MOH/S/FAR/109.23(GU)-e

Ministry of Health Malaysia

PHARMACY RESEARCH PRIORITIES IN MALAYSIA

Second Edition

PHARMACY RESEARCH PRIORITIES IN MALAYSIA

(SECOND EDITION)

March 2024

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List of Abbreviations

ACS	acute coronary syndrome
ADR	adverse drug reaction
ADS	automated dispensing system
AEFI	adverse events following immunisation
AI	artificial intelligence
AMS	antimicrobial stewardship
API	active pharmaceutical ingredient
AR	augmented reality
BIA	budget impact analysis
CDR	cytotoxic drug reconstitution
CHNRI	Child Health and Nutrition Research Initiative
COPD	chronic obstructive pulmonary disease
CPI	consumer price index
DiPS	*Didik, Pantau, Serbu* (educate, monitor, raid)
DRP	drug-related problem
DUNas	Malaysian National Medicines Policy
GP	general practitioner
HAM	high alert medication
HMR	home medication review
HRQoL	health-related quality of life
IoT	internet of things
IR4.0	Fourth Industrial Revolution
MADRAC	Malaysian Adverse Drug Reactions Advisory Committee
MCDA	multiple criteria decision analysis
MDR	multidrug resistant
mHealth	mobile health
MOH	Ministry of Health Malaysia
MOPI	Malaysian Organisation of Pharmaceutical Industries
MREC	Medical Research and Ethics Committee

MSOM	Malaysian Statistics on Medicines
MTAC	medication therapy adherence clinic
NCD	non-communicable disease
NGO	non-governmental organisation
NMRR	National Medical Research Register
NOAC	non-vitamin K oral anticoagulant
NSTEMI	non-ST-segment elevation myocardial infarction
NTD	neglected tropical disease
NVAF	non-valvular atrial fibrillation
OKBT	*Operasi Khas Bahan Terkawal* (Controlled Substances Special Operation)
PAP	Patient Assistance Programme
PASc	Patient Access Scheme
PICC	pharmacy integrated community care
PIM	potentially inappropriate medication
PPI	proton pump inhibitor
PPP	public-private partnership
PRPM	Pharmacy Research Priorities in Malaysia
PRPM Ed.1	Pharmacy Research Priorities in Malaysia, First Edition, 2018
PRPM Ed.2	Pharmacy Research Priorities in Malaysia, Second Edition, 2024
PSP	Pharmaceutical Services Programme
QUM	Quality Use of Medicines
R&D	research and development
SDM	shared decision-making
TCM	traditional and complementary medicine
TDM	therapeutic drug monitoring
TPN	total parenteral nutrition
VAS	value added services
VBM	value-based medicine
VR	virtual reality
WTP	willingness to pay

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Foreword

The landscape of healthcare is evolving at an unprecedented pace, and pharmacists find themselves at the forefront of this transformation. The success of pharmaceutical services hinges on the undivided commitments and collaboration among all stakeholders throughout the pharmaceutical life cycle. At the same time, we must constantly adapt and innovate to meet the dynamic needs of our patients and healthcare system.

I have had the privilege of witnessing the continuous evolution of pharmaceutical care and the crucial role that research plays in shaping the future of our industry. Hence, I am delighted to present the Second Edition of the Pharmacy Research Priorities in Malaysia, a document that outlines our priorities in ensuring evidence-based decision-making in pharmacy services. This document serves as a testament to our commitment to advancing pharmacy practice, improving patient outcomes, and driving innovation in the field.

"This document serves as a testament to our commitment to advancing pharmacy practice, improving patient outcomes, and driving innovation in the field."

I am confident that this document will serve as a source of inspiration and guidance for the researchers and pharmacists. It is a call to action and a commitment to excellence in pharmacy research. It is my hope that it will inspire us to continue pushing the boundaries of what is possible in pharmacy services. Together, we will make a difference and contribute to the betterment of healthcare for all.

Preface

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Pharmacy research serves as the foundation upon which we build a better future for pharmacy practice. Our obligation to advancing knowledge in this field is unwavering. By defining our research priorities, we are setting a clear path to guide our efforts, ensuring that our research endeavours are strategic, impactful and aligned with the needs of our *Rakyat*.

In this document, you will find a comprehensive overview of the key research areas that we have identified as pivotal in advancing pharmaceutical care. Our priorities span a wide spectrum, from medicine development to pharmacy practice and pharmacotherapy, governance in medicines, and advanced data analytics. We recognise that each of these areas has a unique role to play in improving the health and well-being of the patients we serve.

Furthermore, this document is the result of extensive collaboration with the experts, healthcare providers and researchers within our organisation, as well as valuable inputs from our valued partners and stakeholders. It reflects our collective vision and shared commitment to enhancing pharmacy services. I sincerely hope that this document can contribute to driving the transformation and innovation needed to meet the healthcare challenges of today and tomorrow.

"In this document, you will find a comprehensive overview of the key research areas that we have identified as pivotal in advancing pharmaceutical care."

Introduction

Background

Research is important to generate evidence and information to support healthcare decisions and policies making, and to continuously improve the quality of services provided for the population. Without proper planning and guidance, however, efforts in research can be incoherent with the current evidence gaps. Hence, the Pharmaceutical Services Programme (PSP), Ministry of Health Malaysia (MOH) published the first edition of Pharmacy Research Priorities in Malaysia (PRPM Ed.1)[1] in July 2018. Five research priority domains were identified in PRPM Ed.1, namely:

i. Access to medicines,
ii. Monitoring and evaluation of outcomes,
iii. Quality and safe use of medicines and sustainability,
iv. Optimisation of therapy and pharmacy services delivery, and
v. National databases / big data analytics.

The main objective of PRPM is to guide pharmacy research activities in the country to produce relevant data and evidence needed to fill the critical knowledge gaps to address national problems. These research priorities are not only relevant to the MOH, but all institutions that conduct research in the field of pharmacy and pharmaceuticals in Malaysia. Researchers from MOH, universities, other ministries and government agencies, pharmaceutical industry, community pharmacies, public and private healthcare institutions, as well as pharmacy students are encouraged to consider these research priority areas when designing their research.

Reviewing and Setting the PRPM

The knowledge gaps and research priorities in the PRPM Ed.1 were identified and projected based on the national needs delineated in the Malaysian National Medicines Policy (DUNas) (Second Edition, 2012)[2] and Pharmacy Programme Strategic Plan 2017–2020 [3]. Since the publication of PRPM Ed.1, the PSP has published the Third and Fourth Editions of DUNas [4,5] in 2020 and 2023 respectively, and the Pharmaceutical Services Programme Strategic Plan 2021–2025 [6] in 2021.

As the healthcare sector is very dynamic with constant changes in technology and disease trends, it is necessary to determine whether the research priority areas are still relevant to the current and future needs. In line with this, a systematic process was initiated to review the PRPM Ed.1 and establish the revised edition of PRPM.

Method

The pharmacy research priority setting exercise was systematically carried out as part of a multi-stage research project entitled "Reviewing and Setting the Pharmacy Research Priorities in Malaysia". The study was registered with the National Medical Research Register (NMRR) (NMRR ID: NMRR-21-1818-61291) and ethics approval were obtained from the MOH Medical Research and Ethics Committee (MREC) (Reference number 21-1818-61291, dated 27 October 2021). The study was carried out from November 2021 to December 2023. There were four phases in the study, with each phase addressing each of the following objectives respectively:

i. Phase 1: Retrospective mixed design (qualitative and quantitative) study on the Pharmacy Research Database (*Pangkalan Data Penyelidikan Farmasi*) to determine the uptake of pharmacy research priority areas in PRPM Ed.1 by MOH pharmacy researchers.
ii. Phase 2: Qualitative study using focus group discussions to explore the barriers and enablers for MOH pharmacy researchers in utilising the PRPM Ed.1 document.
iii. Phase 3: Gap analysis to identify research gaps related to pharmaceutical services in Malaysia.
iv. Phase 4: Multiple criteria decision analysis (MCDA) to establish the revised pharmacy research priorities in Malaysia.

Phase 1 and phase 2 studies functioned as situational analyses to evaluate the achievement and utilisation of PRPM Ed.1. The findings can be used to strategise more targeted efforts to improve the promotion, distribution, and uptake of the revised PRPM. The methodology and findings of phase 1 and phase 2 studies will be reported in separate scientific publications. The research priorities setting process (phase 3 and phase 4 studies) was simplified and illustrated in Figure 1.

Identifying the Research Gaps

A gap analysis was conducted to identify research gaps related to pharmaceutical services in Malaysia for the next one to ten years. A research gap is defined as a research question or area with missing, inadequate, or insufficient information that limits the ability of healthcare decision makers to make decisions [7–9]. The gap analysis involved the review of policy documents, published and unpublished literature, workshops and survey among the pharmaceutical services stakeholders to identify the current and future research gaps. A wide representation of stakeholders was involved in this process to gather comprehensive inputs.

The gap analysis was driven by a core team and supported by an expert committee. The core team included pharmacists and research officers from the Pharmacy Research and Development (R&D) Subdivision, Pharmacy Policy and Strategic Planning Division, PSP, MOH.

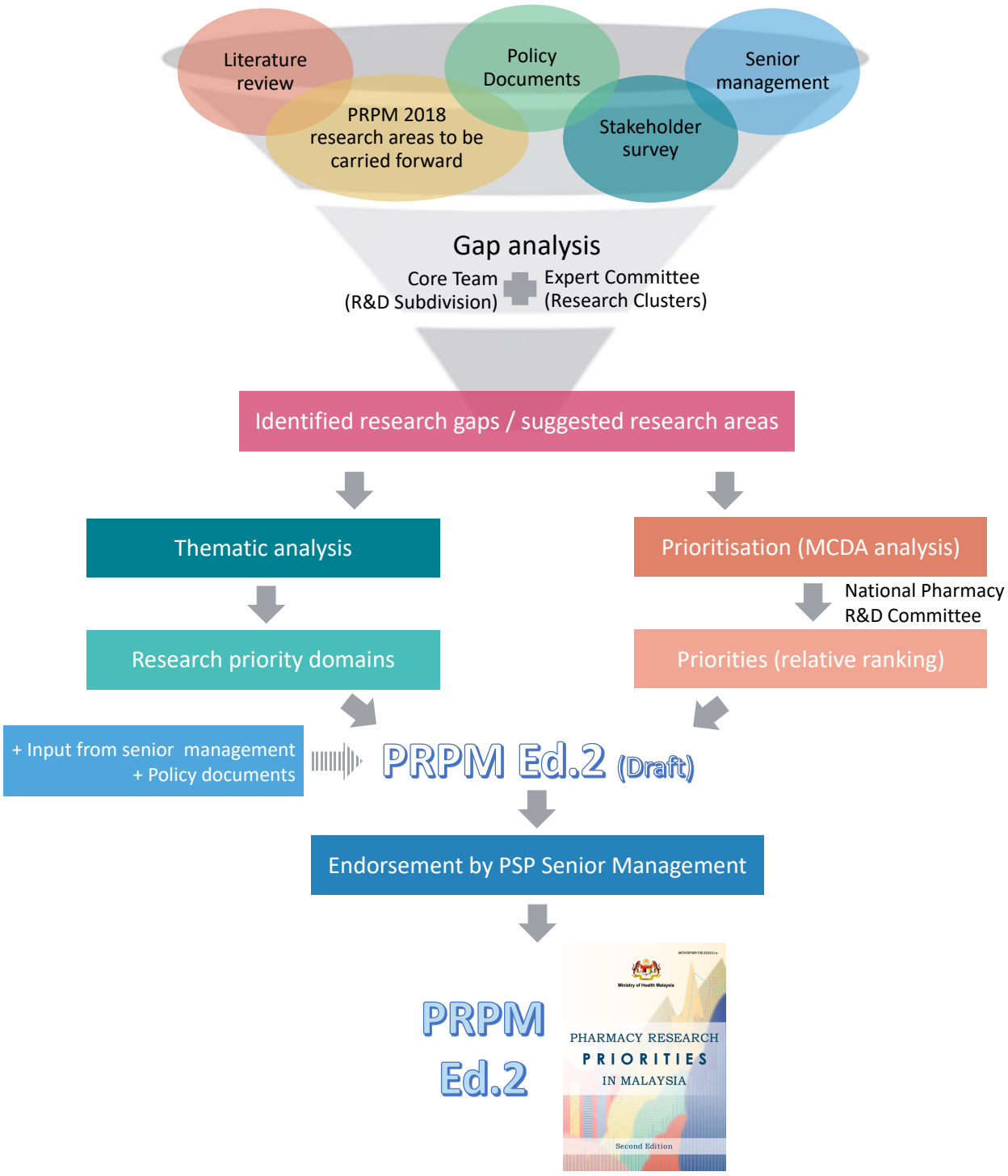

Figure 1: Graphical illustration of the processes in reviewing and setting the PRPM

The expert committee comprised 79 members from the Pharmacy Research Technical Committee, which were made up of six research clusters, namely:

i. Clinical Pharmacy
ii. Pharmacy Policy and Practice
iii. Regulatory and Pharmacy Enforcement
iv. Pharmacoeconomics and Outcome-based Research
v. Pharmaceutical Development Analysis
vi. Pharmacoepidemiology and Data Analysis

The gap analysis began with a literature search on the 82 research gaps and 166 proposed research areas in PRPM Ed.1 to identify unanswered research gaps or areas. The literature search was conducted by the core team. Based on the findings, the expert committee members deliberated further to decide on research areas that are still relevant for the coming years and should be carried forward. Overall, 77 research areas were carried forward to the next PRPM, in which 28 research areas remained as it is while 49 research areas were brought forward at different perspectives (Figure 2).

To carry forward? / Answered?	No	Yes	Different perspectives	Total
Yes	27	0	5	33
No	48	14	28	90
Partially	14	14	16	43
Total	89	28	49	166

77 research areas were carried forward

(46.4%)

Figure 2: Number of research areas in PRPM Ed.1 that was carried forward to the next PRPM

An online stakeholder survey was conducted to gather inputs from the stakeholders who represented various fields or sectors of pharmaceutical services in Malaysia. The stakeholders included were senior managers from the Pharmaceutical Services Programme, MOH as well as representatives from other ministries and private pharmaceutical sectors (see **Appendix 1**). The survey was carried out from March to April 2022 using Google Form. The respondents were asked to propose research question(s) that they think is important to help overcoming a national health problem or achieving a national health goal in the next one to ten years. To ensure that the ideas are captured correctly, respondents were asked to state the research question, research gap / justification of research, aim / objective, scope of study, expected outcome or data needed, urgency of findings, research area / national health problem, and references (if any).

