IMPROVING THE PERCENTAGE OF PATIENTS ON CLOPIDOGREL WHO RECEIVED APPROPRIATE PRESCRIPTIONS IN PRIMARY CARE SETTINGS

Simran Kaur Labir Singh, Norharlina Sulaiman, Noor Harzana Harun, Cheang Ching Ye, Lean Ean Pheng, Khoo Chong Chiang

Klang District Health Office Pharmacy Department, Selangor State Health Department, Ministry of Health Malaysia

Corresponding Author: Cheang Ching Ye
Email: michelle.cheang@moh.gov.my

Abstract

Clopidogrel, an antiplatelet agent, is often prescribed with aspirin for cardiovascular disease (CVD) patients. At the Klang District Health Office (DHO), concerns arose over its prolonged use. A verification study revealed that only 57% of clopidogrel prescriptions were appropriate. The indicator used was the percentage of patients on clopidogrel who received appropriate prescriptions, defined as adherence to recommended indications and duration (12 months). The study set a standard of 100% appropriate use and aimed to achieve this within three improvement cycles. A validated questionnaire was used to identify the contributing factors: lack of review and interventions by doctors (30%) and pharmacists (27%), incomplete clopidogrel indication and duration in prescriptions by doctors (24%), and high patient demands (19%). In Cycle 1 (July – December 2019), eight strategies were implemented, including the development of an in-house guideline, a clopidogrel assessment checklist, and continuous medical education (CME) sessions for doctors and pharmacists. A "Clopidogrel Intervention Mini Note" facilitated communication, while the *Buku Rekod Ubat Pesakit* (BRUP) provided essential patient details. A counselling checklist, standardised information delivery, and a clopidogrel counselling leaflet was created for patients. In Cycle 2 (January – June 2020), five strategies were implemented, including referring hospital and Klang DHO meeting to ensure discharge letters included both the diagnosis and clopidogrel duration. Additional measures included replacing the mini note with a prescription note, introducing QR codes for counselling pamphlets, and online counselling for patients. These interventions increased the appropriate clopidogrel prescribed from 57.0% to 87.2% in Cycle 1, to 94.2% in Cycle 2, and 98.0% in Cycle 3 (July 2022). Clopidogrel expenditure decreased substantially from MYR42,705 to MYR13,469 (Cycle 1), MYR1424 (Cycle 2), and MYR438 (Cycle 3). To sustain improvements, we integrated the Clopidogrel Assessment Checklist into our work processes, promoting continuity of best practices among new doctors and pharmacists.

KEYWORDS: Clopidogrel, Primary care, Quality improvement study

Problem

Clopidogrel, an antiplatelet agent belonging to the thienopyridine class, binds to P2Y12 adenosine diphosphate (ADP) platelet receptors, resulting in irreversible inhibition of platelet aggregation, thereby preventing thrombosis (1). According to the Ministry of Health National Medicines Formulary (2018), clopidogrel is indicated for preventing myocardial infarction, stroke, or established peripheral arterial disease (2). It is also recommended as a second- or third-line treatment for patients who are allergic to acetylsalicylic acid and intolerant to ticlopidine (2).

In Malaysia, clopidogrel therapy is typically started at tertiary healthcare facilities upon diagnosing cardiovascular disease (CVD) or following critical care and invasive procedures. After stabilisation, patients are discharged to primary care clinics for continuation of care. However, the primary care clinics faces a significant challenge in continuing treatment, as information on the indication and duration of clopidogrel prescribed for the secondary prevention of CVD, is often lacking during the transition from tertiary healthcare facilities to primary care clinics. This gap hinders the assessment of its appropriate continuation. Also, it affects medication budgeting, as clopidogrel is an expensive drug that is not routinely purchased or prescribed by the government primary care clinics.

Clopidogrel is categorised under 'group A prescriber drugs,' which can only be initiated by specialised physicians within the tertiary healthcare facilities. Upon discharged from hospitals, patients referred to primary care clinics will be given a referral letter with information on medications for initial consultations. Family Medicine Specialists (FMS) and medical officers are authorised to continue clopidogrel treatment for hospital-referred patients following a thorough clinical assessment. This process of care involves integral collaboration between prescribers and pharmacists to ensure appropriate medication management.

Klang district is one of the largest districts in Selangor state, serving a high-density population estimated at 842,146 people (3). Within the district, twelve healthcare clinics provide outpatient services (3). These clinics are operated by a total of 1209 healthcare workers, which include seven FMS, 202 medical officers, 60 pharmacists, as well as other healthcare staff such as nurses, paramedics, and support staff.

Primary care clinics provide essential ambulatory care services to both walk-in patients and those referred from nearby hospitals. The pharmacy department within these clinics plays a crucial role in ensuring optimal medication management practices. This encompasses various responsibilities such as screening prescriptions, intervening in medication errors, accurately dispensing medications, managing drug inventories, and providing comprehensive medication counselling to patients. In the context of clopidogrel, this involves ensuring prescriptions are appropriate in terms of indication and duration, correcting potential prescribing errors, verifying accuracy during dispensing, monitoring stock to minimise wastage, and counselling patients on the correct use of clopidogrel.

A verification study conducted in 2019 revealed that only 57.0% (513/900) of the prescribed clopidogrel were deemed appropriate (4). This project aimed to improve the percentage of patients on clopidogrel who received appropriate prescriptions under the Klang District Health Office (DHO) from 57% to 100% within three years.

