

## Research Article

# Perceptions and Self-Reported Practices of Hospital Pharmacists Regarding Quality Use of Medicines (QUM) in Saudi Arabia

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## Abstract

**Introduction:** Quality Use of Medicines (QUM) is essential to improving patient safety and care outcomes. This study evaluated the attitudes, perceptions and self-reported engagement of pharmacists in QUM practices within Saudi Arabia (SA). **Methods:** A cross-sectional survey was administered to hospital-based pharmacists in Ministry of Health (MOH) hospitals across SA to evaluate four QUM-related aspects: Perception and Attitudes toward QUM, Medication Review, Patient Education and Adherence, and Medication Dosage and Monitoring. Responses were rated on a 5-point scale, and data were analyzed using SPSS version 29. **Results:** Of 360 surveys, 318 were completed (response rate: 88%). Overall, pharmacists reported high mean scores, indicating favorable attitudes toward QUM concepts and a high perceived importance of QUM-related activities (mean scores >4 across all domains). The highest mean score was for Perception and Attitudes toward QUM (4.63), while Medication Review had the lowest (4.24). Female pharmacists had higher mean scores across all categories, and younger pharmacists (21–30 years) also had higher scores, particularly in Patient Education and Adherence; however, these subgroup differences were not statistically significant after Bonferroni correction. **Conclusion:** Pharmacists in this study hold positive perception and attitudes toward QUM principles. However, the study identified gender- and age-related differences, as well as discrepancies between perception and practice, particularly in medication reviews. Thus, there is a need for targeted, tailored training and educational programs to enhance QUM practices among pharmacists in SA.

**Keywords:** quality use of medicines; pharmacists; perception; attitudes; medication management

## 1. Introduction

Quality use of medicines (QUM) refers to the use of medicines that ensure maximum therapeutic benefits while minimising potential risks and adverse effects. QUM involves the appropriate, safe, and effective selection, prescribing, dispensing, and use of medicines [1]. As experts in medicines, pharmacists play an essential role in QUM. However, the role of pharmacists has shifted from primarily dispensing medications to providing multidisciplinary and patient-centred care. They are required to be involved in all decisions regarding medication use to achieve QUM. Pharmacists' interventions could include direct patient monitoring, patient consultation and education, assisting with treatment administration, conducting medication reviews and reconciliations, and providing follow-up. Studies have consistently shown that pharmacist interventions resulted in improved clinical outcomes [2], enhanced cost-effectiveness [3], and reduced medication errors (MEs) [4], with examples including significant reductions in hospital re-admissions and drug-related problems [5]. For example, pharmacist-led multidisciplinary team care resulted in detecting an average of 0.8 drug-related problems per patient, resulting in cost savings of US\$11.94 per intervention [6]. Another study evaluating clinical pharmacists' intervention reported substantial improvements in medication use among treatment groups, significant im-

provements in therapeutic outcomes, and a reduction in morbidity (68.2% (resolved/improved or prevented) in the intervention group compared with 19.2% in the control group,  $p < 0.001$ ) [7]. In addition, it was found that pharmacists actively participating in the assessment and supervision of the drug-use process were associated with a significant reduction in MEs in the intervention group by 48%, and an increase in the resolution of the errors over time by 70% [8].

Successful and effective implementation of these QUM practices requires that pharmacists be well informed and equipped with the necessary skills. One of the main building blocks of QUM is the provision of appropriate training and education for healthcare practitioners to gain the prerequisite knowledge and skills to achieve QUM [1,9].

Saudi Arabia (SA) has made significant advances in ensuring the competence and training of its healthcare workforce, including pharmacists, despite having a relatively small number of pharmacists compared to other countries [10]. All healthcare practitioners must be licensed by the Saudi Commission for Health Specialties (SCFHS), which requires accredited educational programmes, at least one to two years of experience, and passing the licensing exam for healthcare professionals. SCFHS also offers training programmes in different specialties and provides



