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Association of Prescribing and Adherence-Related Drug Problems with Post-discharge Outcomes in Acute Coronary Syndrome: A Prospective Study in Vietnam

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ABSTRACT

Drug-related problems (DRPs) are common among patients with acute coronary syndrome (ACS), particularly during the transition from hospital discharge to outpatient care. Inappropriate prescribing and suboptimal medication adherence after discharge may contribute to adverse clinical outcomes; however, prospective evidence from low- and middle-income countries remains limited. To determine the prevalence and characteristics of prescribing- and adherence-related DRPs among patients with ACS and to examine their association with adverse post-discharge outcomes. A prospective observational study was conducted among consecutive patients hospitalized with ACS at a specialized cardiovascular hospital in Vietnam between August 2023 and January 2024. DRPs were assessed at discharge and during monthly follow-up for three months through prescription review and structured telephone interviews. Medication adherence was evaluated using a standardized interview-based questionnaire. The primary outcome was adverse clinical outcome, defined as hospital readmission or all-cause mortality within three months after discharge. Multivariable logistic regression was used to identify factors associated with adverse outcomes. A total of 78 patients were included (66.7% male; mean age 66.6 ± 11.8 years). Drug-drug interactions were the most frequent prescribing-related DRPs at discharge (42.3%). Dosing-related DRPs were common at discharge (61.5%) but decreased over follow-up. Inadequate discharge treatment was noted in 11.5% of patients. Non-adherence-related DRPs peaked at one-month post-discharge (48.3%) and subsequently decreased. Both prescribing-related DRPs (OR 14.5, $p = 0.012$) and non-adherence-related DRPs (OR 13.1, $p < 0.001$) were significantly associated with adverse clinical outcomes. Prescribing- and adherence-related DRPs are common among patients with ACS and are associated with adverse outcomes after discharge. These findings highlight the importance of structured medication review and adherence support during the post-discharge period.

Keywords: Acute coronary syndrome; drug-related problems; prescribing practices; medication adherence; clinical outcomes.

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INTRODUCTION

Cardiovascular disease remains the leading global cause of death, with ischemic heart disease accounting for nearly half of these fatalities (Mensah et al., 2023). Acute coronary syndrome (ACS) represents a critical subset of ischemic heart diseases, encompassing unstable angina pectoris and myocardial infarction, including both ST-segment elevation myocardial infarction (STEMI) and non-ST-segment elevation myocardial infarction (NSTEMI), often presenting as the initial clinical event (Bergmark et al., 2022). In 2022 alone, 40,021 admissions for STEMI (46,7%) and NSTEMI (53,3%) were recorded from 192 hospitals across seven countries participating in the EuroHeart registry for acute coronary syndrom and percutaneous coronary intervention (ACS/PCI) (Bhatty et al., 2024). Approximately 30% of patients experiencing an acute myocardial infarction die within the first month, with half of these deaths occurring pre-hospitalization. Among survivors, mortality remains significant, with one in every 25 patients dying within a year post-event, a rate notably higher among individuals aged over 75 years (Buske et al., 2024). Despite substantial advancements in diagnosis and therapeutic interventions, ACS continues to represent a major health burden, necessitating ongoing clinical attention and optimized management strategies (Ministry of Health [Vietnam], 2019).

Drug-related problems (DRPs)—defined as events involving medications that negatively impact desired health outcomes—have increasingly emerged as significant contributors to adverse clinical outcomes in ACS patients, both internationally and within Vietnam (Abdela et al., 2016; Al-Azzam et al., 2016). DRPs commonly involve inappropriate medication selection, dosing errors, inadequate adherence to treatment regimens, and drug–drug interactions, and they substantially contribute to increased morbidity, frequent hospitalizations, and higher healthcare expenditures (Mathews et al., 2018; Mehta et al., 2015). Recent evidence indicates that DRPs may affect up to 80% of hospitalized cardiovascular patients, leading to prolonged hospital stays and increased healthcare resource utilization (Kassab et al., 2013; Medina-Inojosa et al., 2021; Okkonen et al., 2021). Furthermore, non-adherence to prescribed medications post-discharge, particularly in chronic cardiovascular conditions, has been linked to substantially increased risks of adverse cardiac events and hospital readmissions (Gona et al., 2021; Mathews et al., 2018).