Background

Studies worldwide consistently show significant overuse of clopidogrel, whether alone or as part of dual antiplatelet therapy (DAPT) (5 - 8). For instance, a Sri Lankan study found that less than half of clopidogrel prescriptions were for the correct indication and duration (8). Similarly, European research revealed that treatment durations often exceeded clinical guidelines, particularly for neurological conditions (87.8% of patients) and cardiac disorders (38.8%) (7). This overuse carries a substantial financial burden, with European estimates ranging from EUR2 to EUR4.4 million annually (7). A UK audit in Glasgow

further solidified this trend, finding nearly 40% of DAPT patients were treated beyond the recommended duration, leading to an estimated GBP8386 in excess costs from 7,537 weeks of unnecessary therapy (6). Beyond financial implications, prolonged DAPT (over one-year post-procedure) is linked to a higher risk of bleeding (6). Long-term use of clopidogrel exposes to a higher risk of adverse events such as severe neutropenia, various forms of haemorrhage, and cardiovascular events (5). Furthermore, research indicates that combining aspirin with clopidogrel for high-risk ischemic stroke or transient ischemic attack patients offers no significant additional benefit in reducing major vascular events (6). However, the risk of life-threatening or major bleeding was increased by the addition of aspirin (5). Another factor to consider when deciding whether to continue treatment beyond the recommended period is the impact this has on therapeutic compliance. Treatment complexity in these patients is one of the most important predictive factors of lack of treatment adherence (9).

Several factors contribute to inappropriate clopidogrel prescribing. Patient or caregiver exert additional pressure on physicians into prescribing outside established guidelines. Additionally, lack of awareness or understanding of current recommendations among healthcare professionals can lead to improper use (4, 6). Treatment complexity also contributes to inappropriate prescribing by increasing the likelihood of prolonged or incorrect usage (4, 6, 8, 9).

To address these issues, a variety of strategies have been implemented. Routine clinical audits help identify deviations from guidelines and support corrective measures (6, 8). Regular reviews of patient profiles ensure the ongoing appropriateness of clopidogrel therapy. These include cessation dates on prescriptions, to prevent extended use (5 - 7). However, the effectiveness of these strategies varies. As reported by George et al. (2022), periodic clinical audits revealed significant improvements in discharge prescription compliance (10). In other studies, clinical audits have been shown to significantly improve adherence to guideline-based therapy among patients with acute coronary syndrome (ACS) (6, 8). The regular review of patient profiles, led by pharmacists, has increased the appropriate prescribing of secondary prevention medications in ACS from 35% to 80% (11 - 12). Educational programmes aimed at healthcare professionals have also resulted in better prescribing practices and greater adherence to guidelines (6, 8, 12).

Measurement

This quality improvement study was conducted from July 2019 to July 2022. The study included patients discharged with clopidogrel for cardiovascular diseases from the tertiary healthcare facilities to the seven clinics under Klang DHO. The clinics included were Bandar Botanic Health Clinic, Pandamaran Health Clinic, Anika Health Clinic, Bukit Kuda Health Clinic, Port Klang Health Clinic, Kapar Health Clinic, and Meru Health Clinic. Patients who were allergic to aspirin, enrolled in the *Sistem Pendispensan Ubat Bersepadu* (SPUB), walk-in patients, or defaulters for more than six months were excluded from the study. SPUB is a follow-up medication supply service facilitated through prescription referrals. This service enables patients to obtain a supply of their medications from other Ministry of Health healthcare facilities (13).

The indicator assessed in this study was the percentage of patients on clopidogrel who received appropriate prescriptions. A 100% standard was set in 2019 by consensus among the Klang DHO Drug Committee, which included the health officer director, all FMSs, and pharmacists from the participating clinics. The indicator was calculated as below:

$$\textit{Percentage of patients on clopidogrel who received appropriate prescriptions} = \frac{\textit{Total number of patients appropriately prescribed with clopidogrel}}{\textit{Total number of patients prescribed with clopidogrel}} \times 100$$

The criteria for appropriately prescribed clopidogrel were determined based on published literature (14). It was defined as patients correctly prescribed with clopidogrel in adherence to the clinical indications and limiting its usage to a maximum duration of 12 months, except for patients with hypersensitivity to aspirin (14) or patients with recurrent cardiac issues requiring lifelong clopidogrel use (14), as specified by the referring hospitals.

Prescriptions were collected to identify the total number of patients on clopidogrel. Then, the appropriately prescribed clopidogrel was assessed using the clopidogrel assessment checklist (Appendix 1), developed by the members of the Drug Committee at Klang DHO in 2019. The form was filled out by doctors and kept in the patient's record for reference. During the study, the clopidogrel assessment checklist was used to evaluate and align both the appropriate diagnosis and the duration of treatment. This facilitated the determination of the total number of patients on clopidogrel who were appropriately prescribed.

Self-administered questionnaires on contributing factors were distributed to 250 healthcare professionals (100 doctors, 150 pharmacists) conveniently. The questionnaire was content validated by all FMSs from the clinics involved in the study. Another self-administered questionnaire used in a pre- and post-test was developed to assess the healthcare professionals' knowledge of clopidogrel. Further details are explained in the next section. An audit checklist was used to evaluate the critical steps in prescribing and dispensing clopidogrel, including diagnosis, treatment duration, and patient adherence. These tools helped identify areas for improvement and measure the impact of interventions.

The verification study was carried out between April and June 2019. The results revealed that only 57.0% (513/900) of patients prescribed clopidogrel were deemed appropriate. The Achievable Benefit Not Achieved (ABNA) was 43%.

Initial Assessment of the Problem

The problem analysis chart (Figure 1) showed the contributing factors to the problem. The major contributing factors to the inappropriately prescribed clopidogrel in primary care were a lack of reviews and interventions by doctors (30%), a lack of reviews and interventions by pharmacists (27%), incomplete indications and durations in prescriptions by doctors (24%), and high patient demand (19%).

