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REDUCING THE PERCENTAGE OF INAPPROPRIATE TRAMADOL PRESCRIBING IN THE EMERGENCY & TRAUMA DEPARTMENT OF HOSPITAL TUANKU AMPUAN NAJIHAH

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PRE-REQUISITE

1. Second place in JKN Negeri Sembilan Quality Assurance (QA) Convention 2022 (Poster category)
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CONFLICT OF INTEREST & FUNDING

This is an investigator-initiated and self-funded research. Hence, there is no third-party involvement and the author has no conflict of interest pertaining to the result and other parts of this study.

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ABSTRACT

Introduction: Tramadol use in the Emergency & Trauma Department (ETD) of Hospital Tuanku Ampuan Najihah (HTAN) increased by 45.7% between 2018 and 2020. A verification study showed 76.6% of tramadol prescriptions in the ETD were inappropriate. **Objective:** To reduce inappropriate tramadol prescribing in the ETD to 20% as agreed upon by the Pharmacy Department and ETD during Committee Meeting No. 1/20 on 3rd December 2020. **Method**: A quality improvement study using universal sampling of all ETD prescriptions containing tramadol was conducted. Data were collected from prescriptions, and an online questionnaire was distributed to ETD doctors and pharmacists to identify contributory factors. Remedial measures included simplifying the Pain Management in Emergency & Trauma Department Guideline (2nd edition) into a two-page ETD Pain Management Quick Note, available via QR code and in printed and pocket-sized formats. Educational sessions and focus group discussions were conducted to reinforce the Model of Good Care (MOGC). **Results:** The percentage of inappropriate tramadol prescribing in ETD reduced from 76.6% (556/726) to 18.5% (222/1,198) prescriptions with an Achievable Benefit Not Achieved (ABNA) of -1.5%. **Next step:** Ensure sustainable and appropriate tramadol use in ETD through interdepartmental collaboration, monitoring, guideline updates, and state-level approval processes. **Conclusion:** Implementation of remedial measures successfully reduced inappropriate tramadol prescribing in the ETD at HTAN.

Keywords: Tramadol prescribing, Emergency and Trauma Department, Emergency Pharmacy

INTRODUCTION

Hospital Tuanku Ampuan Najihah (HTAN) is a distinguished district hospital and the second-largest in Negeri Sembilan, located in Kuala Pilah. The Emergency & Trauma Department (ETD) at HTAN provides a wide range of comprehensive and holistic emergency care services. The department is staffed by a multidisciplinary team consisting of one Head of Department (HOD), six emergency physicians (EPs), 16 medical officers, eight house officers, 32 medical assistants, and 12 nurses. The ETD at HTAN is equipped with at least 24 beds, and patient care is organised into three treatment zones: the noncritical (Green), semi-critical (Yellow), and critical (Red) zones.

The Pharmacy Department is a critical clinical support unit that provides a wide range of services, including outpatient pharmacy services, inpatient pharmacy services, clinical pharmacokinetic services, ward pharmacy services, total parenteral compounding (TPN) and cytotoxic drug reconstitution (CDR) services, Pharmacy Resources Information Centre (PRIC) services, manufacturing and prepacking services, and pharmacy logistic services. The outpatient pharmacy consists of several units, with the Emergency Pharmacy serving as a key unit responsible for prescription screening, transcription, medication preparation, and dispensing, as well as providing pharmacist interventions and patient counselling for prescriptions originating from the ETD. The HTAN Emergency Pharmacy operates 24 hours a day. During office hours, the Emergency Pharmacy is managed by two pharmacists and one pharmacy assistant. After office hours, on-call duties are handled by a rotating team of 48 pharmacists and 11 pharmacy assistants. The Emergency Pharmacy receives an average of approximately 30,000 prescriptions per year.