In Vietnam, while comprehensive national data remain limited, observational reports indicate a significant and increasing burden of ACS, compounded by medication-related challenges (Nguyen et al., 2025). These challenges often arise from gaps in prescribing practices, limited patient understanding of medication use, and poor adherence behaviors post-discharge (Truong et al., 2019; Vu, 2023). Despite the clinical importance, structured assessments addressing both prescribing-related and adherence-related DRPs in ACS patients remain relatively scarce. Moreover, existing research has primarily focused on inpatient settings, leaving outpatient management after hospital discharge insufficiently explored (Nguyen et al., 2023). To address this critical knowledge gap, we conducted a prospective observational study to systematically evaluate the prevalence and types of DRPs among ACS patients at a specialized cardiology hospital in Vietnam. The objective of this study was to determine the prevalence and characteristics of prescribing - and adherence-related drug problems among patients with acute coronary syndrome and to examine their association with post-discharge clinical outcomes, including hospital readmission and mortality within three months. Results from this study are intended to provide practical insights to guide targeted pharmaceutical interventions, enhance patient education, improve clinical practice standards, and ultimately optimize clinical outcomes for ACS patients.

MATERIALS AND METHODS

Study design and setting

This prospective observational study was conducted at a specialized cardiovascular hospital in Can Tho, Vietnam, from August 2023 to January 2024. Patients diagnosed with ACS were followed from hospital discharge for a period of three months. Data collection was performed at discharge and at monthly follow-up visits conducted via telephone interviews.

Study participants and recruitment

Eligible participants included patients hospitalized with a confirmed diagnosis of acute coronary syndrome, comprising STEMI, NSTEMI, or unstable angina, who were discharged between August 2023 and January 2024. Inclusion criteria required a prescription for ACS treatment at discharge and informed consent to participate. Patients were excluded if they refused participation, were foreign nationals,

