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RESEARCH ARTICLE

# EXPLORING HEALTHCARE MEDICATION-SKILLS, PROFESSIONALISM AND OPPORTUNITIES OF PHARMACY-BASED HEALTHCARE PROVIDERS IN MALAYSIA

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## Abstract

**Background**: Through qualitative and quantitative methods, this study will contribute to a deeper understanding of the evolving role of pharmacy-based healthcare providers in Malaysia and highlight strategies to optimize their impact within the healthcare framework. The evolving landscape of healthcare in Malaysia has placed increasing emphasis on the role of pharmacy-based healthcare providers in delivering patient-centered care. As healthcare systems worldwide shift toward more integrated approaches, pharmacists are uniquely positioned to contribute through their expertise in medication management and patient education. This study explores the current state of medication skills, professionalism, and the opportunities available for pharmacists in Malaysia.
**Objective:** This study investigates the knowledge, professionalism, and perceptions of pharmacy-based healthcare providers among students at University College MAIWP International (UCMI) in Malaysia.
**Method:** A total of 341 students participated in a survey assessing their understanding of pharmacists' roles, responsibilities, and contributions to healthcare.
**Results:** The findings indicate a strong recognition of pharmacists' importance in medication management and patient care, with 93.5% acknowledging their role in helping manage medications effectively. Despite a consensus on the necessity for higher education in pharmacy, 89.2% of respondents believed a high school diploma suffices to become a pharmacy practitioner. Additionally, both male and female students demonstrated similar levels of awareness regarding the diverse responsibilities of pharmacists beyond traditional roles.
**Conclusions:** The study highlights the need for greater integration of pharmacy professionals into the healthcare system and calls for enhanced educational initiatives to elevate the understanding of pharmacy roles among the general public and healthcare providers.
**Keywords:** Community pharmacies, home medication review, medication management, professionalism, student perceptions.

## INTRODUCTION

The main tool used in the prevention and treatment of illnesses and disorders is medicine. For the optimum pharmacological results, medications must be prescribed and delivered correctly. Thus, it is essential for inpatient treatment plans and healthcare to examine medications and medication-taking behaviors[1].
Medication reviews are "a structured, critical examination of a patient's medicines to reach an agreement with the patient about treatment, optimising the impact of medicines, minimising the number of medication-related problems and reducing waste," per the guidelines "A Guide to Medication Review 2008". Medication reviews are becoming a crucial part of medication management in order to enhance the efficacy, safety, and proper administration of medications, hence averting drug-related issues[2]. Pharmacists are vital to the medication review service because they are specialists on drugs in the medical field, and their contributions go beyond standard pharmacy procedures like prescription distribution and patient counseling. Specifically, clinical pharmacists collaborate with doctors, other medical specialists, and

patients on a regular basis to make sure prescription drugs provide the greatest results possible[3]. There is obvious intention to rehabilitate health sector and minimize wastes, this will be helpful for the economic level.

In order to improve patients' care after they leave medical facilities and return home, Home Care Pharmacy Services (HCPS), also known as Home Medication Review (HMR) in Malaysia, offers home care services to patients treated at Ministry of Health (MOH) facilities. A thorough and organized workflow is used throughout the whole HCPS process, including medication review and drug reconciliation to ensure that pharmaceuticals are used appropriately and to address concerns related to pharmaceutical care, such as patient adherence, adverse drug reactions, and medication storage. Patients from the fields of neurology, psychiatry, and geriatrics, as well as those with polypharmacy and chronic illnesses, have been the focus of this research[4]. It has been demonstrated that medication reviews benefit patients. First of all, by lowering the quantity of prescription drugs written, enhancing medication suitability, encouraging suitable polypharmacy, and identifying prospective and real drug-related issues, this service may lower the frequency of hospital stays and the number of geriatric drug-related deaths. Additionally, it might help with medication compliance as well as the diagnosis and treatment of difficult drug problems that caregivers and nursing personnel deal with[5]. The HMR program has been beneficial for patients with chronic conditions, especially those with stroke, schizophrenia, and type 2 diabetic mellitus (T2DM). Benefits of HMR include significantly decreased blood pressure, glucose, and cholesterol levels in post-stroke patients, as well as improved medication adherence, drug awareness, and quality of life among patients with schizophrenia and other illnesses[6].