As pharmacists and doctors were identified as potential contributors to the problem from various aspects, another self-administered questionnaire was developed. The content was reviewed by all FMS and pharmacists from the participating clinics to ensure it met the study's objective of evaluating the knowledge of pharmacists and doctors regarding the appropriate prescription of clopidogrel and their awareness of the workflow. The questionnaire was distributed to 100 respondents in all participating clinics (35 doctors and 65 pharmacists) during the pre-intervention and post-intervention phases to evaluate their knowledge levels. During the pre-intervention phase, only 40% (n=40) of respondents achieved a passing mark of 80% or more. This indicated that the majority of doctors and pharmacists had poor knowledge and awareness regarding appropriate clopidogrel prescription.

The process of care (POC) flowchart illustrates the process of prescribing and dispensing clopidogrel to patients in healthcare clinics (Figure 2). It is applicable to hospital-referred patients who were discharged and referred to healthcare clinics for continuation of care. This process will also extend to follow-up appointments for clopidogrel patients, ensuring that any missed patients during their initial visit are identified in subsequent appointments. Critical steps contributing to the appropriate use of clopidogrel were denoted with asterisks. These steps include clerking and examination, assessment by doctors, prescribing, recording prescription details and prepare *Buku Rekod Ubat Pesakit* (BRUP) as well as dispensing and counselling.

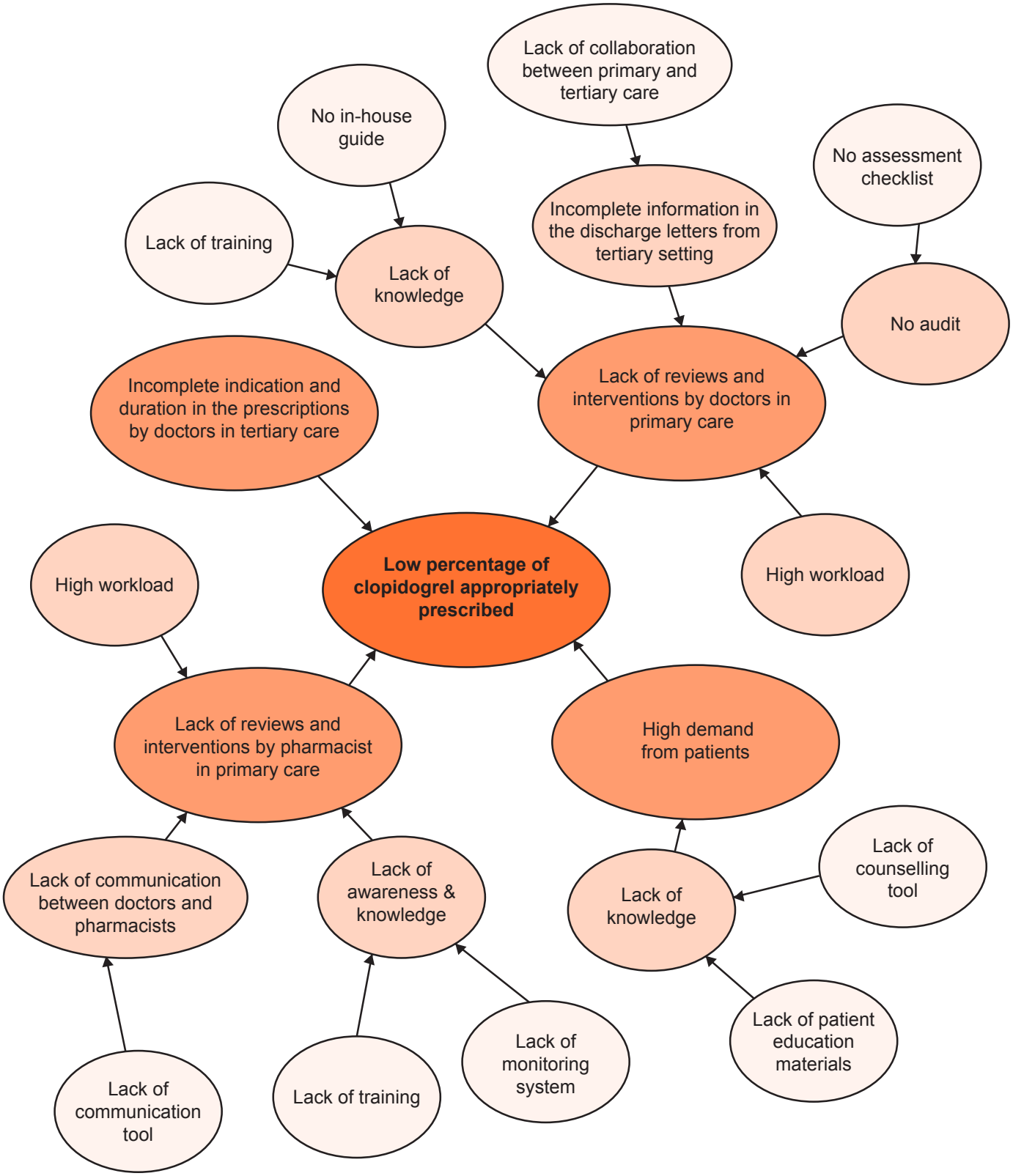
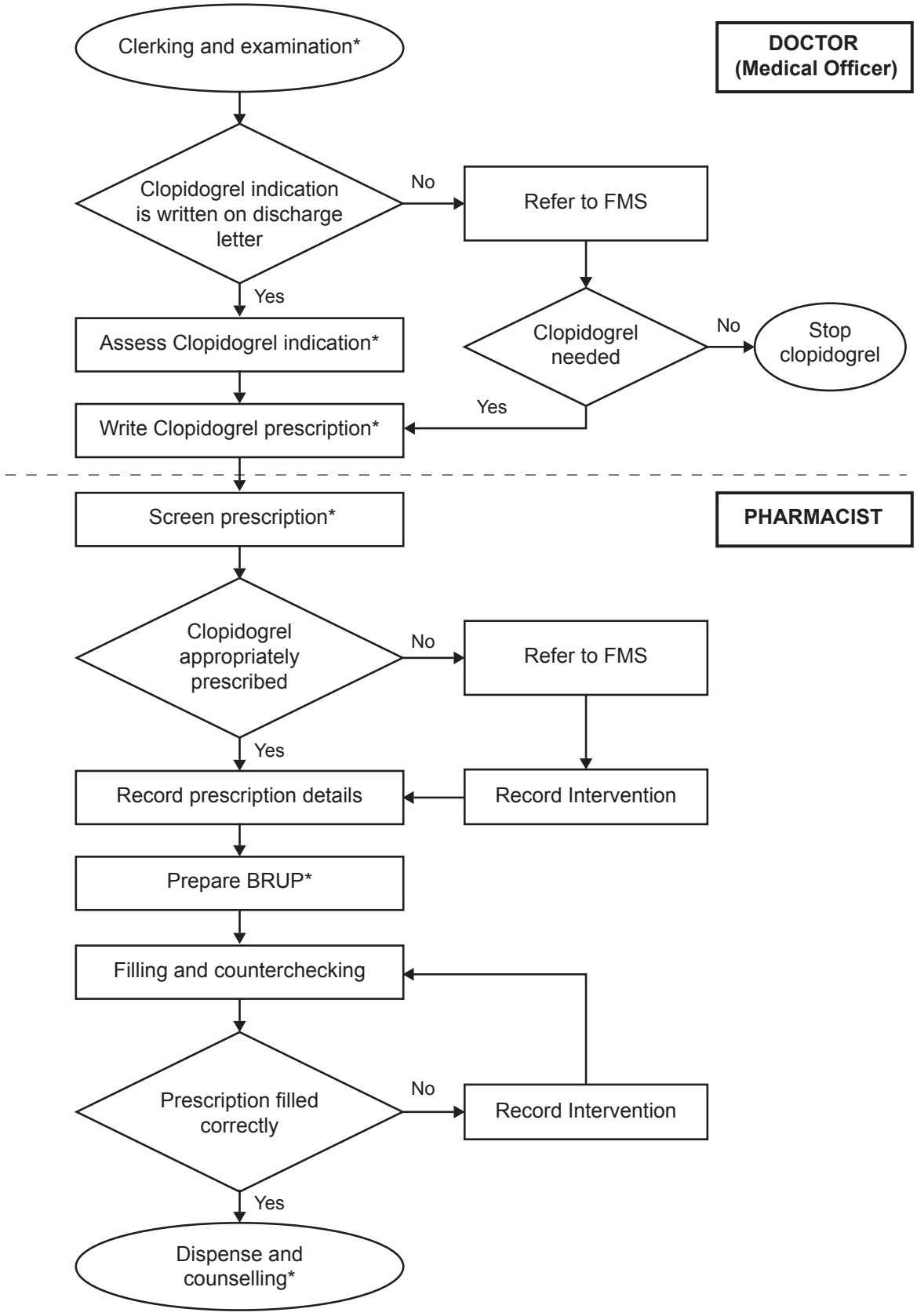