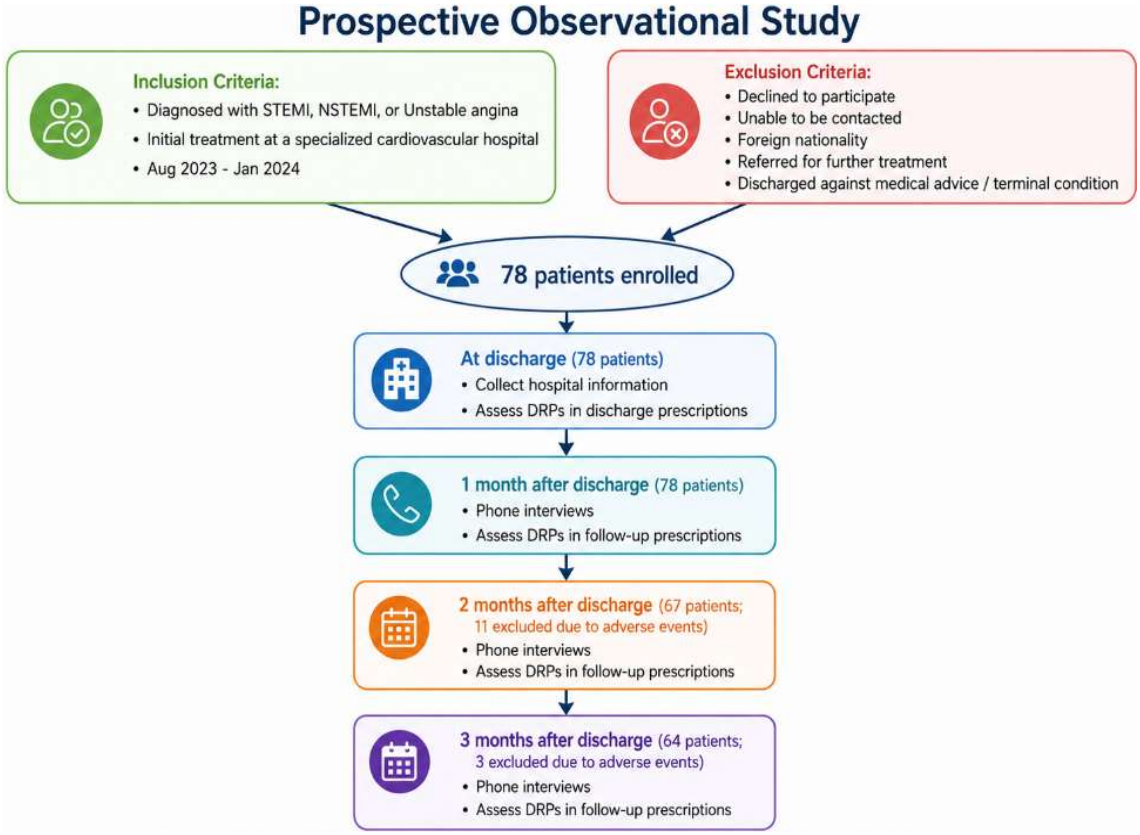


Figure 1. Study flowchart of patient enrollment and follow-up.
STEMI: ST-elevation myocardial infarction; NSTEMI: Non-ST-elevation myocardial infarction; DRP: Drug-related problem.

transferred from another hospital or discharged against medical advice or with a prognosis indicating imminent death. This study employed consecutive sampling of all eligible patients discharged during the study period. A total of 78 eligible patients were consecutively enrolled (78 participants met the inclusion criteria and were included in the final analysis during the study period) (Figure 1).

Data collection procedures

Baseline demographic characteristics, clinical information, comorbidities, and discharge medications were extracted from medical records. Follow-up data were collected through structured telephone interviews conducted at one, two, and three months after discharge. Follow-up was terminated earlier if a patient experienced hospital readmission or death.

Assessment of DRPs

DRPs were identified and systematically classified using a structured review method based on a predefined hierarchy of reference sources. The assessment was performed by a clinical pharmacist with Specialist Level II qualification, based on prescription review and clinical records. The hierarchy prioritized official guidelines from the Vietnamese Ministry of Health (e.g., Vietnam National Formulary 2022 (Ministry of Health [Vietnam], 2022), national ACS treatment guidelines(Ministry of Health [Vietnam], 2019), contraindicated drug interactions (Ministry of Health [Vietnam], 2021)), followed by hospital-specific protocols and reputable national sources, and lastly, international databases such as Drugs.com and Medscape.com.

Prescription-related DRPs were categorized into issues related to drug selection (e.g., drug-drug

interactions, contraindicated medications), dosing selection (e.g., subtherapeutic or excessive dosing, incorrect timing), and inadequate treatment (e.g., incomplete pharmacological therapy, insufficient preventive counseling). Patient adherence-related DRPs included under- or overdosing, inconsistent medication timing, intentional misuse, difficulty with medication forms, and missed follow-up appointments. Patient medication adherence was assessed through patient interviews using a structured questionnaire (Supplementary Materials I).

Adherence-related DRPs were defined to include both direct medication-taking behaviors and related behaviors that could compromise appropriate medication use after discharge, such as intentional medication misuse and missed follow-up visits, which may lead to inadequate medication review, dose adjustment, and reinforcement of adherence. DRPs were assessed comprehensively at each follow-up period. Adverse drug reactions were not assessed in this study because follow-up relied primarily on telephone interviews without clinical or laboratory confirmation. Consequently, no validated adverse drug reaction (ADR) causality or severity assessment tool was applied. This limitation is acknowledged.

Clinical outcome measures

The primary outcome evaluated was the occurrence of adverse clinical events within three months post-discharge. Clinical outcomes were collected through direct telephone interviews with patients who had provided informed consent. Follow-up interviews were conducted at 1, 2, and 3 months after hospital discharge using a standardized data collection form. Patients were categorized into two outcome groups: optimal outcome (no adverse events) or adverse outcome (including hospital readmission due to cardiovascular complications or all-cause mortality). All-cause mortality was selected to ensure comprehensive capture of fatal events during the follow-up period. This definition of optimal outcome was chosen to reflect clinically relevant post-discharge stability in patients with acute coronary syndrome.

Statistical analysis

Data entry was performed in Microsoft Excel 2016, and statistical analyses were conducted in SPSS (version 26.0; IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize patient characteristics and DRPs. Categorical variables were expressed as frequency and percentage, and continuous variables as mean ± standard deviation. Associations between DRPs and outcomes were evaluated using chi-square or Fisher's exact tests, as appropriate. Multivariable logistic regression was performed to identify independent factors associated with adverse outcomes, with results reported as odds ratios (OR) and 95% confidence intervals (CI). Statistical significance was set at $p < 0.05$.

