherence were both significantly associated with quality of life ($p < 0.001$). After adjustment for medication adherence, dietary adherence remained the strongest predictor. Participants with low dietary adherence were substantially less likely to report a higher quality of life than those with high adherence (OR = 0.005; 95% CI: 0.002–0.014). These findings highlight the importance of integrating dietary interventions with pharmacological treatment to improve the well-being of patients with hypertension.

ABSTRAK

Hipertensi merupakan salah satu penyakit kronis utama di dunia yang secara signifikan memengaruhi kualitas hidup pasien. Kepatuhan terhadap pengobatan dan pola makan merupakan komponen penting dalam pengelolaan hipertensi. Namun, kontribusi relatif keduanya terhadap kualitas hidup masih belum sepenuhnya dipahami, khususnya dalam pelayanan kesehatan berbasis komunitas di Indonesia. Penelitian ini bertujuan untuk menganalisis hubungan antara kepatuhan minum obat, kepatuhan diet, dan kualitas hidup pada pasien hipertensi. Penelitian analitik dengan desain potong lintang ini melibatkan 172 pasien hipertensi yang terdaftar di Puskesmas Ngasem, Kediri, Indonesia. Partisipan dipilih menggunakan teknik simple random sampling. Kepatuhan minum obat dinilai menggunakan Morisky Medication Adherence Scale delapan item, kepatuhan diet diukur menggunakan kuesioner berbasis pola makan DASH, sedangkan kualitas hidup dinilai menggunakan instrumen WHOQOL-BREF. Statistik deskriptif digunakan untuk menggambarkan karakteristik partisipan. Hubungan antarvariabel kategorik dianalisis menggunakan uji chi-square, kemudian dilanjutkan dengan regresi logistik ordinal untuk mengidentifikasi

prediktor terkuat terhadap kualitas hidup. Kepatuhan minum obat dan kepatuhan diet secara signifikan berhubungan dengan kualitas hidup ($p < 0,001$). Setelah dikontrol berdasarkan kepatuhan minum obat, kepatuhan diet tetap menjadi prediktor yang paling kuat. Partisipan dengan kepatuhan diet rendah memiliki kemungkinan yang jauh lebih kecil untuk melaporkan kualitas hidup yang lebih tinggi dibandingkan dengan partisipan dengan kepatuhan diet tinggi (OR = 0,005; 95% CI: 0,002–0,014). Temuan ini menegaskan pentingnya mengintegrasikan intervensi diet dengan terapi farmakologis untuk meningkatkan kualitas hidup pasien hipertensi.



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A. INTRODUCTION

Hypertension remains one of the most prevalent non-communicable diseases (NCDs) worldwide and is a major contributor to cardiovascular morbidity, mortality, and disability. According to the World Health Organization (WHO), approximately 1.28 billion adults aged 30–79 years are living with hypertension globally, with nearly two-thirds residing in low- and middle-income countries. In Indonesia, the prevalence of hypertension increased from 25.8% in 2013 to 34.1% in 2018. Based on blood pressure measurements, the incidence of hypertension declined to 29.2% in 2023. Although there has been a decrease, hypertension remains a major non-communicable disease in Indonesia (Kemenkes RI, 2024). In addition, several predisposing factors for obesity are increasing. The proportion of obesity in adults shows a growing trend, rising from 10.5% in 2007 to 14.8% in 2013, and further to 21.8% in 2018 (Kementerian Kesehatan, 2018). At the community health center level, non-communicable diseases such as hypertension, diabetes mellitus, and stroke remain significant public health problems.

In many countries, the prevalence of hypertension is increasing in line with lifestyle factors such as smoking, obesity, physical inactivity, and psychosocial stress (Xu & Long, 2020). Despite the availability of effective antihypertensive therapies, only about 42% of individuals with hypertension are diagnosed and treated, and fewer than one in four achieve adequate blood pressure control. Persistent uncontrolled hypertension markedly elevates the risk of stroke, myocardial infarction, heart failure, chronic kidney disease, and other cardiovascular complications, thereby imposing a considerable burden on healthcare systems and diminishing patients' overall well-being (WHO, 2023).

