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Prescribing appropriateness for rheumatoid arthritis patients at a public regional referral hospital in West Java, Indonesia: a retrospective cross-sectional study

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Abstract: Rheumatoid arthritis requires long-term pharmacotherapy, and inappropriate prescribing poses significant risks of treatment failure, adverse drug events, and increased healthcare costs. This study evaluated prescribing appropriateness for rheumatoid arthritis patients at a public regional referral hospital in Bandung Regency, West Java, Indonesia, during 2023. A retrospective cross-sectional study analyzed medical records of 81 outpatients using five criteria recommended by the Indonesian Ministry of Health: appropriate indication, drug selection, dose, patient, and dosing interval. Complete compliance was achieved for appropriate indication (100%) and drug selection (100%). Dose appropriateness was 81.8%, with diclofenac sodium prescribed below and etoricoxib above therapeutic ranges for rheumatoid arthritis. Patient appropriateness was 97.0%, with diclofenac sodium prescribed to four elderly patients (>65 years) without documented gastroprotection. Dosing interval appropriateness was 81.8%, with etoricoxib and meloxicam prescribed more frequently than recommended. The overall prescribing appropriateness rate was 92.1%. Prescribing practices were generally appropriate but fell short of the 95% quality benchmark. Targeted interventions, including clinical decision support systems, prescriber education on pharmacokinetic principles, and systematic prescribing audits are warranted to address identified deficiencies and optimise therapeutic outcomes for rheumatoid arthritis patients.

Keywords: drug utilization evaluation; non-steroidal anti-inflammatory drugs; prescribing appropriateness; rational pharmacotherapy; rheumatoid arthritis

Introduction

Rheumatoid arthritis (RA) is a chronic, systemic autoimmune disease characterised by symmetrical erosive synovitis predominantly affecting the peripheral joints. Without adequate treatment, the disease follows a progressive course leading to irreversible joint destruction, functional disability, diminished quality of life, and premature mortality [1]. Globally, RA affects an estimated 17.6 million people, with a prevalence of 0.5–1.0% of the adult population, a well-documented female predominance, and peak incidence during the fourth and fifth decades of life [2].

In Indonesia, RA constitutes a significant public health burden. National data from the Indonesian Basic Health Research (Riskesdas 2018) indicate that West Java province ranks second nationally in RA prevalence, with a rate of 8.52% affecting approximately 131,846 individuals [3]. This substantial burden underscores the importance of ensuring high-quality, evidence-based pharmaceutical care for affected patients.

Pharmacological management of RA typically employs disease-modifying antirheumatic drugs (DMARDs) as the cornerstone of therapy, supplemented by corticosteroids for rapid symptom control and NSAIDs for symptomatic relief of pain and inflammation [4,5]. The complexity of RA pharmacotherapy—involving multiple drug classes with distinct mechanisms of action, dosing requirements, and safety profiles—necessitates rigorous attention to prescribing practice.

Despite the availability of evidence-based clinical practice guidelines, inappropriate prescribing remains a persistent challenge in healthcare systems worldwide. The WHO estimates that more than half of all medicines are prescribed, dispensed, or sold inappropriately, and that half of all patients fail to take them correctly [6]. In chronic diseases requiring long-term pharmacotherapy such as RA, the consequences are particularly significant. Subtherapeutic dosing yields inadequate disease control and risks progressive joint destruction, while supratherapeutic dosing increases

the risk of dose-dependent adverse effects — including gastrointestinal complications, cardiovascular events, and renal toxicity associated with NSAIDs and corticosteroids [7]. Failure to account for patient-specific factors, particularly age-related physiological changes and comorbidity burden in elderly patients, can expose vulnerable populations to preventable harm.

The Indonesian Ministry of Health has operationalised the WHO concept of rational drug use — equivalent to the internationally recognised term "prescribing appropriateness" — through five evaluative criteria: appropriate indication, appropriate drug selection, appropriate dose, appropriate patient, and appropriate dosing interval [8]. Systematic evaluation against these criteria provides a structured framework for identifying prescribing deficiencies and implementing targeted quality improvement.