Ethical considerations

This study was approved by the Ethics Committee of Can Tho University of Medicine and Pharmacy (Approval number: 23. 007.HV/PCT-HĐĐĐ), approved in 2023. All participants provided informed consent prior to enrollment. Patient confidentiality and anonymity were strictly maintained throughout data collection and analysis, ensuring compliance with international ethical standards for biomedical research.

RESULTS AND DISCUSSION

Patient and Prescription Characteristics

The study included 78 patients diagnosed with ACS. The majority were male (66.7%), with a mean age of 66.6 ± 11.8 years (range: 44–91 years). Most patients had only completed primary or secondary education (44.9%), and a significant proportion had no formal education (35.9%). A majority of participants were unmarried (59%) and economically independent (71.8%), though 46.2% depended on caregivers for daily activities. Non-smokers accounted for the largest proportion (76.9%), while current smokers comprised only 14.1%. Notably, 62.8% of patients could not adequately identify their medications. Polypharmacy was common, with 88.5% of prescriptions including five or more drugs, and most patients had multiple comorbidities (≥3 comorbidities: 96.2%) (Table I).

Prevalence of DRPs

Prescription-related DRPs were identified in several categories at hospital discharge and during follow-up. Drug-drug interactions represented the most common DRP, affecting 42.3% of patients at discharge. DRPs related to inappropriate dosing (61.5%) were prevalent at discharge, primarily due to subtherapeutic doses (28.2%) and inappropriate timing of medication administration (26.9%). Inadequate treatment, characterized by the omission of essential medications, was noted in 11.5% of patients at discharge (Table II).

Table I. Demographic, Clinical, and Prescription Characteristics of Patients with Acute Coronary Syndrome (*n* = 78)

No	Characteristic	n (%)	No	Characteristic	n (%)
1	**Age**		**7**	**Medication assistance required**	
	≥ 65 years	45 (57.7%)		No	54 (69.2%)
	< 65 years	33 (42.3%)		Yes	24 (30.8%)
	Mean ± SD	66.6 ± 11.8		Caregiver support	
	Range	44 – 91		No caregiver	42 (53.8%)
2	**Gender**			With caregiver	36 (46.2%)
	Female	26 (33.3%)	**8**	**Primary Diagnosis**	
	Male	52 (66.7%)		STEMI	12 (15.4%)
3	**Educational Level**			NSTEMI	51 (65.4%)
	No formal education	28 (35.9%)		Unstable angina	15 (19.2%)
	Primary and secondary	35 (44.9%)	**9**	**Number of medications prescribed**	
	Vocational training or higher	15 (19.2%)		< 5 drugs	9 (11.5%)
4	**Marital Status**			≥ 5 drugs	69 (88.5%)
	Single	46 (59.0%)	**10**	**Number of comorbidities**	
	Married	32 (41.0%)		< 3 comorbidities	3 (3.8%)
5	**Socioeconomic Status**			≥ 3 comorbidities	75 (96.2%)
	Independent	56 (71.8%)	**11**	**Medication awareness**	
	Dependent	22 (28.2%)		Unable to identify medications	49 (62.8%)
6	**Smoking Status**			Fully able to identify medications	29(37.2%)
	Never smoked or previously quit	60 (76.9%)			
	Former smoker, currently not smoking	7 (9.0%)			
	Currently smoking	11 (14.1%)			

STEMI: ST-elevation myocardial infarction; NSTEMI: Non-ST-elevation myocardial infarction: number; %: percentage; SD: standard deviation.

Table II. Prevalence of Prescription-Related DRPs (*n* = 78)

DRP Category	Discharge n (%)	Month 1 n (%)	Month 2 n (%)	Month 3 n (%)
Drug selection				
Drug-drug interactions	33 (42.3%)	23 (29.5%)	22 (32.8%)	21 (32.8%)
Contraindicated medication	1 (1.3%)	0 (0%)	0 (0%)	0 (0%)
Total	34 (43.6%)	23 (29.5%)	22 (32.8%)	21 (32.8%)
Dosing selection				
Dose too low	22 (28.2%)	21 (26.9%)	13 (19.6%)	11 (17.2%)
Inappropriate timing	21 (26.9%)	10 (12.8%)	7 (10.4%)	6 (9.4%)
Inadequate/unclear dosing instruction	5 (6.4%)	0 (0%)	0 (0%)	0 (0%)
Total	48 (61.5%)	31 (39.7%)	20 (30.0%)	17 (26.6%)
Inadequate treatment				
Inadequately treated condition	9 (11.5%)	1 (1.3%)	1 (1.5%)	1 (1.6%)

DRP: drug-related problem; n: number; %: percentage.