Two workshops were organised, in May and October 2022, to bring together the core team and expert committee members. During the workshops, the participants gathered in respective research clusters to identify the research gaps and propose research areas that are relevant to pharmaceutical services and health system in Malaysia. Various policy documents were reviewed to identify evidence needs to support both short- and long-term national planning (please refer to **Appendix 2** for the list of documents). In addition, published and unpublished literature were referred to identify the disease trends, medical innovations, and technological advancements in the pharmaceutical sector. During the second workshop, inputs collected from the stakeholder survey were reviewed by the workshop participants and consolidated with the workshop output.

After the workshops, a few rounds of data cleaning and reviews were carried out by the core team and expert committee. Finally, the gap analysis identified 74 research gaps with 236 suggested research areas. Following that, thematic analysis and prioritisation of the research gaps were conducted to determine the domains and priorities of the research gaps.

Thematic Analysis

The core team conducted thematic analysis on the research gaps to establish the domains and sub-domains of PRPM. Inductive and deductive hybrid thematic analysis method[10,11] was used. An analytical framework, based on the WHO health system building blocks[12] and stages in pharmaceutical lifecycle, was created to guide the coding of research gaps (Figure 3).

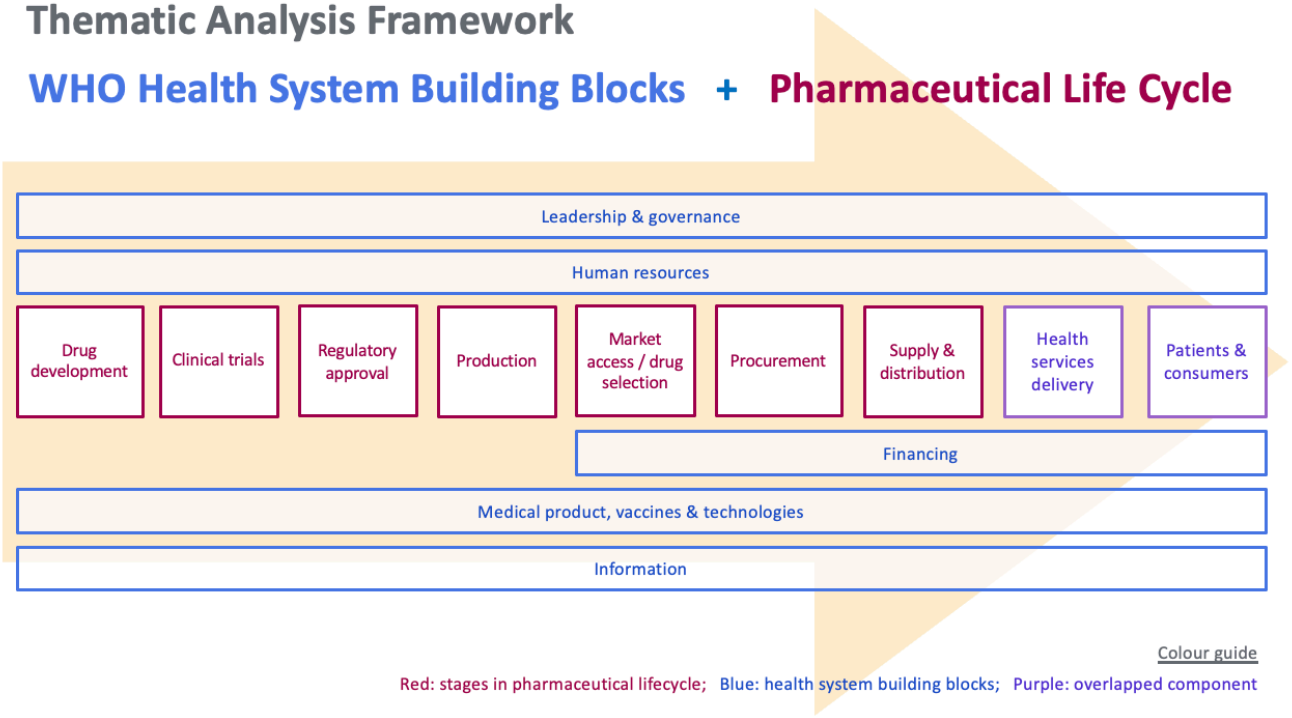

Figure 3: Analytical framework consisting of the WHO health system building blocks and pharmaceutical lifecycle

The thematic analysis identified eight themes and 24 sub-themes. The themes and sub-themes were adopted as the research domains and sub-domains (national problems) in the second edition of PRPM (PRPM Ed.2). The eight domains of PRPM Ed.2 are:

i. Medicine development
ii. Access to medicines
iii. Impact of pharmacotherapy optimisation
iv. Impact of pharmacy services
v. Medicine consumerism
vi. Digital-in-health
vii. Governance
viii. Capacity and capability building

Prioritisation

The research gaps identified in the gap analysis were scored and ranked systematically using a methodology adapted from the Child Health and Nutrition Research Initiative (CHNRI) method [13] and MCDA [14–16]. Overall, the processes were setting the criteria for prioritisation, assigning weights to the criteria, scoring the research gaps based on the criteria, and ranking the research gaps according to the scores.

To determine the criteria for prioritisation, the core team examined various prioritisation criteria used in published literature[13,17–20] and other research priority documents published by the MOH[1,9,21]. After deliberations among the core team members and considering the input from the stakeholders and expert committee, the team reached consensus that the nine-item criteria used in PRPM Ed.1[1] remained most relevant and thus were used in the current prioritisation exercise (Figure 4).

Subsequently, weights were assigned to these criteria before being employed for the assessment of research gaps. An online survey was distributed to the stakeholders and expert committee members to invite them to provide their inputs regarding the perceived importance of each of the nine criteria. The respondents were requested to evaluate each criterion on a scale of 0 to 10, where 0 signified “not at all important” and 10 denoted “extremely important”. The average of perceived importance scores for each criterion resulted in the weight of the criterion.

The MOH National Pharmacy R&D Committee members were then invited to evaluate the research gaps using the prioritisation criteria. For every research gap, the respondents had to assign a score on each of the nine criteria on a scale of 1 to 10, where 1 represented “strongly disagree” and 10 indicated “strongly agree” with the criterion against the research gap. Then, the average weighted scores of every research gap were calculated.

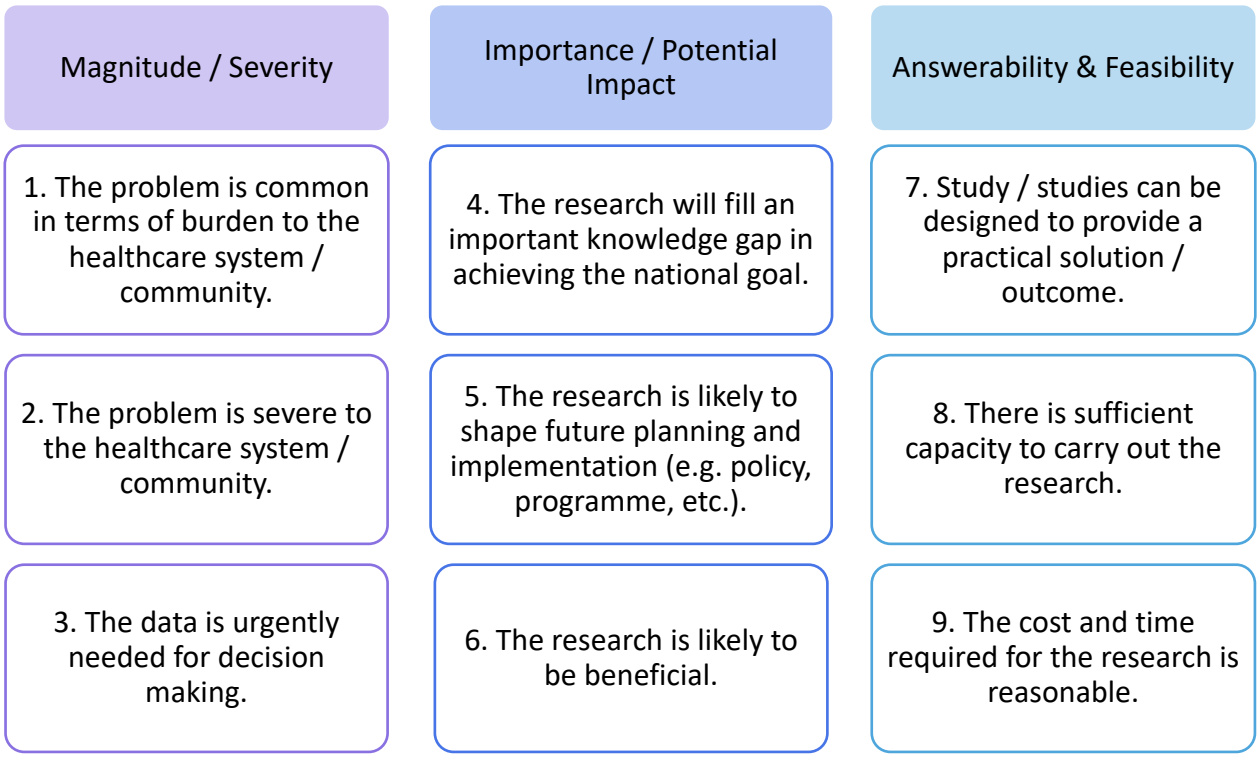

Figure 4: Criteria for the prioritisation of research gaps

After arranging the research gaps into their research domains based on the thematic analysis, the gaps were sorted according to their weighted average scores to determine their relative ranking within the domain. A research gap with higher score will rank higher, which indicates a higher priority.

Alongside the thematic analysis and prioritisation process, a supplemental research gap analysis was carried out by the core team. Additional inputs from the PSP senior management were collected, and policy documents that were not previously included, especially those published in 2023, were reviewed. The relative ranking of research gaps that were deemed important by the policy makers were promoted as “auto prioritised”. Research areas with auto prioritised ranking should be given the highest attention by the researchers.

Endorsement

The preliminary results were presented to the MOH National Pharmacy R&D Committee on 16 November 2023 for deliberation and consensus. Finally, the finalised version of PRPM was presented to the senior management of PSP for endorsement during the PSP Policy Meeting on 22 December 2023.