The profession of pharmacy in Malaysia has changed from being mostly focused on products to being more patient-centered. Physicians at government hospitals prioritize using generic medications and write prescriptions in accordance with the hospital's drug formulary. Pharmacists oversee the distribution of medications to patients[7]. On the other hand, physicians working in private practices are legally permitted to prescribe and dispense medications, and brand prescribing is commonplace. Their unfavorable opinions about the efficacy, safety, and quality of generic medications are the cause of the low prescription rate for generics[8]. Prescription and dispensing processes may become profit-driven in the private sector if there is no distinction between the two. It was discovered that physicians who dispense drugs prescribe seven times as many medications as those who do not. However, many patients choose to buy prescription drugs for chronic illnesses from community pharmacies without first consulting a doctor or following up with one, due to convenience and the desire to save money. This ultimately jeopardizes patient safety and makes it more difficult to use medications cost-effectively[9]. In order to minimize morbidity, a periodic medication review is necessary, as evidenced by a cross-sectional study that showed residents of elderly care homes were extremely vulnerable to potentially improper prescription use[10].

Private hospital pharmacists' roles have expanded as a result of the rapid development of private hospitals brought about by the rise of medical tourism and private healthcare insurance[11]. In addition to their traditional roles as inpatient and outpatient pharmacists, private hospital pharmacists can also participate in clinical services in the wards, therapeutic drug monitoring, clinical oncology pharmacy, medication adherence clinic, and parenteral nutrition services[12]. However, there are no records about how many private hospitals provide medication review services. A few studies have recorded the medication review service, which was mostly offered by pharmacists in public institutions[13]. These studies focused on the effects of medication reviews and their difficulties, and one examined pharmacists' knowledge of pharmacy practice in relation to managing pharmaceutical therapy in public hospitals[14]. To the best of our knowledge, no research has evaluated the expertise, mindset, or working conditions of pharmacists in private hospitals in Malaysia with regard to medication review. The main objective of this study was to ascertain the knowledge, attitude, and practice (KAP) of private hospital pharmacists in Malaysia with respect to medication review services. It also aimed to ascertain the perceived challenges and barriers that Malaysian private hospital pharmacists encountered when conducting medication reviews.

Both urban and rural areas in Malaysia depend on community pharmacy. Thirty percent of the nation's 12,000 registered pharmacists operate in community pharmacies and possess an annual retention certificate. The private and public sectors have different functions, with only medical professionals authorized to prescribe and dispense medication in the former. In Malaysia, pharmaceuticals are classified as either over-the-counter (OTC) or regulated (scheduled toxic) substances. OTC medications are ones that are easily obtained from any source, including pharmacies and grocery stores[15]. Two classifications for controlled substances are as follows: either they are prescription drugs that need to be filled at the community pharmacy, or they are pharmaceuticals that the community pharmacist can give as “dispensed medicine”. According to the Poisons Act of 1952, medication supplied by a licensed pharmacist on the licensed premises or by a registered physician, dentist, or veterinary surgeon for the purpose of medical, dental, or animal therapy is referred to as dispensed medicine (Group C)[16]. More integration of pharmacists into the public health care system is required because the Poisons Act allows Malaysian community pharmacists to prescribe a wide range of controlled medications, such as those for diabetes, asthma, skin, eyes, nose, pain, central nervous system disorders, cough, cold, and cough, as well as oral contraceptives. Most respondents to polls conducted in Malaysia thought that Class C poisons, as defined by the Poisons Act of 1952, were prescription drugs that could be replaced[17]. When non-prescription medication