Regarding patient adherence, DRPs were assessed monthly after discharge. The overall prevalence of non-adherence was highest in month one (48.3%) and decreased gradually by month three (17.3%). The most common adherence issues were inconsistent timing of medication use (21.8%) and missed follow-up appointments (20.5%) (Table III).

Association Between DRPs and Clinical Outcomes

After 3 months, 78.2% of patients achieved optimal outcomes without adverse events, while 21.8% experienced adverse events (hospital readmission: 15.4%; mortality: 6.4%) (Table IV).

Table III. Prevalence of Patient Adherence-Related DRPs (*n* = 78)

DRP Category	Month 1 n (%)	Month 2 n (%)	Month 3 n (%)
Took less medication than prescribed	3 (4.7%)	4 (6.0%)	3 (4.7%)
Inconsistent timing of medication use	17 (21.8%)	7 (10.4%)	4 (6.3%)
Intentional medication misuse	1 (1.3%)	0 (0%)	0 (0%)
Missed follow-up visits	16 (20.5%)	7 (10.4%)	4 (6.3%)
Overall non-adherence rate	37 (48.3%)	18 (26.8%)	11 (17.3%)

DRP: drug-related problem; n: number; %: percentage.

Table IV. Clinical Outcomes at Three Months (*n* = 78)

Outcome	Number (n)	Percentage (%)
Optimal (no event)	61	78.2%
Adverse events	17	
- Hospital readmission	12	15.4%
- Death	5	6.4%

n: number; %: percentage.

Table V. Association Between DRPs and Clinical Outcomes

DRP type	Optimal outcome n (%)	Adverse events n (%)	OR (95% CI)	*p*-value
Prescription-related DRPs				
- No	29 (96.7%)	1 (3.3%)	Reference	
- Yes	32 (66.7%)	16 (33.3%)	14.5 (1.81-116.28)	0.012
Adherence-related DRPs				
- Adherent	45 (93.8%)	3 (6.3%)	Reference	
- Non-adherent	16 (53.3%)	14 (46.7%)	13.13 (3.33-51.72)	<0.001

DRP: drug-related problem; OR: odds ratio; CI: confidence interval; p: p-value.

Table VI. Multivariate Logistic Regression for Adverse Outcomes

Factors	OR (95% CI)	*p*-value
Prescription-related DRPs	55.45 (2.08–74.73)	0.016
Adherence-related DRPs	11.05 (1.54–79.07)	0.017
Family caregiving support	6.68 (0.43–101.84)	0.172
Smoking	1.14 (0.07–17.65)	0.925
Medication dependency	0.05 (0.001–2.08)	0.113
Marital status	3.01 (0.15–60.29)	0.471
Economic dependency	9.70 (0.21–434.61)	0.242

DRP: drug-related problem; OR: odds ratio; CI: confidence interval; p: p-value.

Prescription-related DRPs were significantly associated with adverse outcomes (33.3% vs. 3.3%, OR 14.5; 95% CI 1.81–116.28; $p = 0.012$). Non-adherence-related DRPs similarly demonstrated a substantial association with adverse outcomes (46.7% vs. 6.3%, OR 13.13; 95% CI 3.33–51.72; $p < 0.001$) (Table V).

Multivariate Analysis

Multivariate logistic regression identified prescription-related DRPs (OR 55.45, $p = 0.016$) and adherence-related DRPs (OR 11.05, $p = 0.017$) as significant independent predictors of adverse outcomes. Other patient-related factors showed no significant association with clinical outcomes (Table VI). This study evaluated DRPs among patients with ACS and examined their association with post-discharge clinical outcomes. Both prescribing-related and adherence-related DRPs were found to be significantly associated with hospital readmission and mortality during the post-discharge period.