Figure 1: Problem analysis chart for low percentage of clopidogrel appropriately prescribed



* indicates critical steps

Figure 2: process of care for prescribing and dispensing clopidogrel in primary healthcare clinics

Strategy

The remedial measures were implemented in Cycle 1 (July – December 2019) and Cycle 2 (January– June 2020). Data collection and analysis were conducted in Cycle 1 (November–December 2019) and Cycle 2 (May–June 2020). Cycle 3, conducted in July 2022, evaluated the effectiveness of the previous strategies. During Cycle 1, eight strategies were implemented based on the identified contributing factors. To address the inadequate review and interventions by doctors, our team organised a meeting with all FMS and the pharmacists in charge from their respective clinics. The first strategy was designing a simplified prescribing recommendation for clopidogrel based on Clinical Practice Guidelines (CPG): Primary & Secondary Prevention of Cardiovascular Disease, published in 2017, (15) to assist doctors in determining the duration of clopidogrel treatment.

Second, an in-house clopidogrel assessment checklist (Appendix 1) was developed. This aid in ensuring systematic patient assessment by doctors on the treatment plan during the initial visit. This checklist served as an audit tool and facilitated doctors in reviewing and monitoring patients during subsequent visits. This checklist provided a concise access to patient's history, indirectly reducing their workload. Additionally, both the clopidogrel prescribing recommendation and assessment checklist assisted pharmacists in determining clopidogrel duration efficiently.

Third, a "Clopidogrel Intervention Mini Note" was designed to ensure information is effectively communicated to pharmacists from the doctors. It is sent to the pharmacy along with the prescription during the treatment initiation. The mini-note facilitated pharmacists screening process to ensure clopidogrel is appropriately prescribed. This note addressed the lack of reviews and interventions by pharmacists by providing essential information such as diagnosis and clopidogrel start and stop dates.

The fourth strategy introduced by entering patient details in a pharmacy database maintained using Microsoft Excel, to track clopidogrel usage. These details were then transcribed into the BRUP, provides essential details on initiation date, suggested end date, and diagnosis. This served as a tool utilised by pharmacists to streamline medication monitoring during subsequent patient visits.