Beyond increasing the risk of cardiovascular complications, hypertension profoundly affects patients' quality of life (QoL). QoL is a multidimensional construct encompassing physical health, psychological well-being, social relationships, and environmental functioning, all of which may deteriorate due to chronic illness and long-term treatment. Hypertensive patients frequently experience fatigue, sleep disturbances, emotional stress, anxiety about disease progression, and limitations in daily activities, which collectively impair their perceived QoL. Declining QoL has also been linked to poor treatment adherence, reduced functional capacity, increased healthcare utilization, and a higher risk of hospitalization and mortality. Consequently, improving QoL has become a critical patient-centered outcome in the long-term management of hypertension (Trevisol et al., 2011; WHO, 2023).

Effective hypertension management relies not only on pharmacological therapy but also on sustained adherence to recommended lifestyle modifications. Medication adherence ensures consistent blood pressure control and reduces the likelihood of cardiovascular events. In contrast, dietary adherence—particularly adherence to the Dietary Approaches to Stop Hypertension (DASH) eating pattern—supports blood pressure reduction and overall

cardiovascular health. Previous studies consistently report that poor adherence to antihypertensive medication and unhealthy dietary behaviours are associated with uncontrolled blood pressure, increased disease complications, and poorer clinical outcomes. Therefore, both medication adherence and dietary adherence are regarded as essential components of comprehensive hypertension management (Carey et al., 2021; Soltani et al., 2020; Whelton et al., 2018).

Although previous studies have established that medication adherence and healthy dietary practices contribute to improved blood pressure control and reduced cardiovascular risk, most investigations have examined these factors independently and primarily focused on clinical outcomes rather than patient-reported outcomes such as quality of life. Recent systematic reviews have highlighted that quality of life is shaped by multiple behavioral and psychosocial factors; however, evidence directly comparing the relative contributions of medication adherence and dietary adherence remains limited, particularly in community-based primary healthcare settings in low- and middle-income countries (Amlak et al., 2025).

Unlike previous studies that predominantly examined medication adherence or dietary adherence separately and focused mainly on blood pressure control, the present study simultaneously evaluates both adherence behaviors as predictors of quality of life using validated instruments and multivariable ordinal logistic regression. By identifying the relative contributions of medication adherence and dietary adherence to quality of life among patients with hypertension in a primary healthcare setting, this study provides evidence to support more comprehensive and patient-centered strategies for hypertension management.

B. METHODS

This study employed an analytic cross-sectional design to examine the association between medication adherence, dietary adherence, and quality of life among patients with hypertension. An analytic cross-sectional design was considered appropriate because it allows the simultaneous assessment of exposure variables and outcomes within a defined population at a single point in time. This design is widely recommended for investigating associations between health-related factors when longitudinal follow-up is not required and provides an efficient and cost-effective approach for community-based epidemiological research.

The study population consisted of all patients diagnosed with hypertension who were registered in the hypertension management program at Ngasem Primary Health Center during the study period. According to the health center registry, the total target population comprised 310 patients.

The minimum required sample size was estimated using the formula for estimating a proportion in a finite population:

$$n = \frac{Z^2 P(1-P)N}{d^2(N-1) + Z^2 P(1-P)}$$

where n is the minimum sample size, N is the population size (310 patients), Z is the standard normal deviate corresponding to a 95% confidence level (1.96), P is the estimated population proportion (0.50, selected to maximize sample size in the absence of prior prevalence estimates), and d is the margin of error (0.05). This approach is commonly recommended for determining sample size in cross-sectional studies involving finite populations.

Eligible participants were selected using simple random sampling from the hypertension registry maintained by the primary health center. This sampling technique was chosen because the sampling frame included all eligible patients, allowing each individual an equal probability of selection. Consequently, simple random sampling minimized selection bias and enhanced the

representativeness of the study sample. Compared with systematic or cluster sampling, this method was more appropriate because the study population was relatively homogeneous and geographically concentrated within a single primary healthcare facility.