workshops and courses to support continuing professional development [11]. However, it is argued in some studies that healthcare professionals in SA may not have access to continuous flexible education and training programmes aimed at enhancing their skills, knowledge, and perception of current best practices in medicine usage, and that they need continued training and professional development to ensure that QUM is upheld [12,13,14]. In addition, there is limited information about QUM perception among SA's healthcare practitioners, particularly pharmacists, and their understanding of practices that ensure QUM, such as medication review, deprescribing, evidence-based practices, and medication monitoring. While previous Saudi studies have examined specific aspects such as dispensing errors, counselling practices, and antibiotic prescribing practices, few have conducted a comprehensive evaluation of perception and attitudes toward QUM across multiple domains. Therefore, this study aims to evaluate hospital pharmacists' perception and attitudes regarding QUM across four key domains, providing insights into their understanding and practices. The World Health Organization (WHO) and the Australian National Strategy for QUM frameworks guided the selection and development of survey items in this study, reflecting key QUM processes and supporting comparison of the findings with international literature.

## 2. Methods

### 2.1 Questionnaire Tool

A 25-question cross-sectional survey was developed to evaluate pharmacists' perceptions of QUM and their attitudes toward QUM practices in SA. Items were initially generated from the literature on QUM, medication safety, and hospital pharmacy practice, then grouped into four domains (Perception and Attitudes toward QUM, Medication Review, Patient Education and Adherence, and Medication Dosage and Monitoring) to reflect key QUM processes. A 5-point scale ranging from 1 (not at all important) to 5 (extremely important) was used to rate the pharmacists' responses to each question, except for the frequency item (Question 8), for which anchors ranged from 'never' (1) to 'always' (5). This scale is widely used in survey research as it helps to ensure reliable statistical analysis and enhance response quality. A mean score was calculated for each domain by summing the question-level averages within that domain and taking the mean.

### 2.2 Survey Domains

Questions 1–6 evaluating perception and attitudes toward QUM: This section assesses pharmacists' perception of the primary goals of QUM and evaluates their attitude toward different aspects of QUM, including medication reconciliation, medication storage, deprescribing, antibiotic control guidelines, and evidence-based guidelines. Also, there is a focus on understanding pharmacists' perceptions of medication interactions and side effects. These items

were intended to capture pharmacists' perceptions and beliefs about QUM rather than to measure adherence to specific national guidelines.

Questions 7 to 11 about the importance of medication review in QUM: The questions here focus on pharmacists' perception about medication review and evaluate pharmacists' engagement in practices like medication reviews. These items were designed to reflect self-reported frequency of review activities in routine practice, not to audit formal medication review services or specific clinical protocols. The item on perceived importance of medication review and the item on self-reported frequency were measured separately. This was done to avoid conflating attitudes with behaviour and to show any gaps between what pharmacists view as important and what they report doing.

Questions 12 to 18 about the importance of Patient Education and Adherence: This section evaluates pharmacists' understanding of the importance of patient counselling and collaboration with patients in developing a treatment plan. It covers aspects of patient counselling, such as explaining medical terminology, considering patients' health literacy, and using motivational interviewing to enhance patient adherence. Also, it assesses pharmacists' perceptions of the importance of factors such as dietary intake, medication storage, and affordability in ensuring patients' adherence to their medication regimens. These items aimed to assess pharmacists' self-reported engagement in patient-facing educational activities, recognising that responses reflect perceived rather than observed behaviour.

Questions 19 to 25 about Medication Dosage and Monitoring aspects: The questions in this section evaluate the perception of pharmacists about dosage and administration techniques. Additionally, they assess the perceived importance of monitoring specific drug classes, such as analgesics, antipsychotics, non-steroidal anti-inflammatory drugs (NSAIDs), and anticoagulants. Also, the role of pharmacists in monitoring vital signs and providing supportive care in cases of accidental overdose was assessed. The items were intended to capture pharmacists' general safety practices rather than formal therapeutic drug monitoring protocols or specific storage standards.

### 2.3 Data Collection

The General Administration of Pharmaceutical Care in the Ministry of Health (MOH) distributed the survey electronically to pharmacists working in MOH hospitals. Pharmacists currently working in an MOH hospital and involved in medication management processes, including reviewing, dispensing, and monitoring, were eligible to participate in this study. Data were collected from March 2024 to May 2024. Participation was voluntary, and respondents were assured that their responses would be kept confidential. Comprehensive information about the study's purpose, confidentiality and voluntary nature of participation was included in the survey's introductory page.