Research Priorities

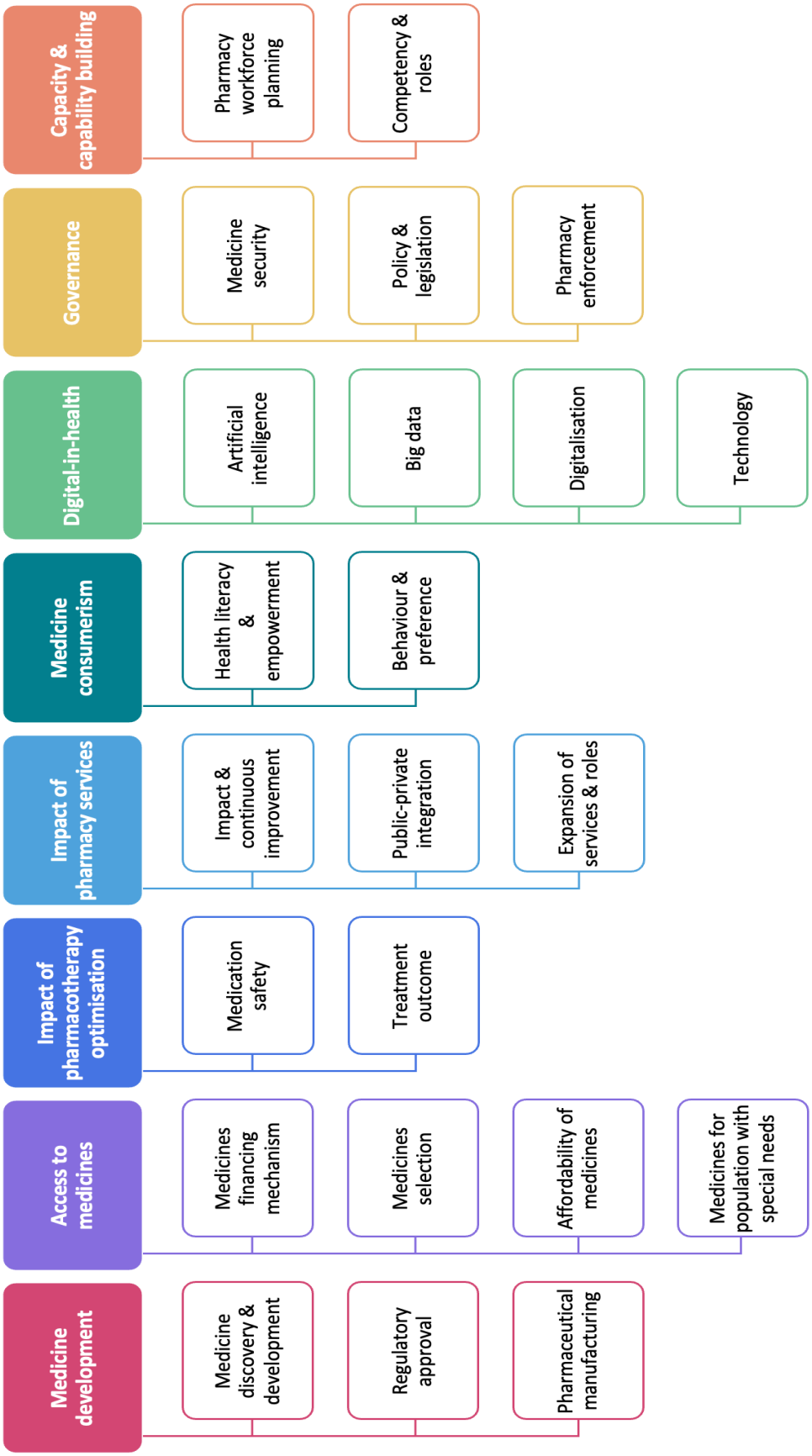

Figure 5: Research domains and national problems (sub-domains) of PRPM Ed.2

Domain 1: Medicine Development

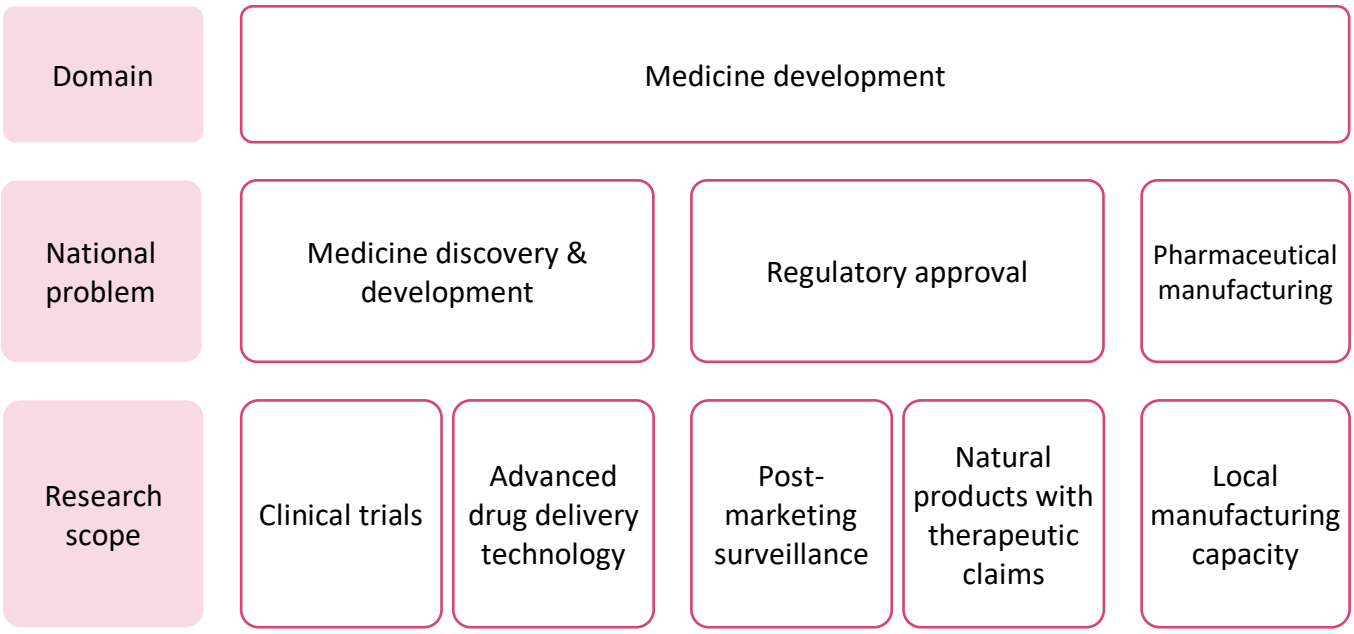

Figure 6: Research priority framework for Domain 1: Medicine development

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

Research Priorities for Domain 1: Medicine Development

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 1.1: Pharmaceutical manufacturing					
1.1.1	Local manufacturing capacity	Local pharmaceutical manufacturers possess the capabilities to produce most pharmaceutical dosage forms including sterile preparations and injections. Nevertheless, a significant reliance on imported active pharmaceutical ingredients (APIs) and bulk biologics exists. According to the Malaysian Organisation of Pharmaceutical Industries (MOPI), 90% of API and 100% of bulk biologics are currently being imported. To enhance Malaysia's medicine security and self-sufficiency, it is imperative to address the issues in local production capacity for vaccines for human diseases, APIs, pharmaceutical raw materials, biological products and certain essential / lifesaving medicines.	♦ To conduct a situational analysis of the local manufacturing capacity, technology availability and ecosystem of the pharmaceutical industry in Malaysia. ♦ To identify the domestic capabilities, gaps and obstacles in the production of human vaccine, APIs, pharmaceutical raw materials, biological products / biosimilars and essential / lifesaving / innovative medicine for human diseases. ♦ To assess Malaysia's preparedness in the development of their own vaccines for human diseases, APIs, pharmaceutical raw materials, biological products or biosimilars. ♦ To explore novel drug candidates for the treatment of chronic diseases and neglected tropical diseases (NTDs). ♦ To develop biosimilar products and scale up their production for commercial use. ♦ To examine factors that influence the production of generic medicines and performance in Malaysia, including regulatory and tender requirements.	Enhancing self-sufficiency and resilience in manufacturing vaccines, medications, and pharmaceutical raw materials.	1

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 1.2: Regulatory approval					
1.2.1	Post-marketing surveillance	The emergence of new adulterants in pharmaceutical products requires the development of robust methods for detecting these adulterants.	♦ To evaluate the detection methods for potential adulterants in pharmaceutical, traditional and cosmetic products. ♦ To develop methods for the identification and quantification of adulterants. ♦ To predict trends in product adulteration using databases and reports from enforcement and surveillance studies regarding product adulteration. ♦ To evaluate the effectiveness of current procedures (e.g. product recall, warning, revocation of licence, raids, etc.) in handling adulteration or quality issues of pharmaceutical products.	Enhanced efficiency in detecting and managing adulterants.	2
		The emergence of new impurities in pharmaceutical products requires the development of robust detection methods.	♦ To evaluate the effectiveness of detection methods for potential impurities in pharmaceutical products. ♦ To develop methods for the identification and quantification of these impurities.	Enhanced efficiency in detecting and managing impurities.	3
1.2.2	Natural products with therapeutic claims	There are numerous hurdles in developing herbal or natural products with therapeutic claims that align with the regulatory standards. These challenges include sourcing of the raw material and transitioning from laboratory-scale production to manufacturing. There is a need for data related to standardisation and quality control methods for herbal products to enhance the regulatory oversight of natural products making therapeutic claims.	♦ To establish standardisation of starting materials and quality control methods that comply with regulatory standards to ensure the quality, safety and efficacy profiles for herbal or natural products with therapeutic claims. ♦ To explore and compile formulations for herbal or natural products that align with the regulatory standards outlined in the Guideline on Natural Products with Therapeutic Claim.	Promote the advancement of natural products with therapeutic claims in Malaysia that meet high standards of quality, safety, and efficacy.	4

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 1.3: Medicine discovery and development					
1.3.1	Clinical trials	Malaysia's clinical trial initiation timelines are less competitive compared to those of other nations. This constraints Malaysia's research potentials and might potentially delay Malaysian's access to critical medications, such as new vaccines for emerging outbreaks.	♦ To understand the current limitations and investigate the potential remedies for accelerating the initiation of clinical trials in Malaysia. ♦ To map key stakeholders involved in clinical trials such as government entities, regulatory bodies, healthcare professionals, health facilities and clinical research centres. ♦ To explore the viewpoints of stakeholders regarding Malaysia's competitiveness as site for clinical trials. ♦ To forecast the impact of streamlined processes on the acceleration of clinical trials.	Proposal of streamlined and efficient pathway for expediting clinical trials in Malaysia.	5
1.3.2	Advanced drug delivery technology	Novel drug delivery has demonstrated some potentials, but it is relatively new, and the technologies have not progressed into the clinical practices. Technology-mediated drug delivery (e.g. tribometer, nano 3D printing, nanoparticle production system, etc.) is still in its infancy in Malaysia. However, there is a potential for significant growth in this area, driven by advancements in technology and materials, as well as the lessons learned from the challenges and history associated with the clinical translation of alternative approaches.	♦ To explore the application of nano technology in the advancement of drug delivery. ♦ To evaluate the quality, safety and efficacy of innovative drug delivery technologies. ♦ To assess the comparability of novel drug delivery technologies with established medications. ♦ To explore innovative dosage forms that offer enhanced quality, safety and efficacy in comparison to currently available medications (e.g. improve bioavailability, delivery, specific target, etc.).	Enhancement of data pertaining to the quality, safety, and efficacy of new and improved drug formulation and delivery technology.	6

Domain 2: Access to Medicines

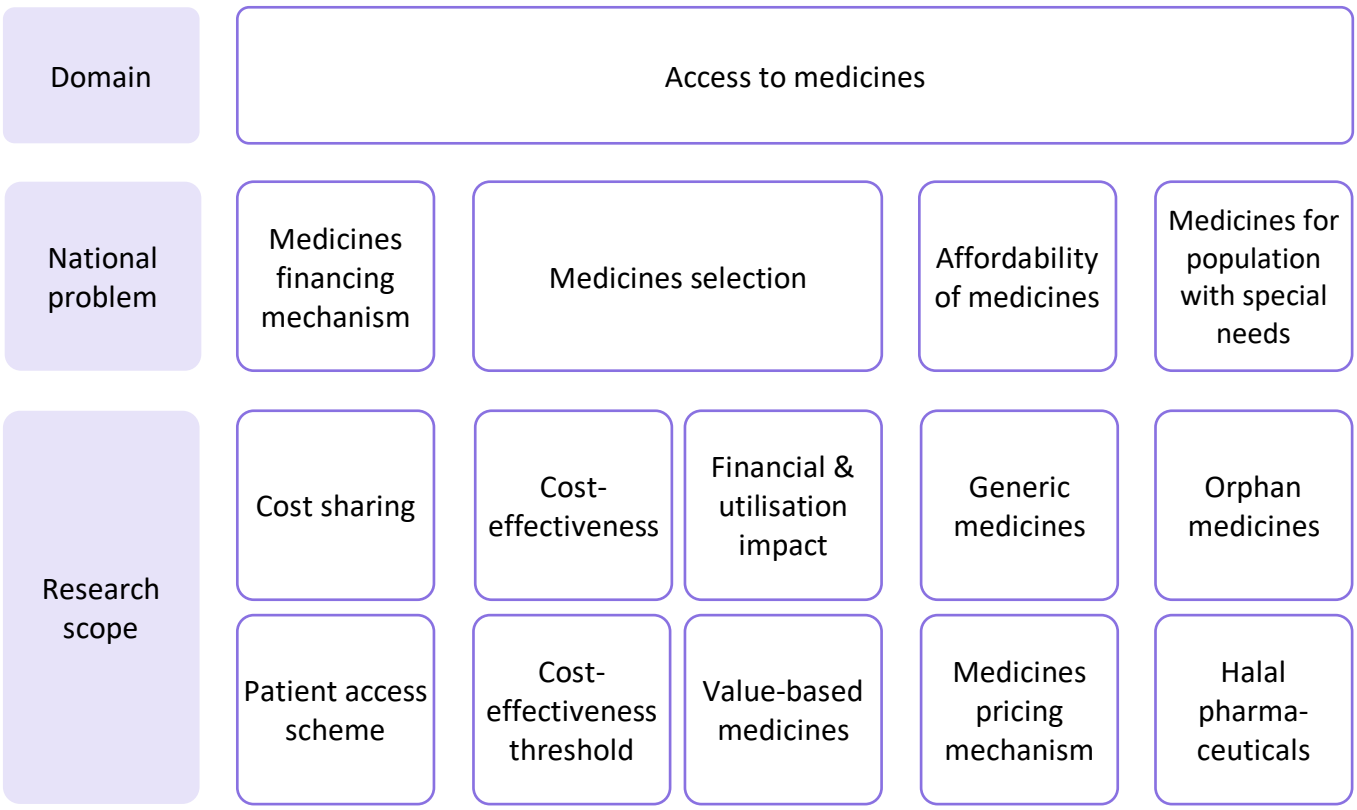

Figure 7: Research priority framework for Domain 2: Access to medicines

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

Research Priorities for Domain 2: Access to Medicines

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 2.1: Medicines financing mechanism					
2.1.1	Cost sharing	Medications provided in the MOH receive full government subsidies, irrespective of patients' income and ability to pay. This is not sustainable in the long term. Many countries have introduced co-payment systems for cost recovery, to minimise medicine wastage and reduce prescription of non-essential medicines. However, such a mechanism might hinder medication access and adherence, particularly among the vulnerable population like elderly and low-income groups. Evidence is necessary to inform the proposal of co-payment or any cost-sharing mechanisms within the MOH.	♦ To study the feasibility, potential implications, enabling factors, barriers, and forecast the financial impact of co-payment / cost-sharing mechanism in MOH. ♦ To assess and analyse various co-payment or cost-sharing mechanisms implemented in different countries. ♦ To understand patients' perception regarding co-payment or cost-sharing system. ♦ To assess patients' perspectives on fully subsidised, partially subsidised and self-paid medications. ♦ To determine the willingness and readiness of MOH patients and healthcare providers to adopt a medicines co-payment or cost-sharing scheme. ♦ To determine the level of willingness to pay (WTP) for medication co-payment or cost-sharing and the factors influencing the WTP. ♦ To investigate what patients are willing to financially contribute within the existing healthcare system, e.g. health insurance or cost sharing to accelerate access to expensive new medicines or treatment of terminal illnesses, enhanced hospitality services, preferred healthcare providers and other related aspects. ♦ To proposed financial safety net if a co-payment or cost-sharing system is implemented.	♦ To offer evidence-based recommendations on whether to introduce co-payment or cost sharing mechanism. ♦ To provide guidance on the design, scope and policy considerations of co-payment or cost sharing mechanism.	1

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
2.1.2	Patient access scheme	Patient Access Schemes (PASc) or Patient Assistance Programmes (PAP) offered by the pharmaceutical industry aim to enhance the access to expensive novel treatments. It is essential to catalogue the various types of PASc and PAP that have been established thus far and assess their impact on patients' health outcome and the healthcare system.	♦ To identify and profile the currently available PASc / PAP in Malaysia and assess their effectiveness. ♦ To compare and analyse the policies, performance and outcomes of PASc, PAP or managed entry agreements implemented in other countries. ♦ To evaluate the impact of PASc / PAP in improving access to medicines and health outcomes. ♦ To evaluate the financial benefits and long-term sustainability of PASc / PAP.	To furnish evidence supporting the ongoing enhancement of PASc and PAP.	7
National problem 2.2: Medicines selection					
2.2.1	Cost-effectiveness	Innovative medicines are often more expensive but may offer enhanced effectiveness with fewer adverse effects. The current formulary listing within MOH relies on budget impact analysis (BIA), often without the inclusion of a comprehensive economic evaluation. Evaluating the cost-effectiveness of pharmaceuticals is essential to optimise patient outcomes and achieve value for money.	♦ To assess the cost-effectiveness of innovative medicines. ♦ To evaluate or re-assess the cost effectiveness of medicines after their listing in the formulary, incorporating real-world data. [Scope: oncology, haematology, biologics, diabetes, mental health, paediatric, geriatric, cardiovascular, rheumatology] ♦ To project whether the utilisation of cost-effective innovative medicines will result in long-term savings.	♦ To guide the listing or delisting of medicines in the formulary. ♦ To establish a basis or provide evidence for negotiations on medicines prices. ♦ To offer evidence supporting the inclusion of medicines in treatment guidelines.	2