Although prescribing patterns have been examined across various therapeutic areas in Indonesian healthcare settings, data specifically evaluating RA prescribing appropriateness in hospital outpatient settings remain limited. To date, no published study has systematically evaluated RA prescribing against all five Indonesian Ministry of Health criteria at a regional referral hospital in West Java — one of the highest-prevalence provinces in the country. This evidence gap limits the capacity of healthcare administrators and policymakers to develop targeted, evidence-informed quality improvement initiatives.

This study therefore aimed to evaluate the appropriateness of drug therapy for RA outpatients at a public regional referral hospital in Bandung Regency, West Java, Indonesia, during 2023. Specific objectives were to: (i) characterise the demographic and clinical profile of RA outpatients; (ii) assess prescribing appropriateness against each of the five Ministry of Health criteria; (iii) identify drugs and prescribing patterns associated with inappropriate prescribing; and (iv) calculate the overall rate of prescribing appropriateness in this patient population.

Methods

Study design and setting

This study employed a descriptive observational design with a retrospective cross-sectional approach. Data were collected through systematic review of medical records from RA patients treated at the outpatient clinic of a public regional referral hospital in Bandung Regency, West Java, Indonesia, during the period of January to December 2023 [9]. The study was conducted following institutional approval from the hospital's research and ethics committee, which waived the requirement for individual patient consent given the retrospective nature of the study and the absence of direct patient contact or intervention. All patient data were anonymised prior to analysis.

Study population and sampling

The study population comprised all outpatient cases with a confirmed diagnosis of RA at the study site during the study period, totalling 101 patient records. Sample selection was performed using purposive sampling, selecting records that fulfilled all predefined inclusion criteria to ensure completeness of pharmacotherapy data [9].

Inclusion criteria were: (i) confirmed diagnosis of RA (ICD-10 code M06.9); (ii) outpatient treatment at the study site during January to December 2023; and (iii) complete medical record documentation including drug name, dosage, frequency, route of administration, and duration of therapy. Records with incomplete pharmacotherapy data were excluded, resulting in the exclusion of 20 records and a final analytical sample of 81 patient records.

Data collection

Data were extracted from electronic and paper-based medical records by trained researchers using a standardised data collection form developed prior to the study. The following variables were systematically recorded for each patient: demographic characteristics (age, sex), primary and comorbid diagnoses, and complete prescribing information (drug name, dose, frequency, route of administration, and duration of therapy).

Evaluation of prescribing appropriateness

Prescribing appropriateness was evaluated against five criteria defined by the Indonesian Ministry of Health [8], with operational definitions informed by international and national clinical references as described below.

Appropriate indication was determined when the prescribed medication was indicated for the confirmed RA diagnosis and presenting symptoms, assessed against the Indonesian Rheumatology Association (IRA) clinical practice guidelines [10].

Table 1. Demographic characteristics of rheumatoid arthritis outpatients (n = 81)

Variable	Category	Frequency (n)	Percentage (%)
Sex	Male	14	17.3
	Female	67	82.7
Age group*	17-25 years (late adolescence)	5	6.2
	26-35 years (early adulthood)	9	11.1
	36-45 years (late adulthood)	19	23.5
	46-55 years (early elderly)	22	27.2
	56-65 years (late elderly)	16	19.8
	>65 years (advanced elderly)	10	12.3

*Age classification based on Indonesian Ministry of Health criteria (Depkes RI, 2009).

Appropriate drug selection was confirmed when prescribed medications belonged to drug classes recommended for RA management—DMARDs, corticosteroids, or NSAIDs—consistent with IRA guidelines [10] and international treatment recommendations [4,5].

Appropriate dose was assessed by comparing the prescribed dose against the therapeutic dose range for RA specified in the IRA guidelines [10], DiPiro's Pharmacotherapy Handbook [11], and the Drug Information Handbook 23rd edition [12]. A prescription was classified as appropriate when the prescribed dose fell within the recommended therapeutic range.

Appropriate patient was evaluated by determining whether the prescribed medication was contraindicated for the individual patient based on age, comorbidities, or other patient-specific factors, as defined in the Drug Information Handbook [12] and IRA guidelines [10]. Particular attention was given to elderly patients (aged over 65 years) receiving NSAIDs, given the well-documented elevated risk of gastrointestinal and renal complications in this population [7].

Appropriate dosing interval was assessed by comparing the prescribed administration frequency against the recommended dosing schedule from the IRA guidelines [10], DiPiro's Pharmacotherapy Handbook [11], and the Drug Information Handbook [12].