purchases from community pharmacies in Malaysia were examined, it was found that 12.5% of customers bought complementary and traditional remedies, 39.6% bought scheduled poisons, and 45.5% bought unscheduled poisons[18]. In Malaysia, 77.5% of general practitioners may begin closely collaborating with community pharmacists to monitor patients' pharmacotherapeutic outcomes if the separation of dispensing is put into effect[19]. In Malaysia, the majority of community pharmacists (>70%) continued to specialize in diabetes medication counseling, nutritional supplement counseling, and blood pressure and sugar testing screening[20]. In Malaysia, it is typical for community pharmacies to offer a wide range of consumer goods, some unrelated to healthcare, while astute observers may even challenge the pharmacists' inappropriate clothing choices[21]. The objective of this study was to explore the knowledge of specific roles of pharmacy-based healthcare providers among the students of UCMI Malaysia and to understand the opinion about the overall performance and job scope of pharmacy-based healthcare providers among the students of UCMI Malaysia. Many approaches have been taken as prescription regulation and discussion with patients before prescribing non-desired medications. Chaos realized by private sector is obvious, this lead to install more control for helping this mess. Studies about side-effects resulting from abuse in medications are also required.

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## METHODS

**Study site**

The study area is selected in our campus University College MAIWP International and Kampung Bharu, Kuala Lumpur. The following are the main area where students often gather, study and live nearby.

**Study subjects**

Three thousand students from a tertiary university in Kampung Bharu, Kuala Lumpur, Malaysia, participated in this study.

**Study population**

The study population is a student in University College MAIWP International. Most of the students range from diploma students, degree students or foundation student ranging from about 3000 students.

**Inclusion criteria**

The survey participants were pre-selected based on certain inclusion criteria, including being at least eighteen years old, enrolled in college, having a strong command of the English language, being of both sexes, and being in good physical and mental health.

**Exclusion criteria**

Respondents under the age of 15, those who were not in excellent bodily or mental health, those who could not comprehend the questions or did not speak English well enough, and those who were not university students were not allowed to participate in this survey.

**Determination of sample size**

The sample size is based on the sample selection which is convenience sampling that are involved 341 participants take a part in this survey. With the confidence level about 95% and 5% margin of error the sample size for data collection in this research involved only 341 respondents from 3000 participants that take part in this survey. Using the Rao soft calculator, the required respondent for our research project is 341 respondents (Confidence level = 95%, Margin of error = 5%, Population size = 3000).

**Survey tools**

There were fifteen questions in the final survey, which were broken up into many categories. However, its primary goal is to find out how well-informed UCMI Malaysia students are regarding the various responsibilities played by pharmacy-based healthcare providers and to find out what they think about the general performance and range of work of these professionals. and assessed the features of the participants, which included completing an e-consent form at the conclusion of the survey.

**Ethical concerns**

The university research committee gave its approval to the project and survey questionnaire design. Throughout the study, the respondents' privacy was rigorously protected and kept private. Students from several programs at University College MAIWP International, Kampung Bharu, Kuala Lumpur, Malaysia, were represented among the participants. The purpose of selecting various sample populations was to essentially represent the viewpoints of those with and without pharmaceutical backgrounds.

**Data collection**

The validated survey questionnaire (survey monkey form) link was distributed directly to student using WhatsApp's groups and data were collected from our survey site which were completed and submitted by the respondents.

**Consent form**

Prior to answering the survey questions, all participating respondents had to complete the e-consent form.

**Data management and analysis**

The data collected from the survey was managed systematically to ensure accuracy and reliability. After distributing the validated questionnaire through an online platform (Survey Monkey), all responses were compiled and stored securely. The following steps were undertaken in the data management process:

**Data collection:** Responses were collected over a predetermined period, with a total of 341 completed surveys. Each response was timestamped and stored in a secure database to maintain confidentiality.

**Data cleaning:** The dataset was examined for any inconsistencies or incomplete responses. Entries with missing data or those that did not meet the inclusion criteria were removed from the analysis, ensuring that the final dataset was accurate and complete.

Data Coding: Responses were coded for quantitative analysis. For example, categorical responses (e.g., "Agree," "Disagree") were assigned numerical values to facilitate statistical analysis. This coding scheme was applied uniformly across all questions to ensure consistency.

**Data protection:** All personal identifiers were removed to maintain respondent anonymity. Access to

the dataset was restricted to the research team to uphold ethical standards and privacy regulations.