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
2.2.2	Financial and utilisation impact	Budget impacts of expensive medicines are evaluated before formulary listing. The actual cost implications post listing in real world setting and the accuracies of pre-listing BIA are often not investigated. The impact of listing new medicines or changing prescriber categories in the formulary on medicine utilisation and expenditure also need to be investigated.	♦ To evaluate the budget or expenditure implications post-listing of medicine in the formulary (with actual utilisation data and procurement price). ♦ To determine how listing new medicine in formulary affects the utilisation of other drugs within the same or different therapeutic group. ♦ To forecast the utilisation and expenditure of newly listed medicines and other medicines in the same or different therapeutic group after listing new medicines in MOH formulary. ♦ To estimate the financial and utilisation impact due to the change of clinical practices and prescribing category in formulary. ♦ To compare the pre-listing BIA with actual utilisation and expenditure post-listing in formulary.	♦ To provide basis or evidence for medicines price negotiation. ♦ To evaluate the pre-listing BIA outcome for continuous improvement.	3
2.2.3	Cost-effectiveness threshold	Economics evaluations can be employed to assess medicines for inclusion in the formulary and health technology assessment. Nonetheless, Malaysia lacks a well-defined WTP or cost-effectiveness threshold to guide decisions regarding medicines listing and funding.	♦ To estimate the cost-effectiveness threshold in Malaysia for healthcare interventions for acute & chronic conditions. ♦ To estimate the cost-effectiveness threshold in Malaysia for healthcare interventions for life extending conditions.	To establish WTP / cost-effectiveness threshold specific to Malaysia.	6
2.2.4	Value-based medicines	Across the world, healthcare systems are shifting towards value-based medicine (VBM), which incorporates the preferences and values of stakeholders and patients in clinical practice and decision-making. It is essential to gather evidence to determine the suitability and feasibility of implementing VBM in Malaysia.	♦ To conduct a situational analysis and assess the feasibility of implementing VBM in Malaysia. ♦ To investigate the acceptance, challenges and readiness of healthcare providers and stakeholders in using VBM for medicines listing in MOH formulary.	To propose a VBM framework for Malaysia.	8

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 2.3: Affordability of medicines					
2.3.1	Generic medicines	Generic medicines are typically considered as a cost-effective approach, but the utilisation of generic medicines in Malaysia is suboptimal, hindering the realisation of potential cost savings and improved access to medicines.	♦ To evaluate the utilisation, adoption, perception on generic medicines and identify barriers to their use. ♦ To quantitatively estimate the potential cost savings and societal values or benefits of implementing a national-level generic medicine policy. ♦ To provide evidence demonstrating the effectiveness and safety of generic medicines.	To provide evidence to support the use of generic medicines.	4
2.3.2	Medicines pricing mechanism	The pricing of medicines has long been a subject of debate in Malaysia. Meanwhile, MOH is actively working to enhance the transparency of medicines prices in Malaysia. It is essential to evaluate the impact of medicines price transparency mechanism and gather additional evidence to inform the establishment of an effective medicines pricing policy.	♦ To assess the impact of medicines price transparency mechanism on medicines prices and access to medicine. ♦ To document the challenges encountered during the implementation of the medicines price transparency mechanism. ♦ To analyse the impact and outcomes of medicines pricing mechanisms internationally. ♦ To understand pharmaceutical stakeholders and patients' perception on medicines pricing policy. ♦ To predict / evaluate the consequences of changes in medicines pricing mechanisms on the access to medicines in Malaysia.	To provide guidance for the development of an effective medicines pricing mechanism.	5

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 2.4: Medicines for population with special needs					
2.4.1	Orphan medicines	The scarcity of local data on the access of orphan medicines in Malaysia is a critical gap. Such data is important in addressing equity in access to these specialised medicines.	♦ To evaluate the access to orphan medicines in terms of availability and affordability. ♦ To identify the challenges and treatment gaps for rare diseases in Malaysia. ♦ To conduct a comprehensive review and comparison of current policies, regulations and guidelines related to the financing, management and accessibility to orphan medicines and expensive life-saving medicines in Malaysia and neighbouring countries. ♦ To identify and evaluate the incentives that promote market availability of orphan medicines in Malaysia, including factors such as orphan drug designation, marketing authorisation processes, safety and efficacy requirements, and incentives aimed at fostering research and development.	Enhancing access to orphan medicines and expensive life-saving medicines.	9
2.4.2	Halal pharmaceuticals	The global halal pharmaceuticals market is anticipated to sustain its growth, with rising local demand for halal medicines, medical devices and healthcare products in Malaysia. Current government initiatives focus on standards, pharmaceutical analysis and guidelines. However, it is crucial to also consider the perspectives of healthcare professionals and consumers when shaping the halal medicine policies.	♦ To evaluate the perception, acceptance and adoption of halal status medicine from the viewpoints of consumers, healthcare professionals and procurement policies.	Evidence to inform the development and implementation of policies and practices related to halal pharmaceuticals.	10

Domain 3: Impact of Pharmacotherapy Optimisation

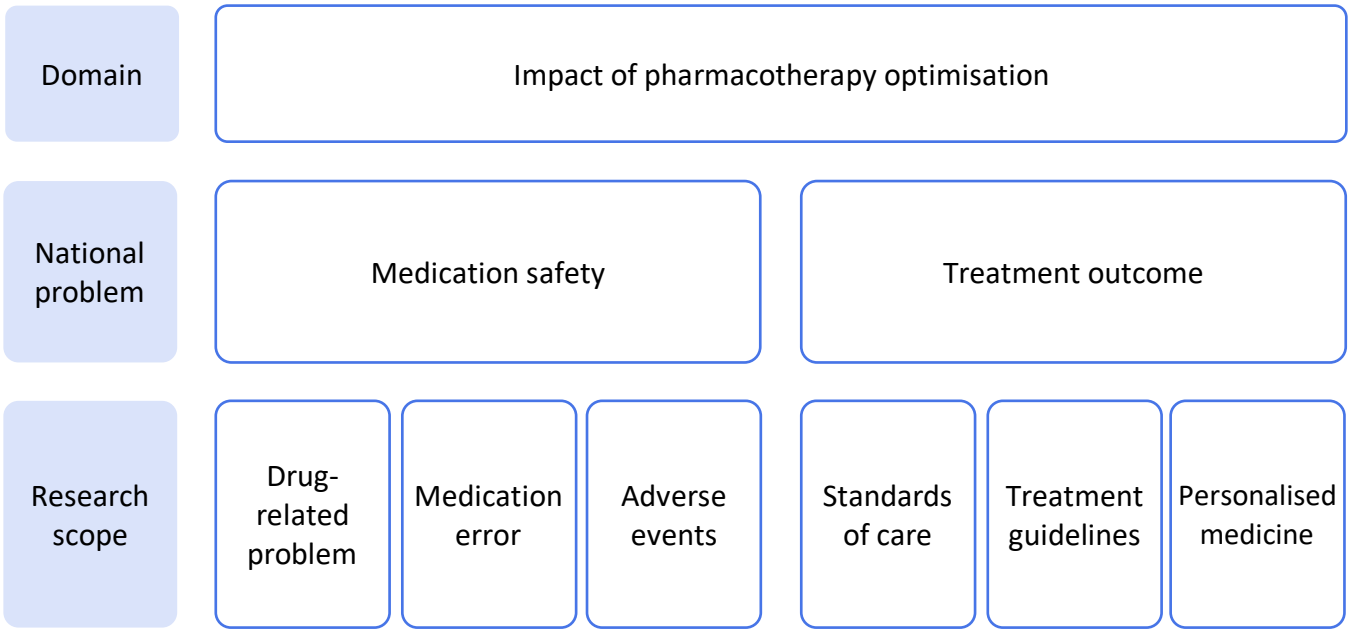

Figure 8: Research priority framework for Domain 3: Impact of pharmacotherapy optimisation

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Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

Research Priorities for Domain 3: Impact of Pharmacotherapy Optimisation

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 3.1: Medication safety					
3.1.1	Drug-related problem	Polypharmacy is a significant concern due to its association with drug-related problems (DRPs) in the elderly. Older individuals are at an elevated risk of experiencing medicine-related issues with using multiple medications, which can increase the likelihood of harmful side-effects and interactions. There is a need to establish local guidelines and explore the ideal system and personalised approaches to mitigate harm resulting from polypharmacy particularly among older individuals.	♦ To identify the prevalence, factors and predictors of DRPs among older individuals. ♦ To determine the prevalence of potentially inappropriate medications (PIM) among older adults in Malaysia. ♦ To adapt and integrate validated tools or develop local standards to enhance the safe use of medication among the older individuals. ♦ To evaluate the capability of pharmacists in identifying and preventing drug-drug interactions. ♦ To assess the impact of pharmacy services in geriatric care. ♦ To identify and assess the impact of pharmaceutical care interventions aimed at preventing medication-related fall injuries.	Development of local tools with recommended measures to address DRPs in older individuals, with a focus on enhancing the appropriate use of medicines and medication safety among this population.	1

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
3.1.2	Medication error	Various interventions, clinical practices and pharmacy services have been implemented to prevent medication errors. The effectiveness of these interventions should be demonstrated through interventional studies.	♦ To determine the effectiveness of various interventions in reducing medication errors (e.g. high alert medications (HAM), pharmacist-led medication reconciliation, computerised medication reconciliation, pharmacist partnership, prescriber education, computerised physician order entry, etc.). ♦ To analyse and identify best practices for reducing medication errors. ♦ To identify and profile the incidences of medication errors and implemented interventions to reduce / prevent medication error in community pharmacies and private hospitals.	To reduce medication errors and provide evidence for the expansion of best practices to all healthcare facilities.	3
		Medication errors are more prevalent in children compared to adults, primarily due to the risk of dosage calculation errors related to age, weight, body surface area and clinical conditions. Pharmacists play a significant role in recognising and preventing medication errors, and therefore the ability to detect errors is very important.	♦ To determine the prevalence, attributes and factors contributing to medication errors including near misses in paediatric care. ♦ To evaluate the effectiveness of interventions aimed at preventing medication errors in paediatric patients. ♦ To assess the competency of pharmacy personnel in identifying medication errors in paediatric care.	Enhancing medication safety in paediatric care.	4

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
3.1.3	Adverse events	Adverse drug reaction (ADR) reporting is essential for refining drug safety profiles. However, insufficient awareness of the importance of ADR reporting and hesitancy among healthcare professional to share comprehensive information during ADR reporting are recognised barriers to effective ADR monitoring.	♦ To understand the existing barriers and perceptions among healthcare professionals in reporting ADR events. ♦ To examine the current understanding of ADR reporting processes. ♦ To explore strategies for enhancing ADR reporting both at the national level and within the individual treatment facilities. ♦ To evaluate the impact of initiatives aimed at improving ADR reporting among healthcare professionals.	Enhanced ADR reporting.	7
		Millions of adverse events following immunisation (AEFI) data are reported to the Malaysian Adverse Drug Reactions Advisory Committee (MADRAC). These data should be leveraged to improve the safety of immunisation or vaccination.	♦ To determine the prevalence of AEFI among vaccines recipients in Malaysia. ♦ To analyse the AEFI database and identify the factors or predictors associated with AEFI.	Enhanced vaccination safety.	8
National problem 3.2: Treatment outcome					
3.2.1	Standards of care	Despite the availability of national guidelines for perinatal care, the management of anaemia in pregnancy remains suboptimal, with the underutilisation of parenteral iron therapy. There is a need to evaluate the standards of care for anaemia among pregnant women in Malaysia.	♦ To evaluate the management of anaemia in pregnancy and compare it across different health systems and international practices. ♦ To identify the extent and trends in drug use for the management of anaemia in pregnancy. ♦ To evaluate the clinical outcomes of anaemia management during pregnancy.	Improved management and outcomes of anaemia in pregnancy.	2

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
		The current practices of anticoagulation reversal in Malaysia lack comprehensive documentation. Inconsistencies are observed in the recommendations of oral anticoagulant reversal.	♦ To evaluate the current prescribing patterns and practice of oral anticoagulants reversal. ♦ To identify the existing resources including availability of reversal agents for anticoagulation reversal in secondary and tertiary hospitals across Malaysia. ♦ To identify the factors that influence treatment decisions when reversing oral anticoagulants. ♦ To evaluate the outcomes of Factor Xa inhibitor reversal with Three-factor prothrombin complex concentrate (3FPCC) and Four-factor PCC (4FPCC).	To update current practices and improve the outcomes of oral anticoagulant reversal.	11
3.2.2	Treatment guidelines	Some studies have indicated a higher rate of renal function decline among patients with non-valvular atrial fibrillation (NVAF) receiving warfarin therapy compared to non-vitamin K oral anticoagulant (NOAC). Local data is needed to inform clinical practice.	♦ To evaluate and compare the effectiveness, renal outcomes and bleeding events associated with oral anticoagulants in patients NVAF. ♦ To identify the predictors of estimated glomerular filtration rate (eGFR) decline among NVAF patients.	To provide local recommendations on oral anticoagulants for NVAF patients.	5
		Latest evidence highlighted the safety concern of long-term use of proton pump inhibitors (PPI). Unnecessary prolonged use and overprescribing of PPI can lead to increased cost for the health system. There is a need for a local guideline on appropriate prescribing of PPI.	♦ To investigate the utilisation trends of proton pump inhibitor and Histamine-2 receptor antagonist. ♦ To identify the prevalence, practices and impact of PPI deprescribing in MOH facilities. ♦ To formulate guidelines for PPI deprescribing.	Appropriate use of PPI in MOH healthcare facilities.	6

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
		To update the pharmacotherapy management of cardiovascular diseases, it is crucial to gather local data on the prevalence, predictors and implications of clopidogrel treatment failure. Additionally, assessing the efficacy and safety of clopidogrel versus ticagrelor is essential to inform treatment guidelines considering new recommendations, discrepancies and updates.	♦ To determine the prevalence, predictors and implications of clopidogrel treatment failure in acute coronary syndrome (ACS). ♦ To assess the outcomes and safety of clopidogrel compared to ticagrelor in high-risk non-ST-segment elevation myocardial infarction (NSTEMI) and ACS patients.	To revise the treatment guidelines for cardiovascular diseases by incorporating local evidence.	9
3.2.3	Personalised medicine	There is a lack of personalised device approaches in the management of asthma and chronic obstructive pulmonary disease (COPD) despite the significant heterogeneity observed in these diseases.	♦ To identify biomarkers and phenotypes specific to asthma and COPD. ♦ To evaluate the effectiveness of personalised pharmacological, non-pharmacological and self-management approaches in the management of asthma and COPD. ♦ To evaluate the effectiveness of personalisation of inhaler devices for individuals with asthma and COPD.	Enhanced disease outcomes in asthma and COPD including improved symptom control, reduced exacerbations and hospital admissions.	10