The fifth strategy was to address the high demand for patient counselling; pharmacists developed a standardised clopidogrel counselling checklist to ensure consistent delivery of information to all patients prescribed the medication. The primary objective of these counselling sessions was to emphasise the treatment indication and duration. Pharmacists were required to provide counselling to all new patients initiating clopidogrel therapy, focusing on clearly explaining the rationale for the treatment, the prescribed duration, and highlighting both the benefits and potential risks associated with the medication.

A clopidogrel counselling leaflet for patients and their families, constituting as the sixth strategy. This leaflet served as a reference for patients who may forget information shared during the pharmacy counselling sessions. It also benefited family members who were unable to accompany the patient to the clinic, helping them understand the patient's treatment plan.

Seventh, continuous medical education (CME) sessions on clopidogrel prescribing were conducted at each clinic to increase doctors' knowledge. During these sessions, briefings on the prescribing recommendation and instructions on utilising the in-house clopidogrel assessment checklist were given. Pre- and post-test quizzes were given to ensure attendees comprehended the briefing content. With these measures in place, doctors can conveniently and confidently determine the treatment plan.

The eighth strategy was to address pharmacists' lack of awareness and knowledge; CME sessions were conducted in all clinics. These sessions focused on the prescribing workflow, monitoring, and counselling of clopidogrel. Pharmacists were organised into small groups for hands-on training regarding the recording and monitoring procedures, as well as patient counselling. Additionally, they were briefed on common challenges and participated in role-playing scenarios that depicted common challenges encountered with clopidogrel, along with strategies for addressing each scenario.

Following Cycle 1, we found that the criterion of the indication and treatment duration documented in the discharge letters from the referring hospital still had the lowest performance among all the criteria outlined in the Model of Good Care (MOGC). Thus, in Cycle 2, the first strategy involved a meeting between the heads of departments (HODs) from the primary care and the cardiology team of the tertiary care facility in the Klang district. A consensus was achieved; doctors in the tertiary setting will ensure that discharge letters are completed with both diagnosis (indication) and treatment duration for clopidogrel. This strategy significantly assisted primary care doctors in determining the clopidogrel treatment duration.

Second, we prioritised minimising manual documentation by removing the "Clopidogrel Intervention Mini Note" and directly recording essential information such as diagnosis, start date, and stop date of clopidogrel on prescriptions. The third strategy was to link the "Patients' Record List" to a QR code to streamline the recording process and improve accessibility for all pharmacy staff. This innovation allowed pharmacy staff to quickly check a patient's status from the counter using a smartphone, eliminating the need to access a computer for information.

Moreover, we improved accessibility to the counselling pamphlet for patients by linking it to a QR code, offering an alternative method for accessing the information anywhere and enabling easy sharing with their family members. Lastly, we introduced online counselling services for patients who still had queries regarding the medication or wished to include a counselling session with their caregiver who cannot physically attend the patient's clinic visit. During these online counselling sessions, patients and their family members can interact directly with pharmacists to inquire about information and have their queries addressed.

A key learning from Cycle 2 was the critical role of collaboration between the primary and tertiary care in ensuring complete and accurate discharge letters. Engaging the heads of departments (HODs) from primary care and the cardiology team at the tertiary care facility resulted in significant improvements in documentation, particularly in specifying diagnoses and treatment durations. This collaboration was essential in facilitating appropriate prescribing decisions at the primary care level.

In Cycle 3, the focus shifted from introducing new strategies to evaluate the effectiveness of previous strategies in Cycle 1 and Cycle 2. Instead of implementing new remedial measures, efforts were concentrated on reinforcing existing strategies and ensuring that the practices and procedures established in previous cycles became a permanent part of the workflow. This involved monitoring adherence to the guidelines, maintaining effective communication, and continuing patient education to ensure that the gains made in appropriate clopidogrel prescribing were sustained over the long term.

Results

After implementing several strategies, there was a significant increase in the percentage of patients on clopidogrel who received appropriate prescriptions in Klang DHO. Initially, only 57% (513 out of 900 patients) were prescribed appropriately, but this surged to 87.2% (840 out of 963 patients) in Cycle 1; then further increased to 94.2% (212 out of 225 patients) in Cycle 2 and 98% (198 out of 202 patients) in Cycle 3. The ABNA improved substantially across the three cycles, from 43% to 12.8%, then to 5.8% and lastly to 2% in Cycle 3. (Figure 3)

Each intervention contributed significantly to the improvement. Table 1 illustrates the enhancement of each process within the MOGC. Before the interventions, all criteria failed to meet the 100% standard. Criteria such as recording prescription details, preparing BRUP, dispensing, and counselling were all at 0%. Another crucial criterion with poor results was the clerking and examination, at only 25%.