## 2.4 Sample Size and Response Rate

Based on the Raosoft sample size calculation [15] for a population of 4031 MOH hospital pharmacists [16], a minimum of 351 completed responses was required to achieve a 5.28% margin of error at a 95% confidence level. In line with this estimate, the questionnaire was distributed to approximately 360 eligible pharmacists working in MOH hospitals. Of these, 318 pharmacists completed the survey, yielding an effective response rate of 88%.

## 2.5 Survey Validation

The questionnaire was developed using items derived from established QUM frameworks and from the published literature on medication safety and hospital pharmacy practice, to ensure that each domain reflected key QUM processes and concepts. Content validity was assessed through independent review by two hospital pharmacists and two pharmacy faculty members, who examined all items for relevance, clarity, and coverage of the targeted constructs and suggested minor modifications to wording and ordering. The revised instrument was then piloted with a small group of hospital pharmacists to confirm face validity, comprehensibility, and completion time, and feedback from this group was used to refine item wording and layout. For the main study, internal consistency was evaluated for each domain using Cronbach's alpha, which indicated acceptable reliability of the multi-item scales.

## 2.6 Data Analysis

For data analysis, Statistical Package for the Social Sciences version 29 (Chicago, Illinois, USA) was used. Domain scores were calculated as the means of multiple 5-point Likert items. Histograms and the Shapiro–Wilk test were used to assess the distribution of each domain score. Group differences in domain scores by gender, age, education, years of experience and region were examined using non-parametric tests: the Mann–Whitney U test for two-group comparisons (e.g., gender) and the Kruskal–Wallis test for comparisons involving three or more groups (e.g., age, education, years of experience, region). Comparisons of gender and age across the four domains were defined as primary subgroup analyses. For these tests, a Bonferroni correction for multiple testing (overall  $\alpha = 0.05$ ; eight tests) was applied. Multivariable regression models were fitted with each QUM domain score as the outcome and gender, age group, education, years of experience, and region as predictors to examine independent demographic associations.

## 3. Results

A total of 318 questionnaires were completed by pharmacists under the MOH. Respondents were slightly more likely to be male ( $N = 184$ , 57.9%) than female ( $N = 134$ , 42.1%). Half of the respondents (50.3%) were aged 31–40 years, and 44.0% were aged 41 years and older. Most re-

spondents had more than 10 years of experience (58.5%), with 46.2% holding a PharmD degree and 39.0% holding a Diploma. More than half of the participants were practising in the Eastern Region, with smaller proportions from the Northern, Middle, Southern and Western Regions. This uneven regional distribution should be considered when interpreting the findings. Complete demographic characteristics are shown in Table 1.

**Table 1. Socio-demographic characteristics of respondents.**

| Variable   | Category           | Frequency | Percentage |
|------------|--------------------|-----------|------------|
| Gender     | Male               | 184       | 57.9%      |
|            | Female             | 134       | 42.1%      |
| Age group  | 21–30 years        | 18        | 5.7%       |
|            | 31–40 years        | 160       | 50.3%      |
|            | >41 years          | 140       | 44.0%      |
| Education  | BSc. in Pharmacy   | 26        | 8.2%       |
|            | PharmD             | 147       | 46.2%      |
|            | Diploma            | 124       | 39.0%      |
|            | Masters            | 19        | 6.0%       |
|            | PhD                | 2         | 0.6%       |
| Experience | Less than 5 years  | 13        | 4.1%       |
|            | 5–10 years         | 119       | 37.4%      |
|            | More than 10 years | 186       | 58.5%      |
| Region     | Northern Region    | 54        | 17.0%      |
|            | Central Region     | 53        | 16.7%      |
|            | Southern Region    | 25        | 7.9%       |
|            | Eastern Region     | 163       | 51.3%      |
|            | Western Region     | 23        | 7.2%       |