Domain 4: Impact of Pharmacy Services

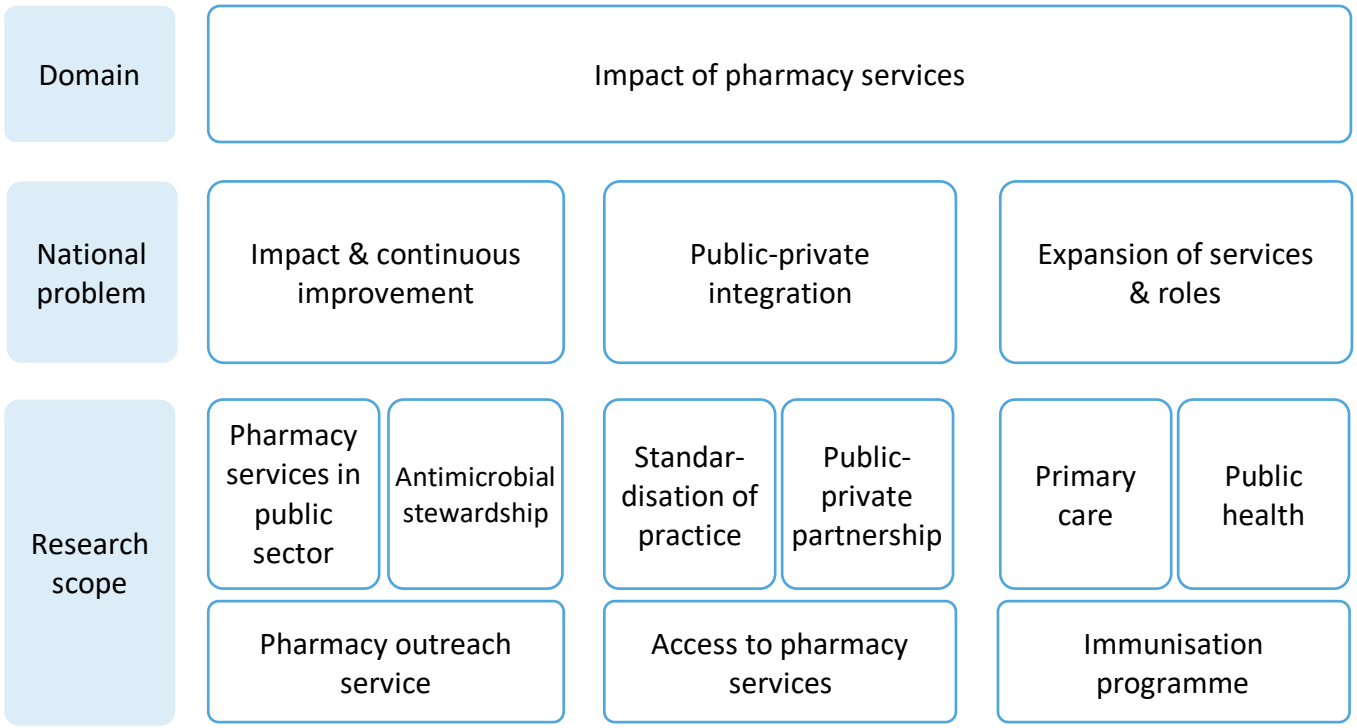

Figure 9: Research priority framework for Domain 4: Impact of pharmacy services

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

Research Priorities for Domain 4: Impact of Pharmacy Services

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 4.1: Impact and continuous improvement					
4.1.1	Pharmacy services in public sector	There is a need to measure the impact of pharmacy services and identify whether these services are cost-effective and beneficial for patients' health outcomes. It is also important to identify impactful pharmacy services that should be implemented nationwide, including in the private sector healthcare facilities.	♦ To evaluate the impacts, cost-effectiveness, gaps and challenges, strengths and weaknesses, and areas for improvement of existing pharmacy services in the public sector healthcare facilities. [Scope: medication therapy adherence clinic (MTAC), home medication review (HMR), methadone replacement therapy, pharmacy value added services (VAS), pharmacy integrated community care (PICC), antimicrobial stewardship (AMS) programme, smoking cessation programme (mQuit), clinical pharmacy services, etc.] ♦ To understand patients' perception and satisfaction towards pharmacy services and factors influencing service uptake / adoption. ♦ To estimate / forecast the cost-effectiveness of implementing new pharmacy services or adopting new technologies to improve pharmacy services. ♦ To explore the feasibility of expanding existing public sector healthcare facilities pharmacy services or interventions to the private healthcare facilities. ♦ To explore mechanism of expanding the roles of pharmacists to improve the continuity of care in medication management during hospital admission, discharge, and transitions of care.	To guide the improvement or expansion of pharmacy services.	1

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
4.1.2	Antimicrobial stewardship (AMS)	The AMS programme is currently established in MOH facilities. However, variations in AMS practices exist among the facilities due to differences in specialties, manpower and infrastructure. It is essential to understand the current AMS practices and identify the barriers in health facilities to facilitate future improvement and expansion.	♦ To map and document the various types of AMS initiatives that have been implemented at health facilities. ♦ To evaluate and compare the impacts of different types of AMS initiatives. ♦ To identify the barriers faced by pharmacists and other healthcare personnel delivering AMS services and suggest policy changes for improvement.	Enhancing AMS services at health facilities in Malaysia.	4
4.1.3	Pharmacy outreach service	Evidence is required to optimise the existing pharmacy outreach services such as HMR and PICC, and to explore the opportunities for expanding the scope of outreach programmes.	♦ To evaluate the impact and performance of pharmacy outreach programmes in Malaysia. ♦ To identify strategies from other countries that can be adopted or adapted to enhance pharmacy outreach services in Malaysia. ♦ To identify the shortcomings of existing pharmacy outreach programmes and formulate strategies for improvement to achieve greater impact.	Strategies for optimising and expanding pharmacy outreach programmes.	7
National problem 4.2: Public-private integration					
4.2.1	Standardisation of practice	Community pharmacists are one of the most accessible healthcare professionals. Nevertheless, they are often perceived as business entities rather than healthcare providers. The lack of standardised practices in community pharmacies, coupled with variations between public and private sector pharmacies have hindered the promotion of community pharmacy services to the public and thus underutilising their expertise.	♦ To map, compare and evaluate pharmacy services in the public and private healthcare facilities including the community pharmacies. ♦ To conduct a cost analysis of pharmacy services in public and private healthcare facilities as well as community pharmacies. ♦ To evaluate and compare the discrepancies, impacts, outcomes, satisfaction levels and preferences for pharmacy services in the public and private healthcare facilities and community pharmacies.	♦ Improved pharmaceutical care practices and quality standards in Malaysia. ♦ To promote the recognition of community pharmacists as healthcare providers.	2

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
4.2.2	Public-private partnership	The public-private partnership (PPP) initiatives and the community involvement in pharmaceutical care delivery is minimal. MOH should aim to optimise the potential benefits of PPP and explore viable PPP models for enhancing the access to medicines and pharmacy services.	♦ To identify the potential areas of collaborations and partnerships among healthcare providers in the public and private healthcare sectors [e.g. general practitioner (GP), community pharmacy, non-governmental organisations (NGO), etc.] with the goal of enhancing access to medicines and pharmacy services. ♦ To identify the potential collaboration among healthcare providers and feasible PPP models to improve the continuity of pharmaceutical care from secondary / tertiary care to primary care, and vice versa. ♦ To assess the feasibility of various PPP models and explore the readiness, perception and willingness of healthcare providers to engage with these PPP models [e.g. refill prescription medicines dispensing, follow-up counselling and device evaluation by community pharmacists, and patients receiving intravenous administrations of medicines from GPs instead of crowding hospitals or health clinics, etc.]. ♦ To identify the gaps in integrating community pharmacists into any PPP or national healthcare schemes.	To propose practical PPP models and investigate the opportunities for intersectoral partnerships.	3

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
4.2.3	Access to pharmacy services	Community pharmacies in Malaysia exhibit an uneven distribution, with many concentrating in the urban areas and limited presence in the rural regions. The appropriateness of pharmacy zoning policy in Malaysia remains a subject of debate. Concurrently, strategies must be examined to guarantee the accessibility of pharmacy services to the population, particularly in underserved area.	♦ To assess the accessibility of community pharmacies, government pharmacy facilities, and other private health facilities in Malaysia from various dimensions including geographical, financial, physical and virtual connectivity. ♦ To review international evidence regarding strategies aimed at enhancing access to pharmacy services. ♦ To explore long-term strategies for retaining the pharmacy workforce in the underserved area. ♦ To assess the feasibility, acceptance, advantages, disadvantages, barriers and enabling factors of pharmacy zoning implementation. ♦ To forecast or simulate the potential consequences of pharmacy zoning and other interventions on patient access, patient outcomes, medicines and medical pricing, professional development, business competitions and more.	Proposals to improve access to pharmacy services in Malaysia.	8
National problem 4.3: Expansion of services and roles					
4.3.1	Primary care	Pharmacists are trained to manage minor ailments. There is a potential to enhance the efficiency of primary care and reduce healthcare cost by allowing community pharmacists to manage minor ailments. This would enable doctors to concentrate on patients with chronic diseases and complicated cases. Evidence is needed to inform the development of a pharmacist-managed minor ailment scheme in Malaysia.	♦ To examine the feasibility and potential benefits of community pharmacist-managed minor ailment scheme. ♦ To estimate and compare the costs of managing minor ailments in community pharmacies, private clinics and public primary care facilities. ♦ To explore the acceptance and perceptions of stakeholders regarding a community pharmacist-managed minor ailment scheme. ♦ To assess the competency of community pharmacists in managing minor ailments.	To provide guidance for the policy and design of a community pharmacist-managed minor ailment scheme.	5

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
4.3.2	Public health	Enhancing the nation's health outcomes demands a shift in the public health paradigm. In line with a heightened emphasis on promotive and preventive approaches for non-communicable diseases (NCDs) and preparedness for infectious diseases, pharmacists should assume a larger role in public health. Furthermore, health outcomes are not solely dependent on healthcare providers but are also influenced by social, cultural, economic and environmental factors. Realising the 'Health in All Policies' will require more collaborations with non-health and non-governmental stakeholders.	♦ To explore strategies to enhance pharmacists' roles and competencies in public health. ♦ To identify potential area of collaborations or partnerships with non-healthcare sectors aligned with the 'Health in All Policies' approach [e.g. safe disposal of pharmaceutical waste, pharmaceutical patents, promoting healthy lifestyle, addressing health misinformation, environmental health and green energy initiatives, etc.].	Enhanced roles and visibility of public health pharmacists leading to improved national health outcomes.	6
4.3.3	Immunisation programme	Evidence is required for the development of immunisation by pharmacist related policies in Malaysia, considering the practice of pharmacists administering vaccines to the public in some countries.	♦ To conduct a situational analysis regarding the regulatory and capacity requirements necessary for pharmacist to perform invasive procedures such as vaccination. ♦ To assess the readiness and willingness of pharmacists to administer vaccine. ♦ To investigate the perceptions of the public, pharmacists, policy makers and other healthcare professionals concerning pharmacists as vaccinators. ♦ To explore the feasibility, acceptance, requirements and approaches of pharmacist vaccinator programme.	Evidence to guide the proposal of a pharmacist vaccinator programme.	9

Domain 5: Medicine Consumerism

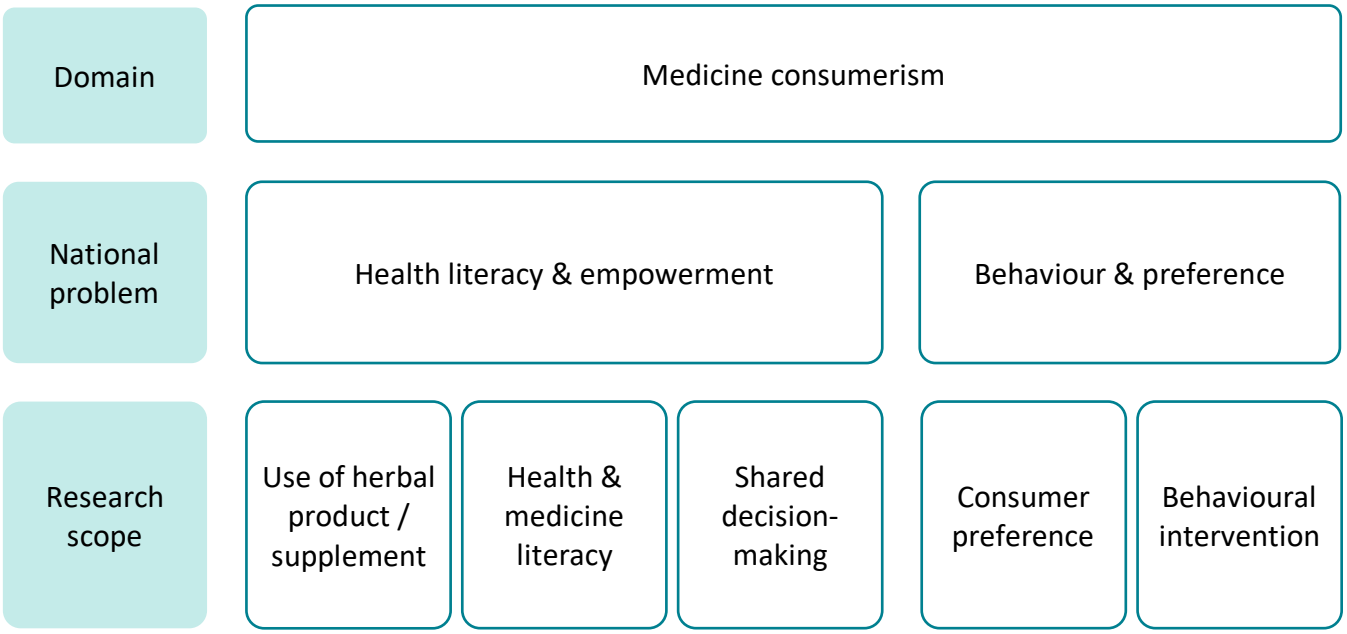

Figure 10: Research priority framework for Domain 5: Medicine consumerism

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Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

Research Priorities for Domain 5: Medicine Consumerism

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 5.1: Health literacy and empowerment					
5.1.1	Use of herbal product / supplement	The use of traditional and complementary medicine (TCM), herbal products and supplements is common among Malaysians. There is an escalating concern about the community's use of herbal products and supplements which may carry potential risks for patients, especially when used concurrently with medicines. More information on concurrent herbs and medicines use is urgently needed.	♦ To identify the availability and impact of educational tools and prevention strategies in current practices aimed at enhancing the awareness on safe use of herbal products and supplements. ♦ To develop educational tools and prevention strategies aimed to prevent adverse reactions caused by herbal products and supplements. ♦ To analyse adverse reactions associated with herbal products and supplements. ♦ To determine the prevalence of concomitant consumption of TCM, supplements and herbal products among patients with NCDs and the elderly populations who are also taking medications for chronic diseases. ♦ To assess the prevalence of drug-herb interactions among patients using medications for chronic diseases.	♦ Improved awareness about the safe use of herbal products and supplements. ♦ Prevention of drug-health products interactions.	1