Data analysis

Data were analysed descriptively using frequency distributions and percentages. For each of the five appropriateness criteria, the number and percentage of prescriptions meeting the criterion were calculated. Overall prescribing appropriateness was determined by calculating the mean percentage across all five criteria. In accordance with Indonesian Ministry of Health guidelines [8], drug therapy is considered fully appropriate only when all five criteria are met at 100% compliance. Recognising that minor operational deviations are inevitable in clinical practice, an overall appropriateness rate of ≥95% was considered acceptable, consistent with the 95% confidence interval threshold recommended by [13]. Results are presented as frequencies, percentages, and summary tables.

Results

Patient characteristics

A total of 81 patient records met the inclusion criteria from 101 outpatient RA cases recorded at the study site during January to December 2023. The demographic characteristics of the study population are presented in Table 1.

Female patients comprised the majority (82.7%, n = 67), while male patients accounted for 17.3% (n = 14). The largest age group was 46–55 years (27.2%, n = 22), followed by 36–45 years (23.5%, n = 19) and 56–65 years (19.8%, n = 16). Patients aged over 65 years represented 12.3% (n = 10) of the total sample.

Prescribing appropriateness

Prescribing appropriateness was evaluated across five criteria. A summary of the results for all criteria is presented in Table 2, followed by detailed findings for each criterion.

Appropriate indication

All 81 patients (100.0%) received medications that were appropriate for their confirmed RA diagnosis. The

Table 2. Summary of prescribing appropriateness by criterion (n = 81)

Criterion	Appropriate (%)	Inappropriate (%)
Appropriate indication	100.0	0.0
Appropriate drug selection	100.0	0.0
Appropriate dose	81.8	18.2
Appropriate patient	97.0	3.0
Appropriate dosing interval	81.8	18.2
Overall	**92.1**	**7.9**

Overall appropriateness calculated as the mean percentage across all five criteria: (100.0 + 100.0 + 81.8 + 97.0 + 81.8) / 5 = 92.1%.

Table 3. Dose appropriateness of prescribed medications

Medication	Reference Dose Range	Prescribed Dose(s)	Appropriate	Ref.
Methotrexate	2.5-25 mg/week	2.5 mg/week	Yes	[10]
Sulfasalazine	500 mg/day	500 mg/day	Yes	[11]
Methylprednisolone	4-48 mg/day	4 mg/day, 8 mg/day	Yes	[12]
Dexamethasone	0.4-4 mg/day	0.5 mg/day	Yes	[12]
Diclofenac sodium	Oral: 100-200 mg/day; Topical: 20-80 mg/day	Oral: 25 mg/day, 50 mg/day; Topical: 1% (40 mg/day)	No (oral)	[11]
Celecoxib	Oral: 100-400 mg/day	100 mg/day	Yes	[11]
Etoricoxib	Oral: 90 mg/day	90 mg/day, 120 mg/day	No (120 mg)	[12]
Meloxicam	7.5-15 mg/day	15 mg/day	Yes	[11]
Paracetamol	Max: 4000 mg/day	500 mg/day	Yes	[12]
Ketorolac	Max: 40 mg/day	10 mg/day	Yes	[12]
Dexketoprofen	25-75 mg/day	25 mg/day	Yes	[12]

prescribed medications—DMARDs, corticosteroids, and NSAIDs — were concordant with presenting symptoms including joint pain, stiffness, swelling, and symmetrical joint involvement, consistent with IRA clinical practice guidelines [10]. Of the study population, 94% had RA as the primary diagnosis, while 6% presented with comorbid conditions; in all cases, pharmacotherapy was appropriate to the confirmed diagnosis and clinical presentation.

Appropriate drug selection

Drug selection was appropriate in all 81 cases (100.0%). Prescribed medications were consistent with drug classes recommended for RA management in both national [10] and international guidelines [4,5]: DMARDs as the cornerstone of therapy, corticosteroids as adjunctive anti-inflammatory agents, and NSAIDs for symptomatic relief of pain and inflammation.

Appropriate dose

Dose appropriateness was achieved in 81.8% of prescriptions (n = 66); 18.2% (n = 15) were classified as inappropriate. Detailed dose evaluation for all prescribed medications is presented in Table 3.