Pharmacists strongly endorsed QUM principles and reported high perceived importance of QUM-related concepts. Respondents scored above 4 on a 5-point scale for all four domains (Perception and Attitudes toward QUM, Medication Review, Patient education and adherence, and Medication Dosage and Monitoring) (Table 2). Scores ranged from 4.24 (standard deviation [SD] = 0.646) for the domain of Medication Review to 4.63 (SD = 0.537) for the domain of Perception and Attitudes toward QUM. In the Medication Review domain, the mean score for items on the importance of medication review and its role in reducing errors was 4.65. In contrast, the mean score for the item on how often pharmacists review patients' medications was 3.16. We report these separately to distinguish pharmacists' attitudes from their self-reported behaviour, and to highlight the gap between what they consider important and what they say they do in practice. Table 3 presents descriptive statistics for each of the 25 questions, ranging from 3.16 (SD = 1.017) for question 8, "In ensuring QUM, how often do you review a patient's medications?" to 4.75 (SD = 0.579) for question 4, "How important is medication reconciliation to ensure QUM?".

**Table 2. QUM domain scores and confidence intervals.**

| Pharmacists' perception and attitudes toward QUM concepts and practices | Mean/SD      | 95% CI       |
|-------------------------------------------------------------------------|--------------|--------------|
| Perception and attitudes toward QUM                                     | 4.63 (0.537) | (4.56, 4.68) |
| Medication review                                                       | 4.24 (0.646) | (4.16, 4.31) |
| Patient education and adherence                                         | 4.41 (0.759) | (4.32, 4.49) |
| Medication Dosage and Monitoring                                        | 4.54 (0.651) | (4.46, 4.60) |

SD, Standard deviation; CI, Confidence Interval; QUM, Quality Use of Medicines.

Table 4 presents the relationship between demographic characteristics and the domain scores. Results varied most by gender, with female pharmacists consistently scoring higher across all domains. Results also varied by age, with younger pharmacists (21–30 years) tending to score higher, particularly in the domain of Patient Education and Adherence. There were also no significant differences by region of practice, with pharmacists in the Western and Eastern regions scoring higher than those in the Southern region. Although several unadjusted *p*-values were below 0.05, these subgroup differences were no longer statistically significant after applying a Bonferroni correction for age and gender subgroups across the four domains (corrected significance threshold of  $p < 0.00625$ ). Other subgroup comparisons (education level, years of experience and region) were considered exploratory and are reported with unadjusted *p*-values.

Multivariate regression models including gender, age group, education, years of experience and region did not identify any statistically significant independent associations with the four QUM domain scores, as all adjusted *p*-values were greater than 0.05.

## 4. Discussion

This study examined the perceptions and attitudes of pharmacists from across SA using a self-administered questionnaire structured around four domains of QUM. Previous studies in SA tend to focus on specific aspects of pharmacy practice such as counselling practice [17], dispensing errors [18], antibiotic prescription [19], medication misuse [20], and herbal medicines [21]. However, this study uses a comprehensive approach, offering a broader understanding of pharmacists' perceptions of QUM across multiple practice areas.

The results show that pharmacists reported high awareness and positive attitudes toward QUM, and described frequent engagement in QUM-related activities. The mean score was highest for the QUM perception domain (4.63), suggesting that pharmacists have a solid grasp of fundamental QUM concepts. Pharmacists particularly recognised the importance of 'medication reconciliation' (4.75), 'antibiotic control guidelines' (4.69), and 'evidence-based guidelines and protocols' (4.68). They also recognised the importance of other aspects for QUM under this category, including 'deprescribing' (4.63), 'proper medication storage' (4.53), and 'dietary intake while on medica-

tions' (4.48). These high scores indicate that pharmacists understand the critical role these practices play in ensuring safe and effective medication use. These findings align with the findings from other studies that evaluate similar aspects covered in this category. For example, a study among hospital pharmacists in SA reported generally positive attitudes towards evidence-based practice; however, gaps were identified in pharmacists' awareness of its key components, particularly the role of patient preferences [22]. In addition, the importance of medication reconciliation in identifying medication discrepancies and minimising adverse drug events was recognised by most pharmacists in another SA study [23].

However, some knowledge gaps were identified in other studies that do not align with the current study. For example, a study reported that while 77.2% of pharmacists were aware of inappropriate antibiotic use, 70.5% were unaware that dispensing antibiotics without a prescription is illegal [19]. In contrast, the equivalent finding in this study suggests that the respondents understand the proper use of antibiotics. This may reflect differences in survey methods or periods.