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
5.1.2	Health and medicine literacy	The public is frequently misled into purchasing health products that lack strong evidence and are associated with exaggerated claims. The Quality Use of Medicines (QUM) programme and other consumer protection activities led by MOH can be enhanced and better coordinated to tackle the issues of misinformation, particularly on social media. Alongside ongoing efforts to enhance health literacy among the public, there is a need to understand and improve the health literacy among vulnerable populations including the elderly, illiterate, person with physical disabilities, the B40 group and more.	♦ To assess the level of health and medicine literacy among the public as well as vulnerable and marginalised population. ♦ To assess the level of public awareness regarding product registration and cosmetic notification. ♦ To determine and compare the effectiveness of various interventions such as traditional, art-based, technology-based and interactive learning strategies in enhancing health and medicine literacy. ♦ To evaluate the impact of QUM programme and existing consumer protection activities. ♦ To evaluate the impact of self-learning using online or other sources of health information on health and medicine literacy. ♦ To identify and establish effective strategies for improving health and medicine literacy among both the public as well as vulnerable and marginalised population.	Enhanced health and medicine literacy among the public and vulnerable population.	3
5.1.3	Shared decision-making	Patient empowerment plays a pivotal role in shared decision-making (SDM) in medical treatment and management plans. There is a need to explore the potential of SDM in enhancing medication adherence, increasing disease awareness, and improving disease management. Additionally, the role of pharmacists within an SDM model should be thoroughly examined.	♦ To assess the extent of patient involvement in treatment decision making. ♦ To explore the potential roles of pharmacists in SDM. ♦ To determine whether SDM is associated with enhanced treatment adherence and improved clinical outcome. ♦ To identify SDM and patient empowerment strategies that have been effectively implemented in other countries that could be adopted and adapted in Malaysia. ♦ To explore the feasibility, barriers and potential impacts of implementing SDM strategies in the Malaysian context.	Formulation of SDM and patient empowerment strategies for the management of diseases and medications.	5

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 5.2: Behaviour and preference					
5.2.1	Consumer preference	Online shopping is trending, but the prevalence of online purchases of pharmaceutical products, both registered and unregistered, remains unknown. It is essential for MOH to gain insight into these trends and consumer preferences to develop more effective strategies for empowering the public on safe online purchases of pharmaceutical products.	♦ To determine the prevalence of online purchases of both registered and unregistered pharmaceutical products. ♦ To identify consumer preferences and factors associated with the online purchase of pharmaceutical products. ♦ To determine consumers' awareness of the risk associated with purchasing pharmaceutical products online. ♦ To explore and develop strategies for enhancing public awareness and empowering safe online purchases of pharmaceutical products.	Enhancing consumer empowerment for safe online purchasing of pharmaceutical products.	2
5.2.2	Behavioural intervention	Many studies on health behaviour and pharmacy-related interventions were conducted. The translation of such findings into evidence-based policy decisions is required.	♦ To explore the association of health behavioural theory (behavioural intervention) with clinical outcomes. ♦ To review, identify and examine health programmes or pharmacy-related interventions that have utilised health behaviour theories to improve adherence to long-term medications, such as chronic diseases, tuberculosis and HIV treatment. ♦ To assess the readiness and confidence of pharmacists in conducting behavioural intervention research.	Promoting health behavioural research.	4

Domain 6: Digital-in-Health

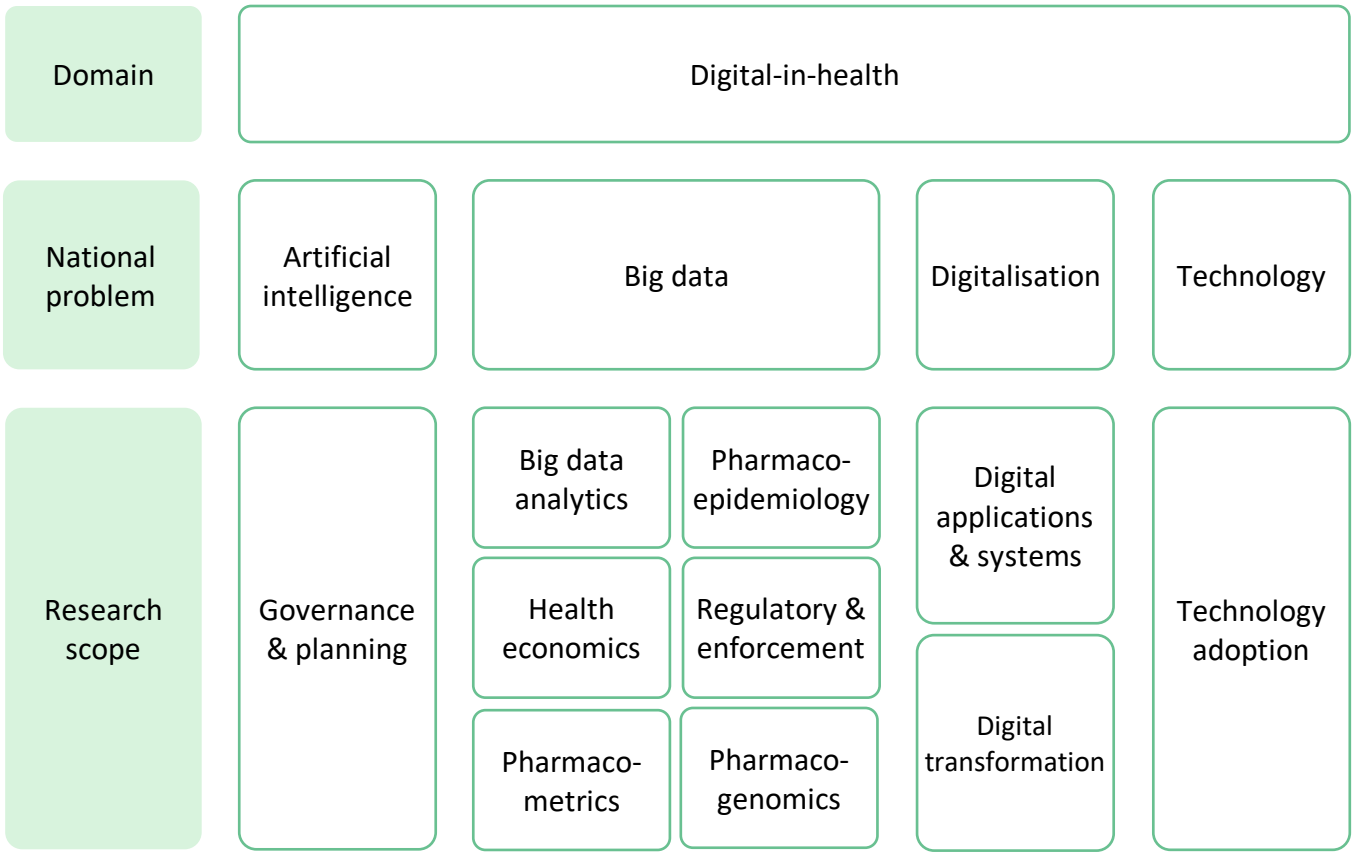

Figure 11: Research priority framework for Domain 6: Digital-in-health

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Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

Research Priorities for Domain 6: Digital-in-Health

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 6.1: Artificial intelligence					
6.1.1	Governance and planning	Artificial intelligence (AI) is revolutionising nearly every aspect of healthcare, from drug discovery to patient care. Holistic adoption and adaptation of AI-based solutions in healthcare will enable healthcare professionals to harness the power of AI to improve medical services, patient safety and quality of care. Therefore, it is important to understand the impact, global trends and regulatory constraints of current and emerging AI technologies.	♦ To identify safety, legal and ethical challenges associated with the integration of AI in healthcare and pharmaceutical practices. ♦ To examine the governance, legal and regulatory prerequisites and challenges pertaining to the implementation of AI in healthcare and pharmaceutical care. ♦ To assess the competency and capabilities of pharmacy personnel in the domains of AI and machine learning. ♦ To identify promising AI-based solutions with the potential to enhance pharmaceutical care.	Leveraging AI to enhance the effectiveness of healthcare services and predictability of patient outcome.	Auto prioritised

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 6.2: Big data					
6.2.1	Big data analytics	Embracing the Fourth Industrial Revolution (IR4.0) technologies such as big data, advanced analytics and AI is vital for enhancing pharmacy services in Malaysia. There is a great potential to take advantage of the advanced analytical technologies to make use of the abundance of data in pharmaceutical services from various databases, application systems as well as social media.	♦ To identify ethical, legal and regulatory requirements and challenges associated with data governance in big data analytics. ♦ To assess the competency and capabilities of pharmacy personnel in conducting big data analytics. ♦ To identify and profile all databases relevant to pharmacy services. ♦ To evaluate the quality, sources, reliability, availability, fitness and format of the data (structured, semi-structured and unstructured form) of existing pharmacy and healthcare databases. ♦ To identify, propose and conduct big data analytics projects that can leverage existing pharmacy databases, and have the potential to enhance the health system and improve population health outcomes.	♦ Improved data governance and database quality. ♦ Successful big data analytics projects that can provide evidence for enhancing pharmacy services and improving health outcomes.	Auto prioritised
6.2.2	Pharmaco-epidemiology	Medicines utilisation in Malaysia is continuously monitored through the Malaysian Statistics on Medicines (MSOM) study. Additionally, a wealth of data is available in various pharmaceutical services databases, application systems and social media platforms. Leveraging these diverse data sources can provide valuable insights into understanding and forecasting medicine utilisation patterns in Malaysia. Big data analytics can also be deployed to predict potential medicines shortages.	♦ To systematically document the incidents and key factors contributing to medicines shortages in Malaysia and develop predictive tools for anticipating potential medicine shortages. ♦ To comprehensively document the incidents and identify factors influencing medicines utilisation in MOH or public healthcare facilities and establish predictive tools for forecasting medicines usage and procurement volume.	♦ Development of a tool for forecasting medicine utilisation, budgetary and procurement volumes within the MOH, public sector or at national level. ♦ Establishment of a predictive tool to anticipate potential medicine shortages.	1

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
		Monitoring medicines utilisation and treatment outcomes is essential to ensure equitable access to medicines and promote rational use of medicines. Medicines utilisation studies are also important to establish national databases for comprehensive big data analysis which in turns informs policy decisions. Additionally, it is vital to gather evidence on the actual utilisation patterns of medicines among specific or special populations. This information aids in tailoring healthcare services and policies to meet the unique needs of these groups.	♦ To investigate the utilisation patterns and outcomes of pharmacotherapy [e.g. effectiveness, hospitalisation rates, duration of hospital stays, cost of treatment and ADR]. ♦ To conduct medicines utilisation review at both the national level and within specific populations [e.g. NCDs, communicable diseases, geriatric patients, paediatric patients, individuals with rare diseases, mental health conditions, epilepsy, anaemia, etc.]. ♦ To investigate the utilisation patterns and treatment outcomes of anti-infectives agents [Scope: COVID-19, pneumonia / SARI / ILI, dengue, tuberculosis, hepatitis, HIV/AIDS, malaria, vaccine preventable diseases, leptospirosis, etc.]. ♦ To identify and evaluate treatment options and preventive measures for infections caused by multidrug resistant (MDR) organisms.	♦ Improved rational use of medicines. ♦ Establishment of medicine utilisation / pharmaco-epidemiology database.	2
		Local epidemiology and pharmacoepidemiology data are insufficient. The data is important for health economics, pharmacoeconomics studies and big data analytics.	♦ To conduct epidemiology and pharmacoepidemiology studies to evaluate the outcomes of diseases or treatments [Suggested area: nephrology, diabetes, cardiovascular, infectious diseases, rheumatology, mental health, geriatrics].	Establishment of epidemiology and pharmacoepidemiology databank.	5

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
6.2.3	Health economics	Medical cost inflation is a long-term issue. If uncontained, the healthcare burden in the future will be too high for government or insurance to afford. The current consumer price index (CPI) in Malaysia doesn't reflect inflation in the health sector. For example, some of the medicine prices had increased more than 20% over the years. Medical and medicine CPI is important to forecast and optimise resource allocations.	♦ To establish medicine / medical CPI for Malaysia. ♦ To identify the trends of medicine price increment over the years including price changes across different sectors, healthcare settings, by diseases and other factors. ♦ To compare the trends of medicine price increment in Malaysia with other countries. ♦ To identify factors contributing to medical cost inflation in Malaysia and identify solutions to it.	♦ Establishment of medicine or medical CPI for Malaysia. ♦ Proposing solutions to slow down or reduce medical cost inflation.	4
		Local data on the outcomes and health-related quality of life (HRQoL) for NCDs and communicable diseases such as HIV/AIDS, tuberculosis, long COVID and others are currently lacking.	♦ To determine utility and HRQoL values for use in local pharmacoeconomics studies. ♦ To derive utility and HRQoL values by translating disease-specific instruments into generic utility and HRQoL tools.	Establishment of utility and HRQoL databank for use in health economics studies.	9
		Limited healthcare costing studies and data in Malaysia make it challenging to conduct health economics and pharmacoeconomic studies, forecast budget and resources, guide planning of health services, establish provider payment mechanisms and set fee structure.	♦ To estimate the cost of pharmacy services in public facilities, private hospitals and community pharmacies. ♦ To estimate the cost of management, cost of disease burden and productivity loss associated with various NCDs and communicable diseases for evidence-based decision-making in healthcare.	Establishment of healthcare costing databank for Malaysia.	10