Dose inappropriateness was identified in two medications. First, diclofenac sodium was prescribed orally at 25–50 mg/day in several patients, which falls below the recommended therapeutic range of 100–200 mg/day for RA [11]. Second, etoricoxib was prescribed at 120 mg/day in some cases, exceeding the recommended dose of 90 mg/day for RA; the 120 mg dose is indicated specifically for acute gout arthritis, not for RA [12].

Appropriate patient

Patient appropriateness was achieved in 97.0% of cases (n = 79); 3.0% (n = 2 prescriptions involving

Table 4. Patient appropriateness of prescribed medications

Medication	Contraindications	Appropriate (n)	Inappropriate (n)	Ref.
Methotrexate	Hepatic/renal dysfunction, bone marrow suppression, pregnancy, active infection	24	0	[10]
Sulfasalazine	Age <2 years, hypersensitivity, porphyria	1	0	[10]
Methylprednisolone	Hypersensitivity, systemic infection	50	0	[12]
Dexamethasone	Live virus vaccines (immunosuppressive dose), systemic infection	1	0	[12]
Diclofenac sodium	Hypersensitivity, active GI ulcer, perioperative CABG pain, hepatic/renal/cardiac failure, pregnancy, age >65 years	21	4	[12]
Celecoxib	Hypersensitivity to sulfonamides/aspirin/NSAIDs, pregnancy, perioperative CABG pain, active gastrointestinal history, asthma, hepatic dysfunction, inflammatory bowel disease	2	0	[12]
Etoricoxib	Hypersensitivity to aspirin, active gastrointestinal disorder, age <16 years, uncontrolled hypertension, ischemic heart disease	5	0	[12]
Meloxicam	Hypersensitivity to aspirin/NSAIDs, perioperative CABG pain	17	0	[12]
Paracetamol	Severe hepatic impairment, hypersensitivity	17	0	[12]
Ketorolac	Hypersensitivity to ketorolac/aspirin, asthma history, age <16 years, renal impairment, pregnancy/delivery/lactation, nasal polyps	1	0	[12]
Dexketoprofen	Hypersensitivity to NSAIDs, photoallergic/phototoxic reactions, gastrointestinal bleeding/perforation history, gastric ulcer	2	0	[12]

Table 5. Dosing interval appropriateness of prescribed medications

Medication	Recommended interval	Prescribed frequency	Appropriate	Ref.
Methotrexate	Max 10x/week	3-8x/week	Yes	[10]
Sulfasalazine	1-2x/day	2x/day	Yes	[11]
Methylprednisolone	1-3x/day	1-2x/day	Yes	[12]
Dexamethasone	1-2x/day	2x/day	Yes	[12]
Diclofenac sodium	1-2x/day	1-2x/day	Yes	[11]
Celecoxib	1-2x/day	1-2x/day	Yes	[11]
Etoricoxib	1x/day	1-2x/day	No	[12]
Meloxicam	1x/day	1-3x/day	No	[11]
Paracetamol	3-4x/day	3x/day	Yes	[12]
Ketorolac	2-3x/day	2x/day	Yes	[12]
Dexketoprofen	2-3x/day	2x/day	Yes	[12]

4 patients) were classified as inappropriate. Detailed evaluation is presented in Table 4.

Patient inappropriateness was identified exclusively in four cases in which diclofenac sodium — a non-selective NSAID — was prescribed to patients aged over 65 years. NSAID use in elderly patients carries an elevated risk of adverse effects, particularly gastrointestinal bleeding, peptic ulceration, and renal impairment [7,12]. When NSAID therapy is deemed necessary in elderly patients with gastrointestinal risk factors, co-prescription of a gastroprotective agent such as a proton pump inhibitor is recommended [10,14]; however, no concurrent gastroprotective medication was documented in the records of these four patients.

Appropriate dosing interval

Dosing interval appropriateness was achieved in 81.8% of prescriptions (n = 66); 18.2% (n = 15) were classified as inappropriate. Detailed evaluation is presented in Table 5.