The Medication Dosage and Monitoring domain received the second-highest mean score (4.54), which indicates a high level of pharmacists' awareness of the importance of proper dosing and monitoring. Notably, 'awareness of appropriate dosages and administration techniques' scored 4.69, and 'therapeutic drug monitoring for various medication classes' (e.g., analgesics, antipsychotics, NSAIDs, anticoagulants) all scored 4.47. This indicates pharmacists' recognition of the crucial role they play in preventing medication errors and ensuring patient safety through proper dosing and monitoring. The findings align with previous studies that evaluated similar aspects in SA and globally. For example, an SA study found that pharmacists have good awareness of aspects related to dispensing errors and how to minimise these errors [18]. However, another study found that only 22% were familiar with adverse drug reaction (ADR) reporting processes [24]. Another study found that 90% of the community pharmacists in SA did not know about ADR reporting and 40% were not willing to report ADR [25]. A previous survey of community pharmacists in SA found that only 12.5% often or always monitored therapy outcomes, while 62.9% reported never or rarely performing this activity [26].

**Table 3. Mean and SD scores for each survey question.**

| Pharmacists' perception and self-reported practices related to QUM                                                                              | Mean/SD      | 95% CI       |
|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|
| Perception and attitudes toward QUM                                                                                                             | 4.63 (0.537) | (4.56, 4.68) |
| Q1 How important is deprescribing in ensuring QUM?                                                                                              | 4.63 (0.679) |              |
| Q2 How important is the influence of pharmacists' awareness of evidence-based guidelines and protocols on achieving QUM?                        | 4.68 (0.619) |              |
| Q3 How important is it to have guidelines or programs to control antibiotic use?                                                                | 4.69 (0.582) |              |
| Q4 How important is medication reconciliation to ensure QUM?                                                                                    | 4.75 (0.579) |              |
| Q5 In ensuring QUM, how important is it for patients to store their medication?                                                                 | 4.53 (0.752) |              |
| Q6 How important is it to consider dietary intake while on medications to ensure QUM?                                                           | 4.48 (0.789) |              |
| Medication review                                                                                                                               | 4.24 (0.646) | (4.16, 4.31) |
| Q7 How important is the role of medication review in decreasing medication errors?                                                              | 4.65 (0.526) |              |
| Q8 In ensuring QUM, how often do you review a patient's medications?                                                                            | 3.16 (1.017) |              |
| Q9 When conducting a medication review, how important is reviewing prescription medications?                                                    | 4.46 (0.831) |              |
| Q10 When conducting a medication review, how important is reviewing over-the-counter medications?                                               | 4.43 (0.863) |              |
| Q11 When conducting a medication review, how important is reviewing herbal and dietary supplements?                                             | 4.41 (0.907) |              |
| Patient education and adherence                                                                                                                 | 4.41 (0.759) | (4.32, 4.49) |
| Q12 How important to your role as a pharmacist is providing medication counselling?                                                             | 4.69 (0.621) |              |
| Q13 How important is collaborating with patients and considering their preferences, beliefs, and values in your daily practice as a pharmacist? | 4.66 (0.612) |              |
| Q14 How important is explaining specific behaviours that will help with increasing patients' adherence?                                         | 4.00 (1.344) |              |
| Q15 How important is motivational interviewing for improving communication with patients?                                                       | 3.97 (1.344) |              |
| How important are the following factors for patient adherence to medication regimens?                                                           |              |              |
| Q16 Affordability                                                                                                                               | 4.48 (0.789) |              |
| Q17 Side effects                                                                                                                                | 4.55 (0.712) |              |
| Q18 Patient education                                                                                                                           | 4.50 (0.785) |              |
| Medication Dosage and Monitoring                                                                                                                | 4.54 (0.651) | (4.46, 4.60) |
| Q19 How important is pharmacists' knowledge of appropriate dosages and administration techniques to prevent potential errors?                   | 4.69 (0.598) |              |
| Regarding the therapeutic index of the following medications, how important is therapeutic drug monitoring for the following classes?           |              |              |
| Q20 Analgesics                                                                                                                                  | 4.47 (0.789) |              |
| Q21 Antipsychotics                                                                                                                              | 4.53 (0.704) |              |
| Q22 Non-steroidal anti-inflammatory drugs (NSAIDs)                                                                                              | 4.48 (0.789) |              |
| Q23 Anticoagulants                                                                                                                              | 4.56 (0.702) |              |
| Regarding accidental overdose, how important is the role of the pharmacist in the following?                                                    |              |              |
| Q24 Supportive care                                                                                                                             | 4.53 (0.717) |              |
| Q25 Monitoring vital signs                                                                                                                      | 4.48 (0.813) |              |