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
		The expiry of patent for various originator biologics in the next five to ten years will enable the emergence of more biosimilars in the market. Acquiring safety, efficacy and cost effectiveness data in the real-world scenarios is essential to harness the advantages of more affordable biosimilars. This data serves as valuable information for healthcare decision-making and encourages the adoption of biosimilars in clinical practice.	♦ To conduct comparative analysis in terms of safety, efficacy and cost effectiveness of biosimilars against conventional treatment option or reference biologics.	Establishment of database containing information on the cost-effectiveness, efficacy, and safety profiles of biosimilars.	13
6.2.4	Regulatory & enforcement	There are inadequate data and studies on the prevalence of adulterated, unregistered, substandard, falsified and counterfeit pharmaceutical products in Malaysia. Baseline national level and periodic data is needed to continuously monitor and measure the effectiveness of pharmacy enforcement interventions or activities in Malaysia.	♦ To determine the prevalence, types and trends of adulterated, unregistered, substandard, falsified and counterfeit pharmaceutical products. ♦ To analyse and identify current trends of adulterants found in pharmaceutical products and cosmetics. ♦ To predict the potential occurrences of adulterated, unregistered, substandard, falsified and counterfeit pharmaceutical products in the Malaysian market to safeguard public health and enhance regulatory efforts.	Establishment of baseline and routine prevalence data on adulterated, unregistered, substandard, falsified and counterfeit pharmaceutical products in Malaysia.	8
6.2.5	Pharmaco-metrics	Suboptimal response to drug therapy requires population model-based therapeutic drug monitoring (TDM) or pharmacometrics data to enhance treatment outcomes.	♦ To develop population pharmacokinetics models for pharmacotherapy. [Scope: i. Antimicrobial: amikacin, gentamicin, vancomycin ii. Immunosuppressant: cyclosporine, tacrolimus, everolimus, sirolimus, mycophenolate]	Individualised treatment according to model-based TDM for enhanced therapeutic response.	12

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
6.2.6	Pharmaco-genomics	Despite the availability of multiple pharmacotherapy options, variations in drug responses for disease treatment are observed in Malaysia. There is limited data on the genetic factors associated with therapeutic responses or adverse events to drug therapy in the Malaysian population.	♦ To determine the gene polymorphisms that influence therapeutic response or adverse events related to pharmacotherapy. [Scope: i. Antiretroviral therapy: protease inhibitor nucleoside reverse transcriptase inhibitor (NRTI), non-nucleoside reverse transcriptase inhibitor (NNRTI) ii. Oral glucose-lowering agents: sulphonylureas, metformin, sodium-glucose cotransporter-K512 (SGLT2) inhibitors iii. Cytotoxic / targeted therapy: 6 -mercaptopurine, vincristine, PEG-asparaginase]	Optimisation of pharmacotherapy outcomes.	17
National problem 6.3: Digitalisation					
6.3.1	Digital applications and systems	Digital healthcare applications are on the rise, offering a means for delivering healthcare services and facilitating interaction between healthcare professionals and patients. Various application systems were designed to enhance the delivery of pharmacy services, and MOH has developed multiple digital applications in recent years. However, their utilisation and the impact of these digital applications on the quality of pharmacy services and patients' medication adherence remain unclear.	♦ To assess the utilisation and adoption of digital health applications in pharmacy services. ♦ To evaluate the impact of employing digital health applications in delivering pharmacy services on health outcome, treatment adherence, waiting time, cost-effectiveness, efficiency and other relevant factors. ♦ To assess and compare the effectiveness of different digital health solutions for delivering pharmacy services as well as their acceptance and satisfaction levels among patients, pharmacists and other healthcare providers. ♦ To explore digital health technologies that can enhance pharmacists' patient management and service delivery.	♦ Evidence to inform the adoption and expansion of digital health applications for enhancing pharmacy services delivery. ♦ Improved medication adherence with appropriate mobile or web-based applications.	3

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
		The proposed Pharmaceutical Track & Trace System is an initiative aimed at improving pharmaceutical supply chain transparency, optimising logistic management and ultimately improving patient safety. More baseline data and evidence are required to facilitate the design and implementation of this project.	♦ To conduct feasibility study and analyse the potential impacts including regulatory and economic implications, of implementing the Pharmaceutical Track & Trace System.	Evidence to inform the development of the Pharmaceutical Track & Trace System.	6

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
6.3.2	Digital transformation	The inevitable digital transformation in healthcare has the potential to enhance the efficiency of healthcare service delivery through improved access to accurate, up-to-date, and comprehensive information. Various technologies such as augmented reality (AR), virtual reality (VR), mixed reality, wearables, internet of things (IoT), telehealth and mobile health (mHealth) hold the potential for digitalisation of pharmacy services. However, the adoption of these technologies in the public healthcare sector is currently limited. The existing level of understanding, capacity of pharmacists, organisational readiness and technology alignment for digitalisation and pharmacy informatics remain uncertain.	♦ To evaluate the readiness of pharmaceutical sector towards digital transformation, considering aspects such as governance structure, regulatory framework, infrastructure, data management, business models, talents and competency of the workforce, user awareness and more. ♦ To identify the existing gaps, challenges, barriers and prerequisites for digital transformation within the pharmaceutical sector. ♦ To identify the potential pharmaceutical services that can benefit from digitalisation and modern technologies. ♦ To identify and evaluate potential platforms or technologies such as wearables or IoT devices that can be effectively integrated into pharmaceutical care to improve patient outcomes and medication management. ♦ To conduct a comparative study on information systems in different healthcare settings, considering various factors such as system's design, functionality, user-friendliness and levels of end users (e.g., pharmacists, other healthcare providers). ♦ To investigate the trends in the implementation and utilisation of informatics system in pharmacy services at every level of end users such as healthcare organisations, pharmacists and other healthcare providers. ♦ To evaluate the efficiency and cost-effectiveness of pharmacy information systems, considering factors like technology infrastructure, ecosystem integration and overall service quality at different levels of care.	Proposal or action plan towards digital transformation of pharmaceutical sector in Malaysia.	7

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 6.4: Technology					
6.4.1	Technology adoption	Innovation, technology and automation have the potential to enhance the efficiency and safety in pharmaceutical care but often come at very high cost. There is insufficient real-world evidence to support and accelerate the integration of new technologies into pharmacy services.	♦ To identify pharmacy innovations, technologies and automation that can improve the efficiency of pharmacy services and facilitate the achievement of optimal health outcomes. ♦ To assess the outcomes, feasibility and cost-effectiveness of innovations, technologies and automation in pharmacy services, such as automated dispensing system (ADS), robotic and automation in cytotoxic drug reconstitution (CDR), radiopharmaceutical and total parenteral nutrition (TPN) preparation.	Evidence to guide the adoption of new technologies in pharmacy services.	15
		Keeping pace with the rapid technological changes in the pharmaceutical industry is a major challenge for healthcare providers, regulators and policy makers. New technologies such as big data analytics, AI, bioprinting and many more are revolutionising the pharmaceutical sector and transforming patient management in the healthcare system.	♦ To assess the knowledge and readiness of pharmaceutical industry, regulatory agencies and healthcare personnel in regulating and adopting advanced or innovative pharmaceutical technologies. ♦ To develop and validate decision-making tools for the adoption of emerging pharmaceutical products and technologies.	Improved readiness of the government and pharmaceutical industry to adopt advanced technologies.	16

Domain 7: Governance

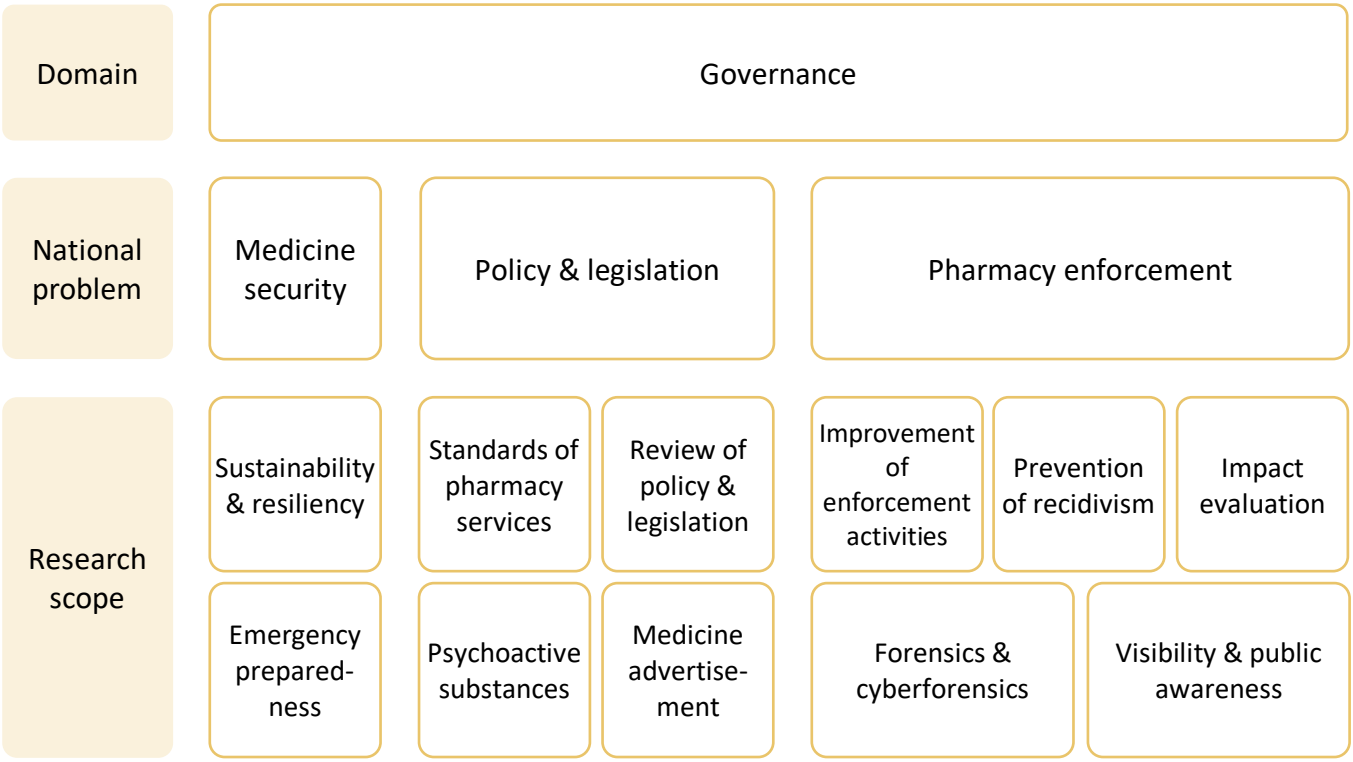

Figure 12: Research priority framework for Domain 7: Governance

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

Research Priorities for Domain 7: Governance

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 7.1: Medicine security					
7.1.1	Sustainability and resiliency	Malaysia relies heavily on the importation of medicines and raw materials to produce essential medicines. During the COVID-19 pandemic, Malaysia's vulnerability to global medicines supply disruptions were exposed. Although the government implemented various short-term solutions to mitigate these issues, there is a pressing need to establish a long-term road map for medicine security to ensure uninterrupted access to medicines under normal circumstances as well as during public health emergencies.	♦ To conduct a comprehensive situational analysis on Malaysia's current medicine security and resilience. ♦ To assess the gaps and challenges at each stage of the pharmaceutical lifecycle, medicine supply chain, regulatory mechanism and governance structure in Malaysia. ♦ To map the roles, capabilities and future opportunities of relevant stakeholders in guaranteeing medicine security in Malaysia. ♦ To explore and recommend strategies and initiatives that will ensure medicine security in Malaysia.	♦ A long-term medicine security road map. ♦ Enhanced national preparedness for addressing future medicine security crisis.	Auto prioritised
7.1.2	Emergency preparedness	The COVID-19 pandemic has underlined the importance of a nation's capacity to ensuring the availability and sufficiency of vital medicines and vaccines. As the custodian of pharmaceuticals, the pharmacy profession must proactively prepare for and respond to future public health emergencies including natural disasters, infectious disease outbreaks, national security threats and more.	♦ To assess Malaysia's preparedness in ensuring access to vital and essential medicines during public health emergencies. ♦ To assess the capacity, capabilities and gaps of the government, pharmacy profession and local pharmaceutical industry in public health emergency preparedness. ♦ To explore strategies for enhancing national preparedness for potential public health emergencies.	Enhancing public health emergency preparedness.	Auto prioritised

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 7.2: Policy and legislation					
7.2.1	Standards of pharmacy services	The dichotomous healthcare system in Malaysia has led to unequal distribution of services, manpower and resources across the public and private sectors. Public-private integration in health services is important to optimise healthcare efficiency. Currently, there is a lack of standardised regulatory enforcement, pharmaceutical care practices and quality standards between the public and private sector pharmacies.	♦ To assess the feasibility of standardising pharmaceutical care practices and quality standards across both public and private healthcare sectors. ♦ To examine the feasibility, acceptance, prerequisites and strategies for accrediting, benchmarking and standardising performance standards in both public and private sector pharmacies. ♦ To explore the feasibility of implementing standardised enforcement regulations for both public and private healthcare facilities which may involve amendments to the existing policies, practices, acts and regulations.	♦ Enhanced pharmaceutical care practices and quality standards in Malaysia. ♦ Improved integration of public and private sectors in pharmacy services delivery.	Auto prioritised
7.2.2	Review of policy and legislation	The Health White Paper which was passed by the Parliament in June 2023 outlines comprehensive healthcare reforms spanning over a 15-year period. These reforms encompass substantial changes in healthcare delivery, financing, and governance structures. To ensure successful implementation of these reforms, it is necessary to review and update existing health-related policies, legislation and regulations to align with the present and future requirements of the healthcare system.	♦ To conduct a comprehensive review and identify the gaps in policies, legislation and regulations pertaining to pharmaceuticals, pharmacy services and pharmacy profession so that they are relevant to the current and future healthcare system [Scope: policies, acts and regulations under the purview of PSP, other divisions in MOH and other ministries / agencies]. ♦ To explore the perception and gather inputs from various stakeholders regarding the effectiveness, shortcomings and challenges associated with the existing laws and regulations governing the pharmaceutical sector.	Alignment of policy and legislations with the current and future evolution of the healthcare system in Malaysia.	Auto prioritised

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
7.2.3	Psychoactive substances	There are gaps in the existing regulatory framework to control or regulate the medicinal, recreational and industrial use of psychoactive substances. While some countries have liberalised the medicinal and recreational use of substances such as cannabis (tetrahydrocannabinol) and kratom (mitragynine), further research is required to spearhead the development of policies in Malaysia.	♦ To review, assess and analyse the adequacy and effectiveness of current legislations and policies related to the control or regulation of psychoactive substances in Malaysia. ♦ To review the legislations and policies related to the control or regulation of psychoactive substances for medicinal, recreational and industrial use in other countries. ♦ To gather insights and opinions from various stakeholders including the public, healthcare professionals, law enforcement agencies, and relevant organisations regarding medicinal, recreational and industrial use of cannabis and kratom.	Establishment of legal framework that aligns with the current developments and requirements for the utilisation of psychoactive substances for medicinal, recreational and industrial purposes.	1
7.2.4	Medicine advertisement regulations	The existing regulatory framework for combating illegal medicine advertisements in Malaysia has limitations. Additionally, the current legal framework may not adequately address the evolving landscape of online medicinal products advertisements, especially on social media and online platforms. The dissemination of misleading information could lead to the use of unregistered products that pose health and safety risks to consumers.	♦ To assess the compliance of stakeholders towards medicine advertisement regulations. ♦ To assess stakeholder's understanding regarding medicine advertisements regulations and associated offences. ♦ To explore the feasibility and potential implications of self-regulation of medicine advertisements in Malaysia. ♦ To explore policies or strategies to improve the regulation of medicine advertisements including online advertisements in Malaysia. ♦ To explore strategies to strengthen the capacity to regulate online service providers and combat illegal sales of pharmaceuticals.	Enhanced regulation of medicine advertisements including online advertisements in Malaysia.	2