Study Variables and Measurement. The independent variables in this study were medication adherence and dietary compliance, while the dependent variable was quality of life among hypertensive patients. Medication adherence was assessed using the eight-item Morisky Medication Adherence Scale (MMAS-8) (Morisky et al., 2008). Total scores ranged from 0 to 8 and were classified according to the original MMAS-8 scoring guideline as high adherence (score = 8), medium adherence (score = 6 to <8), and low adherence (score <6). Dietary adherence was assessed using the Dietary Approaches to Stop Hypertension (DASH) questionnaire (Soltani et al., 2020). Total scores were categorized into high adherence (score ≥ 16), moderate adherence (score 10–15), and low adherence (score <10), with higher scores indicating better adherence to dietary recommendations. Quality of life was measured using the World Health Organization Quality of Life-BREF (WHOQOL-BREF) questionnaire. The overall quality-of-life score was categorized into high quality of life (score ≥ 61), moderate quality of life (score 41–60), and low quality of life (score ≤ 40). Higher scores reflected better perceived quality of life. (WHO, 2018).

Prior to data collection, the study instruments underwent validity and reliability testing. Item validity analysis showed that all questionnaire items achieved correlation coefficients of at least 0.43, exceeding the acceptable threshold. Internal consistency reliability was assessed using Cronbach's alpha, with all instruments demonstrating coefficients of 0.70 or higher, indicating acceptable reliability for research purposes.

Data were analyzed using IBM SPSS Statistics version 24 (IBM Corp., Armonk, NY, USA). Descriptive statistics summarized participants' demographic and clinical characteristics. Bivariate associations between medication adherence, dietary adherence, and quality of life were examined using the Chi-square test. Variables with statistically significant associations in the bivariate analysis were subsequently included in an ordinal logistic regression model to identify independent predictors of quality of life while controlling for potential confounders. Results are reported as odds ratios (ORs) with 95% confidence intervals (CIs). A two-sided p-value <0.05 was considered statistically significant.

Ethical approval for this study was obtained from the Health Research Ethics Committee of Yahya Bima Health College (No. 20/EC/KEPK/STIKES-YB/IV/2025). All participants provided informed consent before data collection.

C. RESULT AND DISCUSSION

1. Result

Table 1. Distribution Frequency Compliance Medication , Diet Compliance , and Quality of Life (n=172)

Variables	Category	n	%
Compliance Take medicine	Low	50	29.1
	Currently	60	34.9
	Tall	62	36.0
Diet Compliance	Low	64	37.2
	Currently	52	30.2
	Tall	56	32.6
Quality of Life	Bad	43	25.0
	Enough	43	25.0
	Good	47	27.3
	Very good	39	22.7

The distribution of respondents indicates that medication adherence tends to be relatively favourable, with a larger proportion classified in the high adherence group. In contrast, dietary compliance remains suboptimal, as a considerable proportion of participants still fall into the low compliance category.

Interestingly, the quality of life among respondents appears heterogeneously distributed across categories, suggesting that factors influencing quality of life are likely multifactorial and not solely dependent on a single behavioural aspect.

Table 2. Relationship between Medication Adherence and Dietary Adherence with Quality of Life

Predictor	Bad n (%)	Moderate n (%)	Good n (%)	Very Good n (%)	χ^2	p-value
Medication adherence						
Low	23 (46.0)	13 (26.0)	11 (22.0)	3 (6.0)	29.23	<0.001
Currently	13 (21.7)	14 (23.3)	21 (35.0)	12 (20.0)		
High	7 (11.3)	16 (25.8)	15 (24.2)	24 (38.7)		
Dietary adherence						
Low	32 (50.0)	26 (40.6)	5 (7.8)	1 (1.6)	88.69	<0.001
Currently	10 (19.2)	11 (21.2)	22 (42.3)	9 (17.3)		
High	1 (1.8)	6 (10.7)	20 (35.7)	29 (51.8)		

Table 2 presents the associations between medication adherence, dietary adherence, and quality of life among patients with hypertension. Chi-square analysis revealed statistically significant associations between both medication adherence and quality of life ($\chi^2 = 29.23$, $p < 0.001$) and dietary adherence and quality of life ($\chi^2 = 88.69$, $p < 0.001$).