Inappropriate dosing intervals were identified for two medications. Etoricoxib was prescribed twice daily in some patients, exceeding the recommended once-daily regimen [12]. Similarly, meloxicam was prescribed at frequencies of twice or three times daily, contrary to the recommended once-daily dosing [11]. Both etoricoxib and meloxicam have prolonged elimination half-lives (approximately 22 hours and 20 hours, respectively) [11,12], such that administration at intervals shorter than recommended risks drug accumulation and a disproportionate increase in exposure.

Overall prescribing appropriateness

The overall prescribing appropriateness rate was 92.1%, calculated as the mean across all five criteria (Table 2). Complete appropriateness (100.0%) was achieved for indication and drug selection. Deficiencies were identified in dose appropriateness (81.8%), patient appropriateness (97.0%), and dosing interval appropriateness (81.8%), yielding an overall inappropriate prescribing rate of 7.9%. This rate exceeds the 5% minor operational deviation margin referenced in the biostatistical literature [13], indicating that targeted quality improvement interventions are warranted.

Discussion

This study evaluated prescribing appropriateness for rheumatoid arthritis patients receiving outpatient care at a public regional referral hospital in West Java, Indonesia, using five criteria established by the Indonesian Ministry of Health [8]. The overall prescribing appropriateness rate of 92.1% indicates that the majority of prescribing decisions conformed to established standards; however, the 7.9% inappropriate prescribing rate warrants careful examination given the chronic nature of the condition and the clinical consequences of sustained pharmacotherapy errors.

The demographic profile of the study population was consistent with established epidemiological patterns. Female patients comprised 82.7% of the cohort, reflecting the well-documented female predominance in rheumatoid arthritis attributed to hormonal influences on immune dysregulation [1]. The predominant age groups of 46–55 years and 36–45 years align with peak incidence data reported in the global burden of disease literature [2] and national Indonesian health data [3].

Both appropriate indication and appropriate drug selection achieved 100% compliance, indicating that prescribers demonstrated sound knowledge of rheumatoid arthritis diagnosis and the corresponding pharmacological armamentarium. All patients received medications belonging to recommended drug classes: DMARDs, corticosteroids, and NSAIDs, consistent with both Indonesian Rheumatology Association guidelines [10] and international recommendations from the ACR [4] and EULAR [5]. This level of compliance with indication and drug class selection has been similarly observed in comparable settings. Mittal et al., in a cross-sectional evaluation of 150 RA patients at a tertiary teaching hospital in India, reported that DMARDs were prescribed to all patients in accordance with standard guidelines, with methotrexate as the predominant agent [16]. These findings collectively suggest that prescriber awareness of disease-specific pharmacological options is generally adequate across healthcare systems in low- and middle-income countries, while deficiencies persist in the more granular aspects of prescribing: dose, patient-specific factors, and dosing schedule.

Dose appropriateness was achieved in 81.8% of prescriptions, with 18.2% classified as inappropriate due to deviations from therapeutic dose ranges for two NSAIDs: diclofenac sodium and etoricoxib. Diclofenac sodium was prescribed at 25 mg orally per day in several cases, substantially below the therapeutic range of 100–200 mg per day recommended for rheumatoid arthritis [11]. Conversely, etoricoxib was prescribed at 120 mg per day in some cases, exceeding the 90 mg per day ceiling for this indication; the 120 mg dose is indicated specifically for acute gout arthritis rather than rheumatoid arthritis [12]. These deviations carry distinct but equally significant clinical implications. Subtherapeutic dosing may result in inadequate plasma concentrations, insufficient anti-inflammatory effect, and disease progression, while supratherapeutic dosing disproportionately elevates the risk of dose-dependent adverse effects including gastrointestinal haemorrhage, cardiovascular events, and renal impairment [7]. The finding that dosing errors were confined exclusively to NSAIDs—while DMARDs and corticosteroids were dosed appropriately in all cases—may reflect comparatively greater prescriber familiarity with DMARD dosing protocols, perhaps reinforced

by structured rheumatology referral pathways, versus the more variable application of NSAID dosing in adjunctive prescribing contexts. Dosing-related drug problems in RA patients have been documented in comparable regional settings: Ma et al., in a six-year retrospective study of 200 RA patients at a tertiary hospital in Malaysia, identified dosing problems including medication overdose cases most commonly associated with existing organ impairment [15]. Although methodological frameworks differ, the convergence of dosing problems around NSAID and adjunctive medication classes across both settings suggests a shared challenge in RA pharmacotherapy management in the region.