SD, Standard deviation; CI, Confidence Interval.

While still scoring high (4.24), the Medication Review domain had the lowest mean score of the four domains. Interestingly, the importance of 'medication review' in reducing errors was rated very high (4.65). However, the 'frequency of conducting medication reviews' scored much lower (3.16). This difference indicates that pharmacists may not be conducting medication reviews as frequently as they should, despite understanding the importance of this practice for patient safety. The data suggest a potential discrepancy between perceived importance and reported practice, but do not permit a precise quantification of a "knowledge–practice gap". This discrepancy may

reflect the fact that structural or contextual factors are limiting practice. Potential explanations, reported in previous Saudi and international literature, include workload pressures, limited staffing, a shortage of clinical pharmacy positions and organisational barriers. However, these factors were not measured in our survey, so they should be considered hypotheses rather than conclusions, and our data cannot confirm the specific reasons for the observed gap. Similar findings were reported in a study of pharmacists in Jordan, which showed a moderate level of knowledge and practice of medication review [27]. Elsewhere, a study in the United Kingdom found that more than a quarter (27%)

**Table 4. QUM domain scores according to the demographic characteristics of respondents.**

| Pharmacist group   | Perception and attitudes toward QUM |          | Medication review |          | Patient education and adherence |          | Medication Dosage and Monitoring |          |
|--------------------|-------------------------------------|----------|-------------------|----------|---------------------------------|----------|----------------------------------|----------|
|                    | Mean (SD)                           | <i>p</i> | Mean (SD)         | <i>p</i> | Mean (SD)                       | <i>p</i> | Mean (SD)                        | <i>p</i> |
| Gender             |                                     |          |                   |          |                                 |          |                                  |          |
| Male               | 4.57 (0.565)                        | 0.024    | 4.16 (0.658)      | 0.013    | 4.31 (0.777)                    | 0.008    | 4.47 (0.672)                     | 0.032    |
| Female             | 4.71 (0.487)                        |          | 4.34 (0.615)      |          | 4.54 (0.714)                    |          | 4.62 (0.612)                     |          |
| Age group          |                                     |          |                   |          |                                 |          |                                  |          |
| 21–30 years        | 4.77 (0.314)                        | 0.304    | 4.35 (0.608)      | 0.454    | 4.65 (0.537)                    | 0.045    | 4.68 (0.478)                     | 0.292    |
| 31–40 years        | 4.66 (0.497)                        |          | 4.28 (0.648)      |          | 4.49 (0.698)                    |          | 4.58 (0.601)                     |          |
| >41 years          | 4.60 (0.610)                        |          | 4.19 (0.651)      |          | 4.38 (0.837)                    |          | 4.52 (0.730)                     |          |
| Educational level  |                                     |          |                   |          |                                 |          |                                  |          |
| BSc. in Pharmacy   | 4.52 (0.535)                        | 0.134    | 4.20 (0.432)      | 0.553    | 4.48 (0.618)                    | 0.144    | 4.47 (0.648)                     | 0.544    |
| PharmD             | 4.69 (0.466)                        |          | 4.29 (0.659)      |          | 4.50 (0.703)                    |          | 4.60 (0.593)                     |          |
| Diploma            | 4.55 (0.622)                        |          | 4.17 (0.679)      |          | 4.27 (0.849)                    |          | 4.46 (0.728)                     |          |
| Masters            | 4.74 (0.374)                        |          | 4.24 (0.571)      |          | 4.48 (0.648)                    |          | 4.58 (0.560)                     |          |
| PhD                | 4.58 (0.590)                        |          | 4.50 (0.424)      |          | 4.43 (0.808)                    |          | 4.57 (0.606)                     |          |
| Experience         |                                     |          |                   |          |                                 |          |                                  |          |
| Less than 5years   | 4.59 (0.423)                        | 0.262    | 4.15 (0.664)      | 0.305    | 4.40 (0.646)                    | 0.277    | 4.48 (0.461)                     | 0.453    |
| 5–10 years         | 4.69 (0.490)                        |          | 4.31 (0.674)      |          | 4.49 (0.726)                    |          | 4.59 (0.625)                     |          |
| More than 10 years | 4.59 (0.570)                        |          | 4.20 (0.625)      |          | 4.35 (0.784)                    |          | 4.50 (0.678)                     |          |
| Region             |                                     |          |                   |          |                                 |          |                                  |          |
| Northern Region    | 4.58 (0.584)                        | 0.166    | 4.14 (0.690)      | 0.287    | 4.25 (0.790)                    | 0.072    | 4.47 (0.675)                     | 0.137    |
| Middle Region      | 4.64 (0.527)                        |          | 4.26 (0.590)      |          | 4.51 (0.688)                    |          | 4.52 (0.645)                     |          |
| Southern Region    | 4.38 (0.606)                        |          | 4.05 (0.698)      |          | 4.13 (0.856)                    |          | 4.26 (0.769)                     |          |
| Eastern Region     | 4.67 (0.511)                        |          | 4.26 (0.651)      |          | 4.43 (0.760)                    |          | 4.58 (0.636)                     |          |
| Western Region     | 4.67 (0.518)                        |          | 4.39 (0.534)      |          | 4.61 (0.629)                    |          | 4.69 (0.521)                     |          |