**Data analysis**

The analysis of the survey data was performed using statistical software (e.g., SPSS, R) to derive meaningful insights regarding the knowledge and opinions of pharmacy practitioners among UCMI students. The following analytical techniques were employed:

**Descriptive statistics:** Basic demographic information, such as age and gender, was analyzed using descriptive statistics (mean, frequency, and percentage). This provided an overview of the participant characteristics.

**Chi-Square tests:** To examine the relationship between categorical variables, chi-square tests were conducted. This included assessing differences in knowledge and opinions based on gender and field of study. A significance level of $p < 0.05$ was set to determine statistical significance.

**Cross-tabulation:** Cross-tabulation analysis was utilized to explore the association between different variables, such as gender and knowledge of pharmacy practitioners' responsibilities. This helped identify patterns and differences in responses among various subgroups.

**Content analysis:** For open-ended questions, content analysis was performed to categorize and quantify qualitative responses. This approach enabled the identification of common themes and insights into student perceptions of pharmacy roles.

**Reliability analysis:** Cronbach's alpha was used to assess the survey instrument's internal consistency. The survey items were deemed to assess the desired constructs with reliability if they had a value of 0.70 or higher.

## RESULTS AND DISCUSSION

Results from the analyses were summarized in tables and figures, highlighting key findings. Descriptive statistics were presented to illustrate the demographic characteristics of respondents, while inferential statistics were used to draw conclusions regarding knowledge and opinions about pharmacy practitioners. The final report will include a discussion of significant findings, limitations of the study, and implications for pharmacy education and practice.

By adhering to rigorous data management and analysis protocols, the study ensures that the findings are credible and can contribute valuable insights into the perceptions of pharmacy practitioners among students in Malaysia.

**Table 1. Background characteristics of the student respondents of UCMI Malaysia.**

| Basic characteristics | Number, n |
|---|---|
| **Age (in years)** | |
| Below 20 | 45 (13.9) |
| 20 | 97 (29.9) |
| 21 | 165 (50.9) |
| 22 & above | 17 (5.2) |
| Mean age ± SD | 20.48±1.089 |
| **Gender** | |
| Male | 62 (19.1) |
| Female | 262 (80.9) |
| **Respondents' studied subjects** | |
| Pharmacy | 260 (80.2) |
| Medical Sciences | 40 (12.3) |
| Physiotherapy/Occupational Safety and Health | 15 (4.6) |
| Non-medical subjects* | 9 (2.8) |
| Total (n) | 324 (100.0) |

**Note:** *non-medical subjects: Human Resource Management/Management, Education & Humanities/ Business Management/Logistic Management/Early Childhood Education;