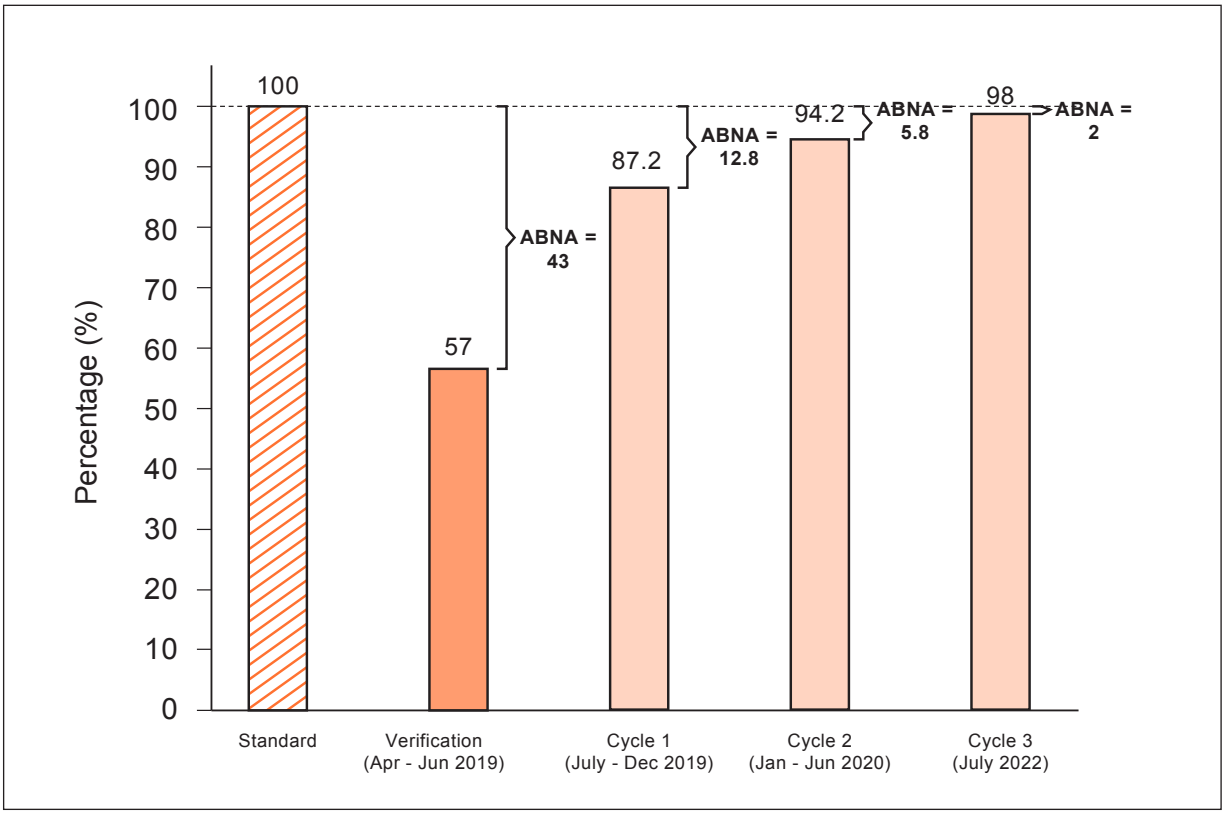


Figure 3: Percentage of patients on clopidogrel who received appropriate prescriptions from Cycle 1, Cycle 2, and Cycle 3

Table 1: Comparison of Model of Good Care Achievement Before and After Remedial Measures.

No.	Critical Step	Criteria	Standard	Verification	Cycle 1	Cycle 2	Cycle 3
1.	Clerking and examination	Ensure MOH discharge letter is complete with indication and duration	100%	25%	52.4%	78.3%	85.1%
2.	Assess clopidogrel indication	Identify indication(s) along with start and stop date for clopidogrel utilisation	100%	57%	87.2 %	94.2%	98%
3.	Write clopidogrel prescription	Document indication(s) along with start and stop date for clopidogrel	100%	57%	85.4 %	93.2%	96.8%
4.	Screen prescription	Screen clopidogrel indication, start and stop date and duration	100%	0%	79.8 %	91.4%	96.8%

5. Prepare BRUP	Transfer information (indication, start and stop date) to BRUP (*Buku Rekod Ubat Pesakit*)	100%	0%	79.8 %	93.2%	95.7%
6. Dispense and counsel patient	Provide counselling to patient emphasising indication and duration of treatment	100%	0%	78.2 %	89.6%	91.0%
	Provide leaflet	100%	0%	79.8 %	93.0%	91.0%

The criterion "ensuring MOH discharge letter is completed with indication and duration" increased significantly from 25% to 52.4%, then to 78.3%, and finally to 85.1% over the cycles. The collaboration strategy among HODs has helped sustain the continuous improvement seen. Similarly, the criteria assessing the appropriateness of prescribing clopidogrel rose to 87.2% in Cycle 1, 94.2% in Cycle 2 and 98.0% in Cycle 3. The in-house clopidogrel assessment checklist proved remarkably helpful in improving clopidogrel usage appropriateness. Following the remedial actions taken in Cycles 1 and 2, the screening of prescription details, dispensing and counselling of patients had also improved following the simplified and streamlined work processes.

The expenditure for clopidogrel significantly decreased by 99% indicating potential cost savings and resource optimisation. The expenditure decreased from MYR42,705 during the verification study to MYR13,469 in Cycle 1, which further decreased to MYR1424 in Cycle 2 and finally to MYR438 in Cycle 3. These reductions reflect the overall success of interventions aimed at improving medication management practices, hence contributing to more efficient resource allocation, ultimately enhancing healthcare delivery efficiency and sustainability.

Lessons and Limitations

In our study, we encountered a limitation involving the synchronisation of patients' clinical data between healthcare clinics under Klang DHO and hospitals, as there was no integrated information technology system. Consequently, doctors in healthcare clinics relied on referral letters from tertiary hospitals to decide patient treatment plans, which posed a significant challenge to the study. Further complicating matters were referral letters with incomplete information.

Additionally, there was a significant gap between Cycles 2 and 3 due to the COVID-19 pandemic, during which all activities were temporarily put on hold. Despite these challenges, the project's objective was successfully achieved by engaging the relevant parties involved and underscoring the seriousness of inappropriate clopidogrel prescription. Following Cycle 2, doctors from tertiary settings ensured the completion of discharge letters with diagnosis and treatment duration information.

Coordinating with seven clinics also proved challenging., Nevertheless over twenty CME sessions were organised for all these doctors and pharmacists to ensure they were acquainted with the strategies. However, because numerous parties were involved, human factors prevented the standard of 100% being fully achieved.