*p*, *p*-value (significance test); SD, standard deviation. *p*-values are from Mann–Whitney U tests (gender) and Kruskal–Wallis tests (all other variables). For our primary gender- and age-based comparisons across the four domains, we applied a Bonferroni correction (overall  $\alpha = 0.05$ ; eight tests; corrected threshold  $p < 0.00625$ ). After this adjustment, none of the subgroup differences was statistically significant.

of pharmacists reported not performing any medication reviews, and fewer than one-third reported having performed more than 15 [28]. This indicates that such knowledge-practice gaps in QUM, particularly around medication review, are a common challenge internationally rather than unique to SA.

The findings highlight the importance of organisational and systemic support for QUM. Even when pharmacists have a positive perception of QUM, high workloads, insufficient staffing, limited clinical pharmacy positions, and a lack of formal QUM policies or protocols may limit their ability to perform activities such as medication review and structured patient education. Addressing these barriers through institutional policies, staffing models, and the integration of clinical pharmacy services is essential for translating QUM knowledge into consistent practice.

The Patient Education and Adherence domain scored 4.41, indicating room for improvement. While pharmacists rated the importance of ‘medication counselling’ (4.69) and ‘patient collaboration’ (4.66) highly, they gave lower scores to ‘explaining specific behaviours to increase adherence’ (4.00) and ‘using motivational interviewing’ (3.97). These results suggest that pharmacists may benefit from addi-

tional training in patient communication and adherence-promoting strategies.

Patient education and counselling by pharmacists have been emphasised in SA. For example, one study reported that 88% of community pharmacists were aware of their duties and responsibilities in educating patients with diabetes, while approximately 69% reported spending sufficient time instructing these patients [29]. In another study, it was reported that only 48.2% of community pharmacists inquire about the reasons patients take over-the-counter medications [26].

In this study, female pharmacists scored higher than male pharmacists across all sections of the survey. One possible explanation for the higher scores among younger pharmacists is that they may have had more recent exposure to contemporary clinical and QUM-related training. However, the survey did not include questions about training recency, so this interpretation remains a hypothesis rather than a confirmed explanation. Although the difference was not significant, pharmacists working in the Western and Eastern regions tended to score higher than those in the Southern region. These higher scores may reflect unmeasured factors such as differences in training opportunities

or organisational support for QUM. These possible explanations are speculative, as our study did not collect data on training access or specific organisational policies. The findings are consistent with a previous study that evaluated pharmacists' understanding and intention to provide medication therapy management (MTM), a component of comprehensive QUM, in SA, in which female pharmacists showed more positive attitudes. However, the difference was not statistically significant. However, the study did not specifically examine regional differences among respondents, but the pharmacists with higher educational degrees showed a stronger intention to provide MTM services [30].