Our findings provide important insights into the prevalence and clinical relevance of DRPs in patients with ACS. Prescription-related DRPs were common at the time of hospital discharge, with drug–drug interactions (DDIs) occurring in 42.3% of patients. This finding is consistent with previous studies that have highlighted the complexity of prescribing in cardiovascular care, particularly in patients with multiple comorbidities and polypharmacy (Abdela et al., 2016; Al-Azzam et al., 2016). In addition, dosage-related DRPs were frequently identified, mainly due to inappropriate timing of administration and subtherapeutic dosing. Similar patterns have been reported in studies conducted in comparable hospital settings (Gona et al., 2021; Truong et al., 2019). The high prevalence of prescribing-related DRPs at discharge underscores the importance of comprehensive medication reconciliation and systematic prescription review, emphasizing the critical role of clinical pharmacists in optimizing pharmacotherapy prior to patient discharge (Mathews et al., 2018; Zheng et al., 2024).

Adherence-related DRPs were most prevalent during the first month after discharge, affecting nearly half of the study population (48.3%), and declined substantially in subsequent follow-up periods. This trend may reflect gradual improvement in patient behavior over time, potentially influenced by repeated counseling and reinforcement during follow-up contacts. Difficulties in maintaining consistent medication timing and adherence to scheduled follow-up visits were the most frequently observed challenges. These findings are consistent with global evidence demonstrating suboptimal medication adherence in the long-term management of chronic cardiovascular conditions (Kassab et al., 2013; Mehta et al., 2015). Prior research has consistently shown that sustained patient education and continuous adherence support after discharge are essential for improving adherence and achieving better clinical outcomes(Medina-Inojosa et al., 2021; Okkonen et al., 2021).

Importantly, our results demonstrated significant associations between DRPs and adverse clinical outcomes. Patients with prescribing-related DRPs had markedly higher odds of experiencing adverse events, including rehospitalization and mortality, compared with those without such problems (OR 14.5, $p = 0.012$). Similarly, adherence-related DRPs were strongly associated with adverse outcomes (OR 13.13, $p < 0.001$). These findings highlight the clinical significance of early identification and management of DRPs in patients with ACS and support the expanding role of clinical pharmacists in post-discharge care to improve patient outcomes (Huynh et al., 2022; Nguyen et al., 2023).

Multivariable logistic regression analysis further confirmed that both prescribing-related DRPs (OR 55.45; $p = 0.016$) and adherence-related DRPs (OR 11.05; $p = 0.017$) were independent predictors of adverse clinical events. These results suggest that targeted interventions addressing these specific categories of DRPs may be particularly important in ACS management strategies. Other variables evaluated in the analysis—including socioeconomic status, caregiver support, smoking status, and medication dependency—were not significantly associated with clinical outcomes. This lack of association may be attributable to the relatively small sample size or heterogeneity within the study population, as noted in previous research (Alkofide et al., 2022).

This study has several notable strengths. The prospective observational design, systematic follow-up at multiple post-discharge time points, and integration of both prescribing- and adherence-related perspectives provide a comprehensive evaluation of DRPs in ACS patients. Furthermore, the application of the Vietnamese Ministry of Health's standardized DRP classification enhances the relevance of our findings to local clinical practice and healthcare policy. Nevertheless, certain limitations should be acknowledged. The single-center design and modest sample size may limit generalizability. The relatively short follow-up period restricts assessment of long-term outcomes. In addition, reliance on self-reported adherence during telephone interviews may introduce recall bias, and the absence of economic evaluation or detailed adverse drug reaction monitoring limits a full assessment of the burden associated with DRPs.

Despite these limitations, the study's findings highlight critical areas for clinical pharmacy interventions and patient education to enhance medication safety and adherence in ACS patients. Future research should incorporate larger, multicenter studies with longer-term follow-ups, objective adherence measurements, and comprehensive cost-effectiveness analyses. Ultimately, integrating clinical pharmacists into multidisciplinary teams and developing structured educational programs could potentially improve clinical outcomes and reduce healthcare utilization associated with drug-related problems.