For medication adherence, participants with low adherence were predominantly classified as having poor quality of life (46.0%), whereas only 6.0% reported very good quality of life. In contrast, among participants with high medication adherence, the largest proportion reported very good quality of life (38.7%), while only 11.3% had poor quality of life. Participants with moderate medication adherence showed an intermediate distribution across quality-of-life categories.

A more pronounced pattern was observed for dietary adherence. Half of the participants with low dietary adherence (50.0%) reported poor quality of life, whereas only 1.6% reported very good quality of life. Conversely, among those with high dietary adherence, more than half (51.8%) experienced very good quality of life, and only 1.8% reported poor quality of life. Participants with moderate dietary adherence demonstrated intermediate levels of quality of life.

Overall, these findings indicate that higher levels of both medication adherence and dietary adherence are associated with better quality of life among patients with hypertension. Notably, the larger Chi-square statistic for dietary adherence ($\chi^2 = 88.69$) compared with medication adherence ($\chi^2 = 29.23$) suggests a stronger bivariate association between dietary adherence and quality of life.

Table 4. Feasibility of Ordinal Regression Model

Goodness-of-fit statistic	Value	p-value
Model fitting χ^2	165.960	<0.001
Pearson χ^2	23.059	0.286
Deviance χ^2	17.117	0.645
Test of Parallel Lines	7.967	0.437
Nagelkerke R^2	0.660	-

The ordinal regression model demonstrates a good level of fit and adequacy for explaining the outcome variable. The significant model fitting indicates that the inclusion of predictors meaningfully improves the model compared to the null model. Furthermore, the non-significant goodness-of-fit tests suggest that the model is well aligned with the observed data. The proportional odds assumption is also satisfied, confirming that the model meets key statistical requirements. The relatively high Nagelkerke R-squared value indicates that a substantial proportion of variation in quality of life can be explained by medication adherence and dietary compliance, supporting the robustness of the model.

Table 5. Ordinal Logistic Regression Results of Related Factors with Quality of Life

Predictor	B	SE	Wald	p-value	OR	95% CI OR
Adherence Low vs High Dose Medication	-3.690	0.500	54.460	<0.001	0.025	0.009–0.067
Adherence Moderate vs. High Medication	-1.355	0.380	12.702	<0.001	0.258	0.123–0.543
Low vs High Diet adherence	-5.342	0.563	90.133	<0.001	0.005	0.002–0.014
Moderate vs High Diet adherence	-2.480	0.430	33.342	<0.001	0.084	0.036–0.194

Ordinal logistic regression analysis demonstrated that both medication adherence and dietary adherence were independently associated with quality of life after adjustment. However, dietary adherence showed the largest effect size. Participants with low dietary adherence had 99.5% lower odds of reporting a better quality of life than those with high dietary adherence (adjusted OR = 0.005; 95% CI: 0.002–0.014; $p < 0.001$). Similarly, low medication adherence was associated with significantly lower odds of better quality of life (adjusted OR = 0.025; 95% CI: 0.009–0.067; $p < 0.001$).

2. Discussion

This study investigated the associations between medication adherence, dietary adherence, and quality of life among patients with hypertension attending a primary healthcare center. The findings revealed that both medication adherence and dietary adherence were significantly associated with quality of life. Moreover, ordinal logistic regression analysis indicated that dietary adherence had a stronger independent association with quality of life than medication adherence. These results underscore that optimal hypertension management should not rely solely on pharmacological treatment but should also incorporate sustained adherence to healthy dietary practices to enhance patients' overall well-being.

The present study demonstrated a significant association between medication adherence and quality of life among patients with hypertension. Participants with higher levels of medication adherence were more likely to report better quality of life than those with low adherence. This finding aligns with previous studies showing that regular use of antihypertensive medication improves blood pressure control, reduces cardiovascular risk, and alleviates hypertension-related symptoms, thereby enhancing patients' physical and psychological well-being (Burnier & Egan, 2019; Carey et al., 2021; Nelson et al., 2024).