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 7.3: Pharmacy enforcement					
7.3.1	Improvement of enforcement activities	There are abundance of pharmacy enforcement investigation, operation and prosecution data. These data can be used to formulate surveillance strategies and improve the effectiveness and efficiency of pharmacy enforcement activities.	♦ To conduct geographical, demographic and longitudinal mapping and profiling of premises and areas often referred to as 'hotspots' that are investigated and prosecuted under the pharmacy legislations. ♦ To explore strategies to enhance pharmacy enforcement activities including the development of improved monitoring, surveillance and operational methods, as well as redistribution of resources to target specific hotspots or offences.	Improved effectiveness and efficiency of pharmacy enforcement activities.	3
		The MOH Pharmacy Enforcement Division and its state branches are responsible for issuing licenses and permits to regulate the import, export, supply, distribution and use of poisons, psychotropic substances and other controlled substances in Malaysia. Currently, these licenses or permits are issued within three to seven working days upon receipt of a complete application. It is important to determine the factors affecting the productivity and efficiency of enforcement services, to further expedite and shorten the time for issuing licenses or permit to better facilitate the pharmaceutical industry.	♦ To identify the average duration and factors that affect the efficiency of issuing or renewing licenses / permits. ♦ To identify the opportunities for improving the efficiency of pharmacy enforcement workflows.	To improve the current workflow and improve the efficiency of enforcement services.	6

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
7.3.2	Prevention of recidivism	There are inadequate studies about the prevention of repeat offenders and evidence is required to facilitate the development of more effective framework and policies to address this issue.	♦ To determine the prevalence and associated factors of pharmacy offence recidivism among pharmaceutical stakeholders and licensees. ♦ To anticipate repeat offenders and establish proactive measures to combat pharmacy offense recidivism.	A predictive model to identify habitual offenders and implement effective rehabilitation measures to reduce the likelihood of recidivism.	4
7.3.3	Impact evaluation	The impact and effectiveness of specific pharmacy enforcement initiatives such as *Didik, Pantau, Serbu* (DiPS), *Operasi Khas Bahan Terkawal* (OKBT) and other initiatives remain unknown. It is essential to assess the effectiveness of these specific initiatives to develop more effective strategies and enhance the overall outcomes of pharmacy enforcement activities.	♦ To evaluate the effectiveness and impact of specific pharmacy enforcement initiatives, such as DiPS and OKBT.	Improved effectiveness of pharmacy enforcement activities.	5
7.3.4	Forensics and cyberforensics	The MOH has made significant investments in pharmacy enforcement personnel training, technology, assets, and other resources to ensure the timely issuance of high-quality pharmacy forensic analysis reports. However, there is a lack of information regarding the utilisation of these reports, including the enforcement actions taken based on the reports and the reasons behind the lack of action.	♦ To analyse the outcomes and determine the factors associated with the actions taken based on the forensic chemistry and cyberforensic analysis reports. ♦ To explore strategies to enhance the forensic chemistry and cyberforensic analysis capacities of pharmacy enforcement services.	Enhanced performance of MOH pharmacy enforcement.	7

Colour reference for relative rank

Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
7.3.5	Visibility and public awareness	The public may have low awareness on the existence and functions of pharmacy enforcement. Increasing public awareness about the roles and functions of pharmacy enforcement is essential to promote cooperation by the public and enhance the effectiveness of pharmacy enforcement activities.	♦ To assess the level of public awareness of pharmacy enforcement activities and the roles of pharmacy enforcement officers. ♦ To develop strategies aimed at promoting the visibility and public awareness of pharmacy enforcement activities and the roles of pharmacy enforcement officers. ♦ To formulate strategies that encourage public awareness, empowerment and participation in community governance related to pharmacy enforcement activities. This may include receiving and handling complaints, sharing information, providing consultations and organising joint events.	Improved awareness and public participation to enhance the effectiveness of pharmacy enforcement activities.	8

Domain 8: Capacity and Capability Building

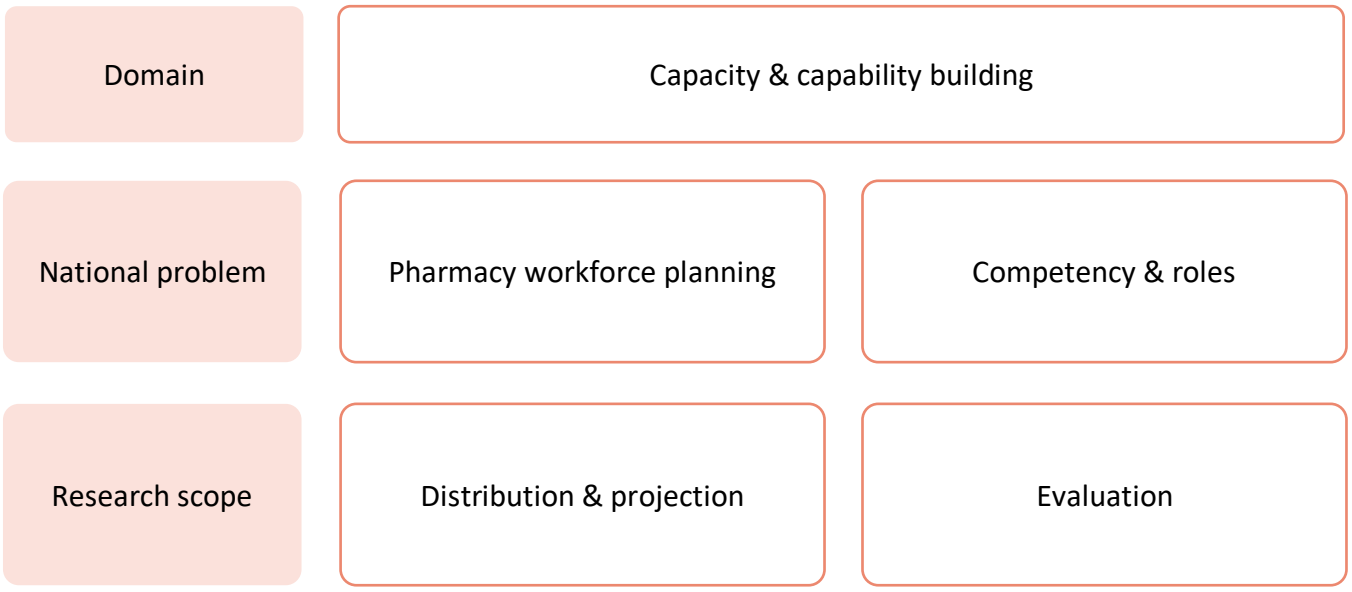

Figure 13: Research priority framework for Domain 8: Capacity and capability building

Colour reference for relative rank				
Auto prioritised	1 - 3	4 - 6	7 - 10	≥ 11

Research Priorities for Domain 8: Capacity and Capability Building

No.	Research scope	Gaps & needs (rationale)	Suggested research area	Expected output	Relative rank
National problem 8.1: Pharmacy workforce planning					
8.1.1	Distribution and projection	Over the years, the pharmacist workforce in Malaysia has grown, but the issues of imbalances and maldistribution between the public and private sectors as well as variations in skill mix, geographical placements and service quality have become apparent. Strengthening the planning and management of the pharmacy profession is essential to address these challenges.	♦ To assess the distribution of pharmacy workforce in terms of geographical location, industry sectors and facility types while considering workloads, professional trainings and healthcare outcomes. ♦ To conduct pharmacist supply and demand analysis. ♦ To forecast the future needs for pharmacists accounting for their numbers, professions and skill mix based on evolving needs. ♦ To investigate plausible strategies for optimising pharmacy human resources to overcome regional and geographical disparities.	Enhanced planning for pharmacy human resources.	1
National problem 8.2: Competency and roles					
8.2.1	Evaluation	The roles of pharmacist have evolved from product-centred to pharmaceutical care services. To deliver high quality pharmacy services that result in improved patients' health outcomes, it is essential to maintain the competency of pharmacy personnel. Furthermore, the profession must continue to adapt in responding to new challenges arising from factors like an ageing population, shifts in disease patterns, and advancement in medicine and technology.	♦ To assess the competency of pharmacy personnel across different fields, services and roles. ♦ To evaluate the knowledge and readiness of pharmacy personnel towards digital transformation and technology advancement. ♦ To investigate the readiness of pharmacy personnel in expanding their roles. ♦ To understand the perception and expectation of the public towards the pharmacy profession and services.	Ensuring adequate, competent, and adept pharmacy workforce to meet the current and future healthcare demands.	2

Conclusion

The PRPM aspires to guide pharmacy research activities in the country to generate useful evidence needed to fill the critical knowledge gaps in addressing national problems. This document is a result of extensive collaborations among the MOH pharmacists, researchers, administrators, as well as stakeholders and partners in both public and private sectors. In this second edition of PRPM, eight research domains were identified. Each of these eight research domains represents an important segment in the pharmaceutical and health sector, which is inevitable in ensuring the health and well-being of the *Rakyat*. The research priorities stipulated in this document shall be the key focus of pharmacy research in the next few years. Depending on the pace of the profession's evolution, national health problems and global challenges in pharmacy services, the PRPM will be reviewed accordingly. Hopefully, with the research priorities being clearly laid out, we will be able to produce more impactful research evidence that can be translated into policy and practice.

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Appendix

Appendix 1: Stakeholders in pharmaceutical services

Senior managers from the MOH:

1. Senior Director of Pharmaceutical Services
2. Directors and Deputy Directors from the headquarters of PSP:
    a. National Pharmaceutical Regulatory Agency (NPRA)
    b. Pharmacy Policy and Strategic Planning Division
    c. Pharmacy Practice and Development Division
    d. Pharmacy Enforcement Division
    e. Pharmacy Board Malaysia
3. State Deputy Directors of Health (Pharmacy)
4. Deputy Director (Pharmacy) of Hospital Kuala Lumpur
5. Chief Pharmacist of National Cancer Institute
6. Head of Public Health Pharmacy Sector, Public Health Development Division
7. Head of Profession, Pharmacist Assistant Profession Development Subdivision, Pharmacy Policy and Strategic Planning Division

Other government / private organisations & higher education institutions:

1. Health Services Division, Malaysian Armed Forces, Ministry of Defence (MINDEF)
2. University hospitals
    a. University Malaya Medical Centre (UMMC)
    b. Hospital Canselor Tuanku Muhriz (Universiti Kebangsaan Malaysia Medical Centre)
    c. Hospital Universiti Sains Malaysia (USM)
    d. Sultan Ahmad Shah Medical Centre @IIUM
    e. Hospital Al-Sultan Abdullah Universiti Teknologi MARA (UiTM)
3. Pharmacy schools / faculties (universities) in Malaysia
    a. Faculty of Pharmacy, University of Malaya (UM)
    b. School of Pharmaceutical Sciences, Universiti Sains Malaysia (USM)
    c. Faculty of Pharmacy, Universiti Kebangsaan Malaysia (UKM)

d. Faculty of Pharmacy, Universiti Teknologi MARA (UiTM)
e. Kulliyyah of Pharmacy, International Islamic University Malaysia (IIUM)
f. Faculty of Pharmaceutical Sciences, UCSI University
g. Faculty of Pharmaceutical Sciences, International Medical University (IMU)
h. Faculty of Pharmacy, AIMST University
i. School of Pharmacy, University Nottingham Malaysia Campus (UNMC)
j. Faculty of Pharmacy, University of Cyberjaya (UoC)
k. Faculty of Pharmacy, Asia Metropolitan University (AMU)
l. School of Pharmacy, Management & Science University (MSU)
m. Faculty of Pharmacy, SEGI University College
n. School of Pharmacy, Monash University Malaysia Campus
o. Faculty of Pharmacy, MAHSA University
p. School of Pharmacy, Taylor's University
q. Faculty of Pharmacy, Lincoln University College
r. Faculty of Pharmacy & Health Sciences, Universiti Kuala Lumpur - Royal College of Medicine Perak (UniKL-RCMP)
s. School of Pharmacy, KPJ Healthcare University College
t. Faculty of Pharmacy, Quest International University
u. Faculty of Pharmacy, Universiti Sultan Zainal Abidin (UniSZA)

Private pharmaceutical sectors:

1. Malaysian Pharmacists Society (MPS)
2. Malaysian Organisation of Pharmaceutical Industries (MOPI)
3. Pharmaceutical Association of Malaysia (PhAMA)
4. Malaysian Community Pharmacy Guild (MCPG)
5. Malaysian Association of Pharmaceutical Suppliers (MAPS)

Appendix 2: Policy documents used for the identification of research gaps related to pharmacy services in Malaysia

Documents published by MOH:

1. Health White Paper for Malaysia[22]
2. Malaysian National Medicines Policy 3rd Edition 2017-2021[4]
3. Malaysian National Medicines Policy 4th Edition 2022-2026[5]
4. Health Research Priorities for 12th Malaysia Plan (12MP-HRP) 2021-2025[9]
5. Ministry of Health Malaysia Strategic Plan 2021-2025[23]
6. Pharmaceutical Services Programme Strategic Plan 2021-2025[6]
7. National Health Agenda[24]
8. National Environmental Health Action Plan (NEHAP) Malaysia: Action Plan for Environmental Health 2016-2020[25]

Documents published by other Malaysian government agencies or international organisations:

1. Twelfth Malaysia Plan 2021-2025 [Economic Planning Unit, Prime Minister's Department][26]
2. Mid-Term Review, Twelfth Malaysia Plan [Ministry of Economy][27]
3. New Industrial Master Plan 2030 [Ministry of Investment, Trade and Industry][28]
4. National Fourth Industrial Revolution (4IR) Policy [Economic Planning Unit, Prime Minister's Department][29]
5. Malaysia National Artificial Intelligence Roadmap 2021-2025 (AI-RMAP) [Ministry of Science, Technology & Innovation][30]
6. Digital-in-Health: Unlocking the Value for Everyone [World Bank][31]
7. The FIP Development Goals. Transforming Global Pharmacy [International Pharmaceutical Federation (FIP)][32]

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