CONCLUSION

This study demonstrates that DRPs related to both prescribing practices and patient adherence are common among patients with acute coronary syndrome. These DRPs are significantly associated with adverse clinical outcomes, including higher rates of hospital readmission and mortality. Timely identification of DRPs and targeted interventions addressing prescribing practices and patient adherence may be important for optimizing therapeutic outcomes. Our findings underscore the critical role that clinical pharmacists play in multidisciplinary care teams, highlighting the need to integrate pharmaceutical care interventions to enhance medication safety and patient adherence post-discharge. Future research should focus on evaluating long-term clinical outcomes and exploring comprehensive interventions, including structured patient education and pharmacist-led follow-up, to further improve cardiovascular care quality and reduce preventable adverse events.

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REFERENCES

Abdela, O. A., Bhagavathula, A. S., Getachew, H., & Kelifa, Y. (2016). Risk factors for developing drug-related problems in patients with cardiovascular diseases attending Gondar University Hospital, Ethiopia. *Journal of Pharmacy & Bioallied Sciences*, *8*(4), 289–295. https://doi.org/10.4103/0975-7406.191975

Al-Azzam, S. I., Alzoubi, K. H., AbuRuz, S., & Alefan, Q. (2016). Drug-related problems in a sample of outpatients with chronic diseases: A cross-sectional study from Jordan. *Therapeutics and Clinical Risk Management*, *12*, 233–239. https://doi.org/10.2147/TCRM.S98165

Alkofide, H., Alshuhayb, R., Alhazmi, N., Almofada, R., Hazzaa, A. B., Alsharif, A., Abouzaid, H., Almofada, R. S., & Hazzaa, A. M. B. (2022). Adherence to prescribing guideline-directed medical therapy at hospital discharge in subjects with acute coronary syndrome, and the relationship with mortality. *Cureus*, *14*(4), e24295. https://doi.org/10.7759/cureus.24295

Bergmark, B. A., Mathenge, N., Merlini, P. A., Lawrence-Wright, M. B., & Giugliano, R. P. (2022). Acute coronary syndromes. *The Lancet*, *399*(10332), 1347–1358. https://doi.org/10.1016/S0140-6736(21)02391-6

Bhatty, A., Wilkinson, C., Batra, G., Alfredsson, J., Erlinge, D., Ferreira, J., Guðmundsdóttir, I. J., Hrafnkelsdóttir, Þ. J., Ingimarsdóttir, I. J., Irs, A., Járai, Z., Jánosi, A., Popescu, B. A., Santos, M., Vasko, P., Vinereanu, D., Yap, J., Maggioni, A. P., Wallentin, L., … Gale, C. P. (2024). Cohort profile: The European Unified Registries On Heart Care Evaluation and Randomized Trials (EuroHeart)—Acute coronary syndrome and percutaneous coronary intervention. *European Heart Journal - Quality of Care and Clinical Outcomes, 10(5),* 386–390. https://doi.org/10.1093/ehjqcco/qcae025

Buske, M., Feistritzer, H.-J., Jobs, A., & Thiele, H. (2024). Management des akuten Koronarsyndroms [Management of acute coronary syndrome]. *Herz*, *49*(1), 5–14. https://doi.org/10.1007/s00059-023-05228-w

Gona, O. J., Shambu, S. K., & Madhan, R. (2021). Frequency and nature of drug-related problems in patients with acute coronary syndrome: Role of the clinical pharmacist in coronary care practice. *Journal of Pharmacy Practice and Research*, *51*(1), 36–42. https://doi.org/10.1002/jppr.1706

Huynh, H. H. N., Nguyen, T. N., & Tran, H. H. (2022). Treatment outcomes in patients with acute coronary syndrome at Tra Vinh General Hospital. *Vietnam Journal of Medicine*, *517*(1), 45–50. https://doi.org/10.51298/vmj.v517i1.3175

Kassab, Y., Hassan, Y., Abd Aziz, N., Ismail, O., & AbdulRazzaq, H. (2013). Patients' adherence to secondary prevention pharmacotherapy after acute coronary syndromes. *International Journal of Clinical Pharmacy*, *35*(2), 275–280. https://doi.org/10.1007/s11096-012-9743-3

Mathews, R., Wang, W., Kaltenbach, L. A., Thomas, L., Shah, R. U., Ali, M., Peterson, E. D., & Wang, T. Y. (2018). Hospital variation in adherence rates to secondary prevention medications and the implications on quality. *Circulation*,