Patient appropriateness was achieved in 97.0% of cases, with identified inappropriateness involving prescription of diclofenac sodium to four patients over 65 years of age without documented concurrent gastroprotective therapy. NSAID use in elderly patients carries substantially elevated risk of gastrointestinal complications—including peptic ulceration and haemorrhage—as well as renal and cardiovascular toxicity, attributable to age-related reductions in renal prostaglandin synthesis, decreased mucosal protective capacity, and pharmacokinetic alterations [7]. Current clinical practice guidelines recommend that when NSAID therapy is deemed necessary in elderly patients with gastrointestinal risk factors, co-prescription of proton pump inhibitors or H2 receptor antagonists is indicated [14]. Medical records reviewed in this study did not consistently document the concurrent use of such gastroprotective agents, representing a potentially preventable safety gap. This pattern is not unique to the present setting. Bobek et al. observed in a hospital cohort of active RA patients that NSAID prescribing decisions were frequently made independent of the presence of gastrointestinal risk factors, and that gastroprotective co-prescribing was inconsistently applied [11]. Similarly, a large longitudinal analysis of prescribing trends in England by Rutherford et al. found that despite increased awareness of NSAID toxicity over two decades, improvements in gastrointestinal prophylaxis co-prescribing remained suboptimal, particularly among elderly RA patients [19]. The persistent gap between guideline recommendations and clinical practice regarding gastroprotection in NSAID-treated elderly patients thus represents a global quality improvement target, not an isolated institutional finding. When NSAIDs are clinically necessary for elderly patients, selective COX-2 inhibitors such as celecoxib or etoricoxib offer a more favourable gastrointestinal safety profile compared to non-selective agents such as diclofenac, and paracetamol remains a recommended first-line analgesic alternative provided hepatic function is adequate [12,13].

Dosing interval appropriateness was achieved in 81.8% of prescriptions, with 18.2% classified as inappropriate. The identified errors involved etoricoxib and meloxicam, both prescribed at frequencies exceeding the recommended once-daily schedule in some cases—meloxicam prescribed up to three times daily in certain instances. Both agents possess long elimination half-lives (etoricoxib approximately 22 hours; meloxicam approximately 20 hours [12]), which underpin their once-daily dosing regimens. Prescribing beyond the recommended frequency risks progressive drug accumulation, disproportionate increases in systemic exposure relative to dose, and heightened risk of dose-dependent adverse effects including nephrotoxicity, gastrointestinal complications, and cardiovascular events [15]. The occurrence of inappropriate dosing interval errors may reflect insufficient integration of pharmacokinetic principles into routine prescribing practice and potentially limited accessibility of current prescribing references at the point of care.

The overall prescribing appropriateness rate of 92.1%, while reflecting generally satisfactory practice, falls below the 95% operational threshold proposed as an acceptable benchmark for clinical prescribing quality [13]. The Indonesian Ministry of Health specifies that fully appropriate drug therapy requires 100% compliance across all five criteria [8], underscoring that even a modest proportion of inappropriate prescribing carries meaningful clinical risk when applied to a patient population receiving long-term pharmacotherapy. Direct numerical comparison of overall appropriateness rates with published studies from other settings is methodologically constrained by the heterogeneous evaluation frameworks employed across healthcare systems. Nevertheless, the specific patterns of inappropriate prescribing identified—NSAID dose deviation, inadequate consideration of patient-specific risk factors in elderly populations, and inappropriate dosing frequencies for long-acting agents—are consistent with themes documented in RA prescribing evaluations across the region and beyond [11,15,16,17]. The concentration of inappropriateness in dose, patient, and interval criteria while indication and drug selection achieved full compliance mirrors patterns from comparable low- and middle-income

country settings, where basic disease recognition and formulary adherence are adequate but individualisation of therapy remains a persistent challenge [16,18].