Despite these challenges, valuable insights were gleaned. Prior to the study, pharmacists lacked certainty about patients' diagnoses and treatment plans. Implementing clopidogrel prescribing recommendations and an in-house assessment tool enabled prompt and

accurate determination of diagnosis and treatment plans. Additionally, the study's strength lay in the provision of adequate counselling and education to patients at the onset of therapy, which enhanced their understanding, thereby alleviating concerns about long-term misperceptions of clopidogrel.

This study underscored the importance of engaging a multidisciplinary team in initiating and sustaining successful change. Both prescribers and pharmacists play pivotal roles in ensuring optimal treatment outcomes for patients on clopidogrel, thereby enhancing patients' quality of life and reducing unnecessary healthcare costs. This project was awarded second place in the QA (oral category) during the Innovation Carnival organised by Selangor State Health Department in 2020. Sharing our experiences and providing guidance on implementing these remedial actions can foster replication of our project which can lead to widespread improvements in medication management across primary care facilities, benefiting patients and healthcare systems alike.

Conclusion and the Next Steps

In conclusion, the strategies employed have brought us closer to the study goals. The verification study revealed only 57% of patients were appropriately prescribed according to the duration and indication as recommended in CPG 2017 (14), compared to the standard of 100%. The main contributing factors were lack of reviews and interventions by doctors, and pharmacists, incomplete indication and duration in prescriptions by doctors and high demand from patients.

Strategies formulated in Cycle 1 were the development of an in-house guideline, a clopidogrel assessment checklist, CME sessions, Clopidogrel Intervention Mini Note, and BRUP. A counselling checklist and leaflet standardised information delivery to enhance communication and patient management.

In Cycle 2, five additional strategies were introduced, such as ensuring discharge letters included diagnosis and clopidogrel duration, replacing the mini note with a prescription note, QR codes for documentation and counselling pamphlet, and an online counselling between patients and pharmacists. After two cycles of remedial measures, the percentage of appropriate use of clopidogrel increased from 57% to 94.2%. A follow-up sustainability study, conducted in 2022, two years after Cycle 2, achieved a remarkable appropriateness rate of 98%, demonstrating the lasting impact of implemented strategies.

The study faced challenges due to the lack of an integrated IT system, incomplete referral letters, and coordination across seven clinics. Despite challenges faced, we gained better prescribing decisions through assessment tools, a more structured system to monitor the usage, and reducing misconceptions about clopidogrel use.

To date, we have incorporated the Clopidogrel Assessment Checklist into our local formulary to ensure sustainability and familiarity of these practices among new doctors and pharmacists.

References

1. Dorsam RT, Murugappan S, Ding Z, Kunapuli SP. Clopidogrel: Interactions with the P2Y12 receptor and clinical relevance. Hematology. 2003; 8(6):359-65. Available from: https://www.tandfonline.com/doi/abs/10.1080/10245330310001621260

2. Formulari Ubat KKM (FUKKM) | Program Perkhidmatan Farmasi. Available from: https://pharmacy.moh.gov.my/ms/apps/fukkm

3. Ean Pheng L, Syellawaty Ahmad N, Ping Wun C, Hairani Ishak I, Anthony T, Zhu Yun T. Q Bulletin, Volume 1, No. 31, Jan-Dec 2022. Improving the Appropriate Prescribing of Proton Pump Inhibitors (PPI) Among Referred Patients in Healthcare Clinics Under the Health Office of Klang District. Q Bulletin. 2022; 31(1)72-9. Available from: https://myjms.mohe.gov.my/index.php/qbulletin/article/view/16884/110054.

4. Norharlina S, Su Li W, Kar Mun N, Siti Fatimah AB, Sivasakthy V, Simran Kaur LS. September 2019. Utilisation Review Of Clopidogrel In Primary Care. [Poster Presentation] Selangor Research Day 2019.

5. Diener PHC, Bogousslavsky PJ, Brass PLM, Cimminiello PC, Csiba PL, Kaste PM.. Aspirin and clopidogrel compared with clopidogrel alone after recent ischaemic stroke or transient ischaemic attack in high-risk patients (MATCH): randomised, double-blind, placebo-controlled trial. Lancet. 2004;24;364 (9431):331–7.

6. NHS Post Script: Dual anti-platelet therapy. 2014; 82:1-2. Available from: https://ggcmedicines.org.uk/media/uploads/postscript/1407_ps_82.pdf

7. Fornós-Garrigós A, Orozco-Beltrán D, Gil-Guillén VF, Puig-Barberà J, Fluixa C, Fernández A. Appropriateness of clopidogrel use according to current recommendations. Fam Pract. 2014; 31(6):694–8. Available from: https://academic.oup.com/fampra/article/31/6/694/591414

8. Wijekoon CN. Audit of clopidogrel use in a medical clinic in a tertiary care hospital in Sri Lanka. J Ceylon Coll Physicians. 2016; 47:82–5. Available from: http://doi.org/10.4038/jccp.v47i2.7788

9. Ho WM, Hill C, Michael H, Winckel K. Evaluation of the duration of dual-antiplatelet therapy after percutaneous coronary intervention: a retrospective audit on the compliance with guidelines or cardiologist recommendation. J Pharm Pract Res. 2022; 52(1):42-8. Available from: https://onlinelibrary.wiley.com/doi/10.1002/jppr.1780

10. George NE, Shukkoor AA, Joseph N, Palanimuthu R, Kaliappan T, Gopalan R. Implementation of clinical audit to improve adherence to guideline-recommended therapy in acute coronary syndrome. Egypt Heart J. 2022; 1;74(4):1-7. Available from: https://pubmed.ncbi.nlm.nih.gov/35020077/

11. Jabri AM, Alqahtani A, Alhazmi A. Pharmacist role to enhance the prescribing of hospital discharge medications for patients after heart attack. Saudi Pharm J. 2020;28(4):463-469. doi: 10.1016/j.jsps.2020.02.009.