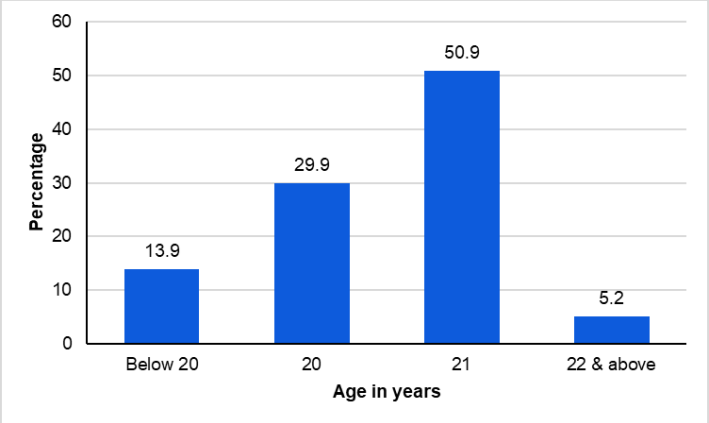


**Figure 1: Age distribution of the student respondents.**

**Table 2: Knowledge about job responsibility and skills of pharmacy practitioners among UCMI students by gender.**

| Characteristics | All | Male (M) | Female (F) | M vs. F $\chi^2$ tes0t |
|---|---|---|---|---|
| Knowledge about job responsibility of pharmacy practitioners | | | | |
| The pharmacy practitioner efforts to help people in managing medications % | | | | |
| Agree/Strongly Agree | 93.5 | 96.8 | 92.7 | 0.247 |
| Disagree/Strongly Disagree | 6.5 | 3.2 | 7.3 | |
| The pharmacy practitioner efforts to help people in improving health or stay healthy % | | | | |
| Agree/Strongly Agree | 94.8 | 91.9 | 95.4 | 0.269 |
| Disagree/Strongly Disagree | 5.2 | 8.1 | 4.6 | |
| Customer service-related skill is important to pharmacy practitioners? % | | | | |
| Agree/Strongly Agree | 96.0 | 98.4 | 95.4 | 0.284 |
| Disagree/Strongly Disagree | 4.0 | 1.6 | 4.6 | |
| Pharmacy practitioner can give doses to patients easily? % | | | | |
| Agree/Strongly Agree | 90.7 | 90.3 | 90.8 | 0.899 |
| Disagree/Strongly Disagree | 9.3 | 9.7 | 9.2 | |
| Pharmacy practitioner should know the name of medication % | | | | |
| Agree/Strongly Agree | 100.0 | 100.0 | 100.0 | NA |
| Disagree/Strongly Disagree | - | - | - | |
| Total (n) | 324 | 62 | 262 | |

Note: NA= Not Applicable; NS= Not Significant at 5% level

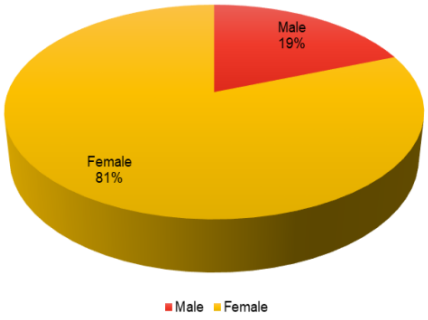


**Figure 2: Distribution of the student respondents by gender.**

Most of the respondents are between the age of 21 with the total of 50.9% (n-165). This is because UCMI has many 21 years old students who are about to graduate. Being the lowest respondent based on age are 22 and above with a total of 5.2% (n-17). The percentage for the students age of 22 years and above is very low because the student has completed their studies, and they are only a few students continue their studies to the degree level. As for age between 20 are 29.9% (n-97), this is because only a few students are interested in taking the time to answer the questions on the google form. Meanwhile for the age below 20 13.9% (n-45), there are only a few new students who have just continued their studies at UCMI. Total of 324 respondents have completed the survey. More than half of the respondents 81% (n-262) were female, a total of 19% (n-62) were male. The total percentage in the graph includes the entire major, which is medical and non-medical. One of the reasons is, the number of female students in the medical department is more than male students. Meanwhile, there are more male students in the field of Occupational Safety and Health. There are various methods used to attract students to fill in the Google form such as sending a WhatsApp link in the UCMI group.

**Table 3: Opinion about the professionalism and scope of pharmacy practitioners among UCMI students by gender.**

| Opinion on education and professional scope as pharmacy practitioners | All | Male (M) | Female (F) | M vs. F $\chi^2$ test |
|---|---|---|---|---|
| To be pharmacy practitioner only need high school diploma % | | | | |
| Agree/Strongly Agree | 89.2 | 96.8 | 87.4 | 0.033 |
| Disagree/Strongly Disagree | 10.8 | 3.2 | 12.6 | |
| Did the pharmacy practitioner demonstrate professionalism of being a respectful, courteous, and caring manner? % | | | | |
| Agree/Strongly Agree | 83.6 | 80.6 | 84.4 | 0.478 |
| Disagree/Strongly Disagree | 16.4 | 19.4 | 15.6 | |
| Did you know pharmacy practitioner has many job scope? % | | | | |
| Agree/Strongly Agree | 96.6 | 95.2 | 96.9 | 0.485 |
| Disagree/Strongly Disagree | 3.4 | 4.8 | 3.1 | |
| Total (n) | 324 | 62 | 262 | |