Several evidence-based strategies could address the specific deficiencies identified in this study. Integration of real-time clinical decision support alerts within electronic prescribing systems—flagging dose deviations from therapeutic ranges, contraindicated drug use in at-risk populations, and dosing frequencies inconsistent with established pharmacokinetic parameters—would provide prescribers with targeted, point-of-care guidance. At the institutional level, development of standardised local prescribing protocols for NSAID use, specifying therapeutic dose ranges by indication, dosing interval requirements for long-acting agents, and mandatory co-prescribing criteria for gastroprotective agents in elderly or high-risk patients, would operationalise guideline recommendations into routine practice. Structured continuing professional development addressing pharmacokinetic principles in rheumatology prescribing, combined with periodic prescribing audits and constructive feedback to individual prescribers, could promote sustained behavioural change. At the patient care level, systematic pharmaceutical care services and medication review programmes offer an additional safety layer for identifying and resolving drug therapy problems, and are particularly valuable for elderly patients receiving complex polypharmacy regimens [19].

This study has several limitations. The retrospective design and reliance on medical record documentation introduced potential incompleteness, with 20 records excluded due to insufficient drug therapy data. Assessment of dose appropriateness for as-needed analgesics was particularly challenging in the absence of standardised pain documentation, which may have affected the precision of dose appropriateness calculations. Single-institution data collection over a one-year period limits generalisability to other hospital settings, geographic regions, or time periods. The appropriateness assessment based solely on recorded prescription data may not fully capture the clinical reasoning underlying individual prescribing decisions; some deviations from guideline-recommended doses or intervals may have been clinically justified by patient circumstances inadequately documented in the medical record. Inter-rater reliability for data extraction was not formally assessed, representing a methodological limitation in the reproducibility of extracted data. Furthermore, RA diagnosis was recorded using ICD-10 code M06.9 from medical records rather than verified against ACR/EULAR 2010 classification criteria [4], which may have introduced diagnostic heterogeneity into the study population. Finally, the equal weighting of five criteria in calculating the overall appropriateness rate assumes equivalent clinical importance across criteria, which may not accurately reflect their relative impact on patient outcomes, and the study did not assess clinical endpoints such as disease activity, radiographic progression, or adverse event occurrence, precluding direct evaluation of the clinical consequences of the identified prescribing deficiencies.

These limitations suggest several directions for future research. Prospective study designs with systematic collection of clinical outcome data—including validated disease activity scores, functional status measures, and adverse event monitoring—would enable direct linkage between prescribing appropriateness and patient outcomes. Formal evaluation of inter-rater reliability in data extraction would strengthen methodological rigour in retrospective drug use evaluation studies. Qualitative research exploring prescriber decision-making processes, institutional resource constraints, and barriers to guideline access would inform the design of more effective quality improvement interventions. Multicentre studies encompassing hospitals of differing resource levels and clinical profiles across West Java would provide a more comprehensive picture of regional prescribing patterns and facilitate meaningful institutional benchmarking.

Conclusion

This study demonstrates that prescribing practices for rheumatoid arthritis patients at a public regional referral hospital in West Java achieved an overall appropriateness rate of 92.1% across five established criteria. Complete compliance was recorded for appropriate indication and drug selection, confirming adequate prescriber adherence to recommended therapeutic classes. However, deficiencies were identified in dose appropriateness (81.8%), patient appropriateness (97.0%), and dosing interval appropriateness (81.8%), falling below the 95% operational benchmark for prescribing quality. Dose-related errors involved subtherapeutic diclofenac sodium prescribing and supratherapeutic etoricoxib dosing inconsistent with the rheumatoid arthritis indication. Patient-related inappropriateness involved

diclofenac sodium use in elderly patients without documented gastroprotective co-prescribing. Interval-related errors involved etoricoxib and meloxicam prescribed at frequencies exceeding their once-daily pharmacokinetic profiles. These findings highlight specific, actionable targets for quality improvement: implementation of clinical decision support systems to flag dose and interval deviations at the point of prescribing; enhanced prescriber education addressing pharmacokinetic principles and age-related risk stratification for NSAID use; and establishment of regular prescribing audits with structured feedback. Future prospective studies linking prescribing appropriateness to clinical outcomes, including disease activity, functional status, and adverse event occurrence are needed to establish the direct clinical significance of the deficiencies identified and to evaluate the effectiveness of targeted quality improvement initiatives.

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Declaration of interest

The authors declare no competing interests.

Author contributions

Conceptualization, AFZ; Methodology and investigation, AFZ and UY; Data curation, AFZ and BTL; Formal analysis and writing—original draft, AFZ; Writing—review and editing, AFZ, UY, and BTL; Supervision, UY.

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