Medication adherence plays a fundamental role in preventing disease progression and minimizing target-organ damage associated with uncontrolled hypertension. Patients who consistently adhere to prescribed treatment are less likely to experience symptoms such as headaches, dizziness, fatigue, and anxiety related to fluctuating blood pressure. Better symptom control enables patients to maintain daily activities, social participation, and emotional stability, all of which contribute positively to health-related quality of life. Conversely, poor medication adherence has been linked to increased hospitalization, greater

healthcare utilization, and poorer long-term clinical outcomes (Chow et al., 2020; Kengne et al., 2024).

Although medication adherence was significantly associated with quality of life, pharmacological treatment alone may not fully address the behavioral and lifestyle factors contributing to hypertension. Therefore, medication adherence should be integrated with comprehensive lifestyle modification to achieve optimal patient outcomes.

The present study also demonstrated a significant association between dietary adherence and quality of life among patients with hypertension. Participants with higher adherence to dietary recommendations consistently reported better quality of life than those with poor dietary adherence. This finding aligns with previous studies showing that adherence to healthy dietary patterns, particularly the Dietary Approaches to Stop Hypertension (DASH) diet, is associated not only with improved blood pressure control but also with better physical functioning, psychological well-being, and overall health-related quality of life (Amlak et al., 2025; Carey et al., 2021; Siervo et al., 2015).

The beneficial effect of dietary adherence on quality of life can be explained by several physiological mechanisms. The DASH dietary pattern emphasizes increased consumption of fruits, vegetables, whole grains, low-fat dairy products, and foods rich in potassium, calcium, magnesium, and dietary fiber, while limiting sodium, saturated fat, and added sugars. This nutrient combination contributes to blood pressure reduction through improved sodium-potassium balance, enhanced endothelial function, reduced arterial stiffness, and decreased systemic inflammation. In addition, healthy dietary practices support weight management, improve lipid and glucose metabolism, and lower the risk of cardiovascular complications, thereby enhancing physical health and functional capacity (Carey et al., 2021; Ndanuko et al., 2016; Whelton et al., 2018).

Beyond its physiological benefits, dietary adherence may also improve psychological and social aspects of quality of life. Patients who successfully maintain healthy eating behaviors often demonstrate greater self-efficacy, healthier lifestyles, and better disease self-management. These behavioral characteristics may reduce anxiety related to disease progression, increase confidence in managing hypertension, and encourage greater participation in social and daily activities. A recent systematic review further identified healthy dietary behaviors as key determinants of quality of life among patients with hypertension, particularly when combined with adequate health literacy and family support (Shahabudin et al., 2024).

Collectively, these findings suggest that dietary adherence contributes to quality of life through multiple interconnected pathways that extend beyond blood pressure control alone. Unlike pharmacological treatment, which primarily targets physiological regulation of blood pressure, healthy dietary behaviors simultaneously influence metabolic health, physical functioning, psychological well-being, and social participation. This broader impact may explain why dietary adherence demonstrated a stronger association with quality of life than medication adherence in the present study.

The ordinal logistic regression analysis further revealed that dietary adherence remained the strongest independent predictor of quality of life after adjustment for medication adherence. Patients with low dietary adherence had substantially lower odds of reporting better quality of life compared to those with high dietary adherence. This finding suggests that dietary behavior may exert a broader influence on patients' daily well-being than medication adherence alone. While antihypertensive medications primarily target blood pressure regulation through pharmacological mechanisms, healthy dietary practices affect multiple dimensions of health directly reflected in quality of life, including physical functioning, nutritional status, metabolic health, psychological well-being, and social participation.

The stronger association observed for dietary adherence may also reflect the long-term and comprehensive nature of dietary behavior. Unlike medication use, which is generally limited to prescribed treatment schedules, dietary habits influence health continuously through daily food choices. Sustained adherence to healthy dietary recommendations may therefore produce cumulative benefits by improving energy balance, reducing obesity-related risk, enhancing vascular function, and lowering chronic inflammation. These physiological improvements may subsequently reduce symptom burden, improve functional capacity, and enhance patients' perceptions of overall health and well-being (Amlak et al., 2025; Carey et al., 2021).