12. National Health Systems Resource Centre (NHSRC). Prescription Audit Guidelines. New Delhi: Ministry of Health and Family Welfare, Government of India; 2021. Available from: https://nhsrcindia.org/sites/default/files/2021-07/1534_Prescription%20Audit%20Guidelines16042021.pdf

13. Jawatankuasa Farmasi Ambulatori, Farmasi Bahagian Amalan Dan Perkembangan, Malaysia. Garis Panduan Sistem Pendispensan Ubat Bersepadu, 2021. Edisi Keempat.

14. Clinical Practice Guideline: Primary & Secondary Prevention of Cardiovascular Disease. 2017. Available from: https://www.moh.gov.my/moh/resources/Penerbitan/CPG/CARDIOVASCULAR/3.pdf

Acknowledgements

The authors would like to thank the Director-General of Health Malaysia for his approval to publish this article. Additionally, we would like to thank the Klang District Health Officer, Dr Masitah Binti Mohamed for her continuous support in institutional research endeavours.

Conflict of Interest

The authors declare that there was no conflict of interest.

Funding

This study received no specific grants from any funding agencies from the public, commercial or non-profit sectors.

Appendix 1: Clopidogrel Assessment Checklist

NO	CLOPIDOGREL CHECKLIST	
1	Reason to start clopidogrel (Please tick in the box below)	
		Post NSTEMI
		Post STEMI
		PCI / Stents Insertion
		Post CABG
		Allergy to aspirin (CAV / PVD)
		Recurrent CVA
		GIT Intolerance
		Others: Please specify: ….....
2	Treatment duration:	
	START date: ….....	
	Planned STOP date: ….....	
3	Contraindication to start clopidogrel (if present, please tick in the box below)	
		History of bleeding tendencies
		Allergy to clopidogrel
		Primary prevention
		Others: Please specify: ….....
4	Presence of warning signs /side effects:	
		Epistaxis
		Hematoma
		Bleeding
		Rashes
		Dyspepsia
		Others: Please specify: ….....
5	Compliance: ……. If not, please state the reason: ….....	
6	Vital signs: BP ……. PR …….	
7	Physical examination: Skin bruises, hematoma, rashes etc	
8	Investigation (if indicated): FBC/LFT/RP (eGFR)	
9	Plan:	
	i. Advice for compliance & continue clopidogrel in appropriate duration	
	ii. Potential for bleeding tendency	
	iii. Advice on risk of non-adherence	
	iv. Avoiding OTC	
	v. Advice on lifestyle modification - stop smoking, control BP, glucose, cholesterol, exercise	
	vi. TCA stat to KK/Hosp if presence of side effects/warning signs	
	vii. Next TCA: ….....	
10	Name of Doctor, signature and official stamp/Date	

CLOPIDOGREL PRESCRIBING RECOMMENDATIONS PKD KLANG 2019 **DURATION**		
1 Month	**12 Month**	**Lifelong**
Fibrinolytic therapy	NSTEMI ACS	Hypersensitivity to Aspirin
PCI with BMS	DES*	
Post CABG	NSTEMI (CABG)	
STEMI	NSTEMI (PCI with / without stent)	
	NSTEMI (with / without PCI)	
	PCI with BMS	
	PCI with DES*	
	STEMI (CABG)	
	Unstable Angina	
*DES duration for more than 1 year is being recommended in individual high-risk patients by some consultants due to concerns regarding later stent thrombosis on cessation of Clopidogrel therapy		

Appendix 2: Clopidogrel Counselling Checklist

Hospital/Klinik:
Patient Name:
Date of Birth:

Clopidogrel counselling checklist

This patient has been counselled on the following areas of Clopidogrel therapy by a pharmacist.

No	Counselling points	Sign	Comment
1.	What is Clopidogrel and how does it work		
2.	Indication for Clopidogrel		
3.	Alternative antiplatelet options/ dual antiplatelet therapy		
4.	Expected duration of therapy		
5.	How to take including dose, frequency, timing (aim to take at the same time every day) ● Clopidogrel can be taken with/ without food		
6.	Importance of adherence and persistence with treatment: ● Fairly rapid fall in drug levels (and therefore loss of effectiveness) if poorly compliant ● Important not to stop treatment unless discussed with doctor		
7.	What to do if a dose if missed – if unsure, talk to healthcare provider ● If a dose is missed take it as soon as possible, do not take a double dose ● Once daily dosing: take within 12 hours of missed dose, if more than 12 hours, omit the dose and then continue at the usual time		
8.	Extra dose taken accidentally? Contact doctor or healthcare team		
9.	Side effects and what to do if experienced		
10.	Potential for drug interactions		
11.	Alcohol intake		
12.	Procedures (including day surgery/ dental treatments etc); hospital admissions		
13.	Leisure activities: avoid contact sports (e.g. football, rugby, boxing) and other high-risk sports (e.g. skiing, and horse riding) as increased risk of head injury/ falls/ bruising/ bleeding		
14.	How to obtain further supplies		
15.	Who to contact for advice/ further information		
16.	Supply Clopidogrel Purple Card – patient to carry for follow up medication collection		
17.	Recheck patients understanding of the above points		
Counselled by: Sign & print name): ……. Designation: …….. Date: …….			
Patient's Signature: …… Date: ……..			