**Table 4: Opinion about the performance of pharmacy practitioners among UCMI students by gender.**

| Opinion on the overall performance of pharmacy practitioners | All | Male (M) | Female (F) | M vs. F $\chi^2$ test |
|---|---|---|---|---|
| Pharmacy practitioner can work in diverse setting include retail pharmacies, hospital, clinics and long-term care facilities % | | | | |
| Agree/Strongly Agree | 98.5 | 98.4 | 98.5 | 0.961 |
| Disagree/Strongly Disagree | 1.5 | 1.6 | 1.5 | |
| Pharmacy practitioner can handle customer inquiries and provide customer service in meeting customer expectations % | | | | |
| Agree/Strongly Agree | 94.4 | 98.4 | 93.5 | 0.132 |
| Disagree/Strongly Disagree | 5.6 | 1.6 | 6.5 | |
| Pharmacy practitioner can solve customer problems in a timely and professional manner % | | | | |
| Agree/Strongly Agree | 97.2 | 95.2 | 97.7 | 0.272 |
| Disagree/Strongly Disagree | 2.8 | 4.8 | 2.3 | |
| Did the pharmacy practitioner make the efforts to help people in managing the medications effectively? % | | | | |
| Agree/Strongly Agree | 74.1 | 67.7 | 75.6 | 0.206 |
| Disagree/Strongly Disagree | 25.9 | 32.3 | 24.4 | |
| Did the pharmacy practitioner make the efforts to help people in improving health or in staying healthy? % | | | | |
| Agree/Strongly Agree | 87.0 | 85.5 | 87.4 | 0.686 |
| Disagree/Strongly Disagree | 13.0 | 14.5 | 12.6 | |
| Did you agree pharmacy practitioner perform a wide variety of tasks instead of preparing medicines for treatment? % | | | | |
| Agree/Strongly Agree | 73.8 | 54.8 | 78.2 | 0.000165 |
| Disagree/Strongly Disagree | 26.2 | 45.2 | 21.8 | |
| Total (n) | 324 | 62 | 262 | |

In addition, meet some students to fill in this google form. The total number who answered and took the time to fill out this questionnaire was more women than men. This is because UCMI has a small number of male students and is less interested in filling out this google form. This proof that entire population of UCMI student is mostly female.

Although there are fewer males than females overall, the graph above shows that the overall percentage of males is higher than that of females. Pharmacy practitioners' duties include reviewing and carrying out doctor's prescriptions, ensuring that they are appropriate and legal, efficiently organizing the pharmacy to facilitate quicker and easier product identification, maintaining complete control over the delivery, stocking, and labeling of medications and other products, keeping an eye on their condition to prevent deterioration or expiration, listening carefully to customers to understand their needs and concerns and providing information and advice, and helping with other medical services like injections and blood pressure/temperature checks.

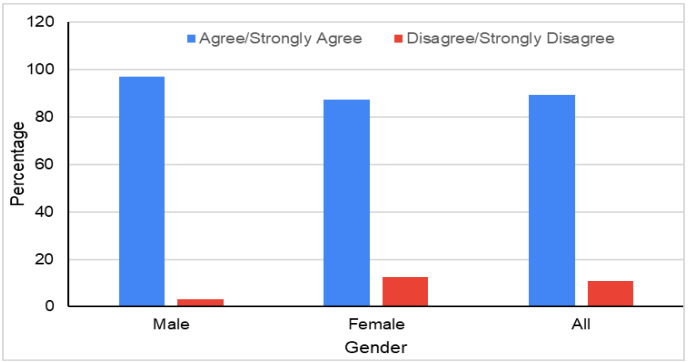


**Figure 3: Pharmacy practitioner need high school diploma only.**

Proven experience as a pharmacist, a solid grasp of chemical components, medical brands, dosage administration and measurement, and strong organizational abilities are all examples of job skills for pharmacy practitioners. In conclusion, UCMI students' gender has no bearing on their understanding of the duties and abilities of pharmacy practitioners. The table's findings demonstrated the Malaysian people's awareness and encouraged their participation in improving services across many industries.