137(20), 2128–2138. https://doi.org/10.1161/CIRCULATIONAHA.117.029107

Medina-Inojosa, J. R., Grace, S. L., Supervia, M., Stokin, G., Bonikowske, A. R., Thomas, R., & Lopez-Jimenez, F. (2021). Dose of cardiac rehabilitation to reduce mortality and morbidity: A population-based study. *Journal of the American Heart Association*, *10*(20), Article e021356. https://doi.org/10.1161/JAHA.121.021356

Mehta, R. H., Chen, A. Y., Alexander, K. P., Ohman, E. M., Roe, M. T., & Peterson, E. D. (2015). Doing the right things and doing them the right way: Association between hospital guideline adherence, dosing safety, and outcomes among patients with acute coronary syndrome. *Circulation*, *131*(11), 980–987. https://doi.org/10.1161/CIRCULATIONAHA.114.013521

Mensah, G. A., Fuster, V., Murray, C. J. L., Roth, G. A., & Global Burden of Cardiovascular Diseases and Risks Collaborators. (2023). Global burden of cardiovascular diseases and risks, 1990–2022. *Journal of the American College of Cardiology*, *82*(25), 2350–2473. https://doi.org/10.1016/j.jacc.2023.11.007

Ministry of Health. (2019). *Guidelines for the diagnosis and management of acute coronary syndrome* (Decision No. 2187/QĐ-BYT). Ministry of Health [Vietnam]. https://soyte.tuyenquang.gov.vn/van-ban/2187-qd-byt.doc

Ministry of Health. (2021). *Decision No. 5948/QĐ-BYT on the issuance of the list of contraindicated drug interactions in clinical practice at healthcare facilities*. Ministry of Health [Vietnam]. https://kcb.vn/tin-tuc/danh-muc-tuong-tac-thuoc-chong-chi-dinh-trong-thuc-hanh-lam-sang-va-huong-dan-giam-sat-phan-ung-co-hai-cua-thuoc-adr-tai.html

Ministry of Health. (2022). *Vietnam national pharmacopoeia*. Ministry of Health [Vietnam]. https://duocdienvietnam.com/tra-cuu-duoc-thu-quoc-gia-viet-nam-2022-online/

Nguyen, T. V., Nguyen, H. T. T., Truong, D. N., Nguyen, V. Q., Nguyen, H. Q., Nguyen, H. Q., Ngo, T. T. K., Amsalu, E., Wong, W. J., & Nguyen, T. N. (2025). Medication adherence and hospitalizations in older patients with coronary heart disease in Vietnam. *British Journal of Clinical Pharmacology*, *91*(6), 1771–1779. https://doi.org/10.1111/bcp.16405

Nguyen, V. T., Nguyen, P. M., & Nguyen, T. (2023). A review of medication adherence in patients with coronary artery disease. *Vietnamese Journal of Cardiology*, (93), 21–27. https://doi.org/10.58354/jvc.93.2023.280

Okkonen, M., Havulinna, A. S., Ukkola, O., Huikuri, H., Pietilä, A., Koukkunen, H., Lehto, S., Mustonen, J., Ketonen, M., & Airaksinen, J. (2021). Risk factors for major adverse cardiovascular events after the first acute coronary syndrome. *Annals of Medicine*, *53*(1), 817–823. https://doi.org/10.1080/07853890.2021.1933161

Truong, T. T., Phan, N. K., Vo, Q. V., Diep, H. G., Vuong, H. T., Le, T. V., Nguyen, P. M., & Nguyen, T. (2019). Drug-related problems in prescribing for coronary artery diseases in Vietnam: Cross-sectional study. *Tropical Medicine & International Health*, *24*(11), 1335–1340. https://doi.org/10.1111/tmi.13303

Vu, H. V., Nguyen, N. C. T., Pham, D. D. Q., Nguyen, D. K., Bui, T. D., & Truong, Q. B. (2023). Current status of heart failure management in Vietnam. *Vietnam Journal of Cardiology*, (107E), 4–17. https://doi.org/10.58354/jvc.107E.2023.328

Zheng, L., Pon, T., Bajorek, S., Le, K., Hluhanich, R., Ren, Y., & Wilson, M. (2024). Impact of pharmacist-led discharge medication reconciliation on error and patient harm prevention at a large academic medical center. *Journal of the American College of Clinical Pharmacy*, *7*(8), 787–794. https://doi.org/10.1002/jac5.1980