## 5. Recommendations

There should be a greater focus on staff training and education, providing pharmacists with specialised training and ongoing education on QUM. Training should prioritise practical skills in conducting structured medication reviews, identifying and resolving drug-related problems, and incorporating deprescribing into routine care. In addition, programmes should cover advanced communication strategies, such as motivational interviewing and techniques to support adherence among patients with low health literacy. Tailored workshops and competency-based modules that reflect regional needs and the identified gaps in medication review frequency and patient education are likely to be most effective. It is also recommended that policymakers update and improve the policies and procedures related to the implementation of QUM programmes. For example, they should encourage pharmacists to perform more frequent medication reviews. Additionally, to reduce the disparities identified in this study and ensure more consistent QUM practice across the workforce, targeted educational initiatives for older and male pharmacists, including refresher courses on medication review, deprescribing and patient education, may be helpful.

## 6. Strengths and Limitations

This study has the strengths of a large sample size, a high response rate and coverage of multiple domains related to QUM. Still, the survey population was limited to pharmacists at MOH hospitals and cannot be generalised to pharmacists working in other governmental and private sectors. The results are based on self-reported information, which may be subject to social desirability bias, and self-reported behaviour may not represent actual practice. Furthermore, the geographical distribution of respondents is uneven, with more than half of the participants originating from the Eastern Region, meaning that the findings are likely to be more reflective of QUM perceptions and practices in this region than in other parts of the country. These factors limit the generalisability of the findings to the wider Saudi healthcare sector and indicate that further studies in non-MOH and under-represented regions are needed. In addition, the cross-sectional design does

not allow causal relationships between pharmacists' characteristics and QUM-related perception or practices to be established, nor can it capture changes in QUM implementation over time. Longitudinal and interventional studies, including samples from non-MOH hospitals and under-represented regions, are needed to evaluate how targeted initiatives may influence QUM behaviour and patient outcomes.

## 7. Conclusion

Hospital pharmacists in this study reported strongly favourable attitudes toward QUM concepts and high perceived importance of QUM-related activities, with some reported gaps between what they view as important and what they say they do in areas such as medication review. Targeted training programmes and institutional policies, including dedicated clinical pharmacy roles and protected time for QUM activities, are required to bridge the knowledge–practice gap and enhance QUM in MOH hospitals, such as those included in this study. Further work is needed to examine whether similar patterns are seen among pharmacists in other sectors and regions of the Saudi health system. Although descriptive differences in QUM scores were observed by gender and age, these differences were not statistically significant after adjustment for multiple comparisons, and multivariable analyses did not identify independent demographic associations with QUM domain scores. Addressing the identified gaps can help to improve QUM, ultimately improving healthcare quality and patient outcomes. Further research into pharmacists' implementation of QUM practices could help us understand the discrepancies identified in the study and ultimately facilitate the design of effective, targeted interventions.

## Availability of Data and Materials

The data that support the findings of this study are not publicly available due to privacy and confidentiality reasons, but are available from the corresponding author upon request.

## Author Contributions

Conceptualization, FA & AW; methodology, FA & AW; software, FA; validation, AW & SL; formal analysis, FA; investigation, FA; resources, FA; data curation, FA; Writing—original draft preparation, FA; writing—review and editing, AW & SL; visualization, AW & SL; supervision, AW & SL; project administration, FA. All authors have read and agreed to the published version of the manuscript. All authors contributed to editorial changes in the manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

## Ethics Approval and Consent to Participate

This study protocol was reviewed and approved by the Ministry of Health in SA, IRB log no: 23-98. Also, A written consent was signed by the patients or their families/legal guardians. The study was carried out in accordance with the guidelines of the Declaration of Helsinki.

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## Conflicts of Interest

The authors declare no conflicts of interest.

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