**Opinion on professional quality of pharmacy practitioners among UCMI students**

Majority of the respondents agreed/strongly agreed (89.2%) that to be a pharmacy practitioner only need high school diploma. Only 10.8% respondents were disagreed/strongly disagreed with this statement, they

believe that to be a pharmacy practitioner may have more higher education as they will serve people.

Based on the graph, total respondents from male students agree is 98% (n-62) and 2% disagree. While female students is students it is 88% (n-262),13% disagree. The total percentage of UCMI students who agree pharmacy practitioners need high school diploma is 90% and 11% disagree. The percentage of students who agree is very high because to become a pharmacy assistant, you must have knowledge in this field. To gain deeper knowledge in this field, continuing education is the best option. If the opportunity to become a pharmacy assistant is wide open, job opportunities for students who have a diploma are less. This, results is injustice for students who have spent money and energy. Not only that, the knowledge learned at the university is very useful to be used at work compared to workers who do not have learning experience and who have to take a long time to learn while working.

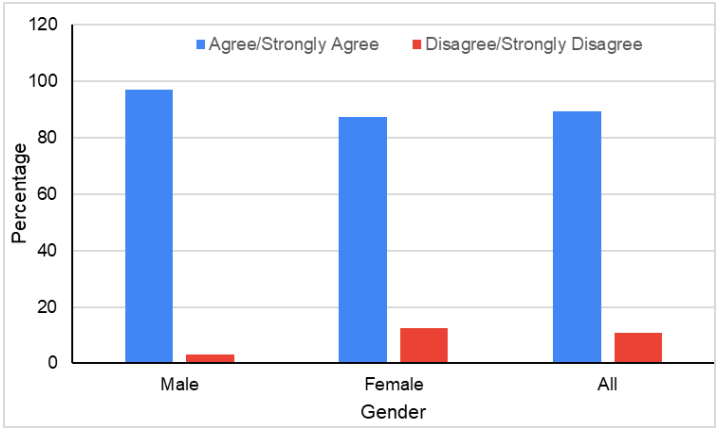


**Figure 4: Pharmacy practitioner makes the efforts to help people in managing the medications effectively.**

**Opinion on overall performance of pharmacy practitioners among students of UCMI**

Based on the above table, the total percentage of male is higher that of female although the total number of males is lower than that of female. Gender does not have a significant impact on the quality of care or performance in the field. Both male and female pharmacists tend to provide high-quality care, though there might be differences in practice patterns or areas of specialization. Gender diversity can contribute positively to the profession, bringing varied perspectives and approaches to patient care and team dynamics. It's important to focus on individual competencies and qualifications rather than gender when evaluating performance.

Based on the graph, total percentage respondents from male students agree are 74.1% (n-62) and 25.9% disagreeing. While female students are 67.7% (n-262), 32.3% disagree. The total percentage of UCMI students who agree on pharmacy practitioners make the efforts to help people in managing the medications effectively is 75.6% and 24.4% disagreeing. There are various ways that pharmacy assistants can assist patients in handling medication. Among them is identifying the right medicine according to the doctor's prescription.

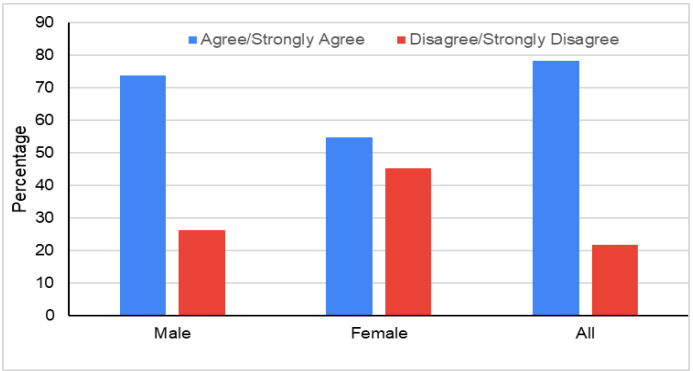


**Figure 5: Pharmacy practitioner can perform a wide variety of tasks instead of preparing medicines for treatment only.**

Next, the pharmacy assistant must give the right medicine and dosage according to the patient's age. Immediately after the administration of the medicine, the pharmacy assistant explains the function of the medicine to the patient, followed by the dose to be taken at the appropriate time. Not only that, an explanation of the function of the medicine against the disease will also be explained to the patient. This can make it easier for the patient to understand the function of the medicine and be confident to take the medicine at the right time. Based on the graph, total percentages respondents from male students agree are 74.5% (n-62) and 27.9% disagreeing.