From a behavioral perspective, dietary adherence represents an important indicator of successful self-management among individuals living with chronic diseases. Patients who consistently follow dietary recommendations are often more engaged in other healthy behaviors, including regular physical activity, routine medical follow-up, stress management, and active participation in treatment decisions. These interrelated health behaviors may collectively contribute to better quality of life beyond the independent effects of medication adherence. Therefore, the present findings underscore the importance of adopting a comprehensive, patient-centered approach to hypertension management that integrates pharmacological therapy with sustained lifestyle modification.

This study has several strengths that warrant acknowledgment. First, probability sampling using a simple random sampling technique was employed, thereby reducing selection bias and enhancing the representativeness of the study population within the primary healthcare setting. Second, medication adherence, dietary adherence, and quality of life were assessed using standardized and validated instruments—namely the MMAS-8, DASH questionnaire, and WHOQOL-BREF—all of which demonstrated acceptable validity and internal consistency reliability prior to data collection. Third, the use of ordinal logistic regression enabled simultaneous evaluation of medication adherence and dietary adherence while accounting for their independent associations with quality of life. This analytical approach provides a more comprehensive understanding of the relative contribution of each adherence behavior compared with bivariate analysis alone.

Nevertheless, several limitations should be considered when interpreting the findings. First, the cross-sectional design precludes establishing temporal or causal relationships between medication adherence, dietary adherence, and quality of life. Although significant associations were observed, it cannot be concluded that improvements in adherence directly lead to better quality of life. Prospective cohort or longitudinal studies are needed to confirm these temporal relationships.

Second, all study variables were measured using self-reported questionnaires. Although the MMAS-8, DASH questionnaire, and WHOQOL-BREF have been extensively validated, self-reported measures remain susceptible to recall bias and social desirability bias, whereby participants may overestimate their adherence behaviors or report more favorable health conditions than actually experienced. Consequently, the observed associations should be interpreted with appropriate caution.

Third, this study was conducted in a single primary healthcare center in Kediri Regency, Indonesia. Variations in healthcare accessibility, socioeconomic characteristics, cultural dietary practices, and health service delivery across different regions may limit the generalizability of these findings to other populations. Therefore, caution is warranted when extrapolating the results beyond similar primary healthcare settings.

Finally, although ordinal logistic regression was performed to identify independent predictors of quality of life, the study did not include several potentially important confounding variables, such as educational attainment, household income, duration of hypertension, comorbid chronic diseases, physical activity, smoking status, and psychological conditions. Future studies incorporating these factors may provide a more comprehensive understanding of the determinants of quality of life among patients with hypertension.

The findings of this study have important implications for hypertension management in primary healthcare settings. While antihypertensive medication remains essential for blood pressure control, the stronger association between dietary adherence and quality of life suggests that lifestyle modification should receive equal emphasis in routine care. Primary healthcare providers should integrate individualized dietary counseling based on the Dietary Approaches to Stop Hypertension (DASH) principles with medication adherence support and regular assessment of patients' quality of life. Such a patient-centered approach may enhance self-management, promote sustained healthy behaviors, and improve overall quality of life rather than focusing solely on clinical indicators of blood pressure control, consistent with current recommendations for comprehensive hypertension management (Amlak et al., 2025; Carey et al., 2021; Whelton et al., 2018).

D. CONCLUSION AND SUGGESTIONS

Medication adherence and dietary adherence were both significantly associated with quality of life among patients with hypertension, with dietary adherence emerging as the strongest independent predictor. These findings underscore that effective hypertension management should extend beyond pharmacological treatment by integrating sustained dietary adherence and other lifestyle modifications into routine primary healthcare services to enhance patients' overall quality of life. By simultaneously evaluating the relative contributions of medication adherence and dietary adherence using multivariable analysis, this study provides evidence supporting a more comprehensive and patient-centered approach to hypertension management. Future multicenter longitudinal studies are warranted to confirm the temporal relationships between adherence behaviors and quality of life and to assess the effectiveness of integrated adherence interventions in improving patient outcomes.

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