While female students are students it is 55.9% (n-262), 45.9% disagree. So, the total percentage of UCMI students who agree on pharmacy practitioners can perform a wide variety of tasks instead of preparing medicines for treatment effectively is 78.9% and 21.9% disagree. There are various tasks that a pharmacist can do apart from providing medicine for patients. These include providing general assistance with daily pharmacy activities, taking prescriptions from patients in person and over the phone, measuring and mixing medications as prescribed, packaging, labeling, and dispensing medications. Not only that, the pharmacy assistant also checks expired drugs and discards them properly, uses the cash register and writes letters and memos, prepares receipts and invoices, and files orders. Finally, help customers find what they need or refer them to a pharmacist for further assistance.

**Limitations of the study**

One limitation of this study is its reliance on a single group of participants—students at University College MAIWP International (UCMI)—which may not fully represent the broader population of pharmacy students or healthcare providers in Malaysia. Additionally, the study is based on self-reported perceptions, which may be subject to bias or inaccuracies in respondents' understanding of the pharmacy profession.

Furthermore, the survey did not assess the actual knowledge or competency of participants in medication management or their practical experiences, limiting the ability to draw conclusions about their true readiness to contribute to healthcare settings. Lastly, the study's cross-sectional design does not allow for an examination of changes in perceptions over time or the long-term impact of educational initiatives.

## CONCLUSIONS AND RECOMMENDATIONS

The study provides valuable insights into the knowledge, attitudes, and perceptions of pharmacy practitioners among students at University College MAIWP International (UCMI) in Kuala Lumpur, Malaysia. The findings indicate a high level of awareness among students regarding the roles and responsibilities of pharmacy practitioners, with significant agreement on the importance of their contributions to medication management and healthcare. The majority of respondents recognize the diverse settings in which pharmacists can work and their capacity to provide high-quality customer service and support for patient health. While the results suggest that gender does not significantly influence perceptions of pharmacy practitioners' effectiveness or their professional responsibilities, it highlights the need for ongoing education and awareness programs that emphasize the diverse capabilities and roles of pharmacists beyond traditional dispensing duties. Moreover, the strong endorsement of the necessity for further education beyond high school for pharmacy practitioners reflects an opportunity for academic institutions to advocate for higher educational standards in the profession.

UCMI and other educational institutions should consider developing curriculum components that focus on the expanded roles of pharmacists in various healthcare settings. This could include practical training in medication management, patient counseling, and collaborative care. Implement initiatives aimed at educating both students and the general public about the diverse roles of pharmacy practitioners. Such campaigns could utilize social media, workshops, and community outreach programs to dispel misconceptions and promote the profession. Future studies should investigate the impact of continuing education on the professional development of pharmacists. Understanding how additional training influences practice can inform educational strategies and curriculum design. Foster collaboration between pharmacy schools and healthcare facilities to provide students with hands-on experience in real-world settings. This could improve their understanding of interprofessional teamwork and the critical role pharmacists play in patient care. Regular assessments of pharmacy services in both community and hospital settings can help identify areas for improvement. This data can be used to refine practices and enhance patient outcomes.

By addressing these recommendations, the profession of pharmacy in Malaysia can continue to evolve, ensuring that pharmacy practitioners are well-equipped to meet the changing needs of patients and healthcare systems.

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## AUTHORS' CONTRIBUTIONS

**Rahman MNA:** funding acquisition, analysis, interpretation of data and the creation of new software used in the work. **Wan Sulaiman WMAB:** project administration. **Azad AK:** conception and design of the work, review, editing. All authors have checked and approved the manuscript.

## DATA AVAILABILITY

All data and materials will be available upon request to the corresponding author.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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