Studies have shown that pain is the most common reason patients present to the emergency department, accounting for up to 78% of visits.[1] Pain is defined by the International Association for the Study of Pain (IASP) as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage”. In Malaysia, the “Pain Management in Emergency & Trauma Department Guideline (2nd edition)” was developed in 2020 by the Clinical Audit Unit, Medical Care Quality Section of Medical Development Division, Ministry of Health (MOH) in collaboration with the National Pain Free Programme Committee. This guideline serves to guide pain management in Emergency Medicine and Trauma Services (EMTS) as frontlines in the MOH hospitals and was adopted as the local HTAN pain management guideline at HTAN.

Pain is commonly treated and relieved with analgesics such as acetaminophen, non-steroidal anti-inflammatory drugs (NSAIDs) and opioids. Tramadol, a centrally acting weak opioid analgesic, is frequently prescribed, particularly in hospital settings. A study by Zin CS *et al.* reported that tramadol was the most commonly prescribed analgesic in public hospital outpatient settings in Malaysia, accounting for 37.9% of prescriptions (n=72,999).[2] Similarly, a retrospective study in Korea found that outpatient tramadol use increased from 19.9% in 2003 to 33.3% in 2013.[3] Although generally

considered safe, tramadol is associated with both common and serious side effects. Common adverse effects include dry mouth, nausea, dizziness, vomiting, constipation, and fatigue.[4] A study in Ireland reported that tramadol-related deaths increased from 9% in 2001 to 40% in 2011, highlighting the risks of misuse.[5] At ETD HTAN, tramadol use showed a rising trend between 2018 and 2020, increasing by 45.7%. This highlights the need to investigate factors contributing to tramadol use. To date, no studies have examined this issue using the HTAN research database.

PROBLEM STATEMENT AND OBJECTIVES

An analysis of tramadol prescription data from the ETD was conducted between October and December 2020 using a data collection form (Appendix 1) at the Emergency Pharmacy. The analysis revealed that, out of 726 tramadol prescriptions received from the ETD, 556 (76.6%) were deemed inappropriate prior to pharmacist intervention. In this study, inappropriate tramadol prescribing was defined as prescriptions not in accordance with the Pain Management in Emergency & Trauma Department Guideline (2nd edition), based on the indication and the patient's pain score. According to the guideline, tramadol is indicated for pain scores of four to six and is not recommended for managing tension headaches or migraines.[6] Using the SMART criteria (Seriousness, Measurability, Appropriateness, Remediability, and Timeliness), the high prevalence of inappropriate tramadol prescriptions was prioritised as a critical issue due to the increased risk of misuse, potential adverse effects, and unnecessary healthcare costs.

The aim of this study is to reduce inappropriate tramadol prescribing in the ETD. The specific objectives are to verify the magnitude of inappropriate tramadol prescribing, to determine the probable causes contributing to the high number of inappropriate tramadol prescriptions, to formulate and implement proper remedial actions, and to evaluate the effectiveness of these actions. The key indicator for improvement was measured using the percentage of inappropriate tramadol prescriptions in the ETD. The target standard, established by mutual consensus between the Pharmacy and ETD during the Committee Meeting No. 1/20 on 3rd December 2020, was set at less than 20%. The percentage of inappropriate prescriptions was calculated using the following formula:

$$\frac{\textit{Total number of tramadol prescriptions not following ETD Pain Management Guideline}}{\textit{Total number of tramadol prescriptions from ETD}} \times 100\%$$

A verification study was conducted using an online questionnaire distributed to 45 pharmacists and 15 ETD doctors to identify the most common contributing factor to the high number of inappropriate tramadol prescriptions in the ETD. The identified contributing factors were then visualised using a Problem Analysis Chart, as shown in Figure 1. The perceived contributing factors included doctors and pharmacists not adhering to the ETD pain management guidelines, common prescribing malpractices among doctors, a lack of pharmacist intervention, and low awareness of the

guidelines. The verification study supported these findings, with 100% of cases not following the guidelines, 86.7% demonstrating common prescribing malpractices, 77.8% reflected a lack of pharmacist intervention, and 48.3% demonstrated low guideline awareness among both doctors and pharmacists.

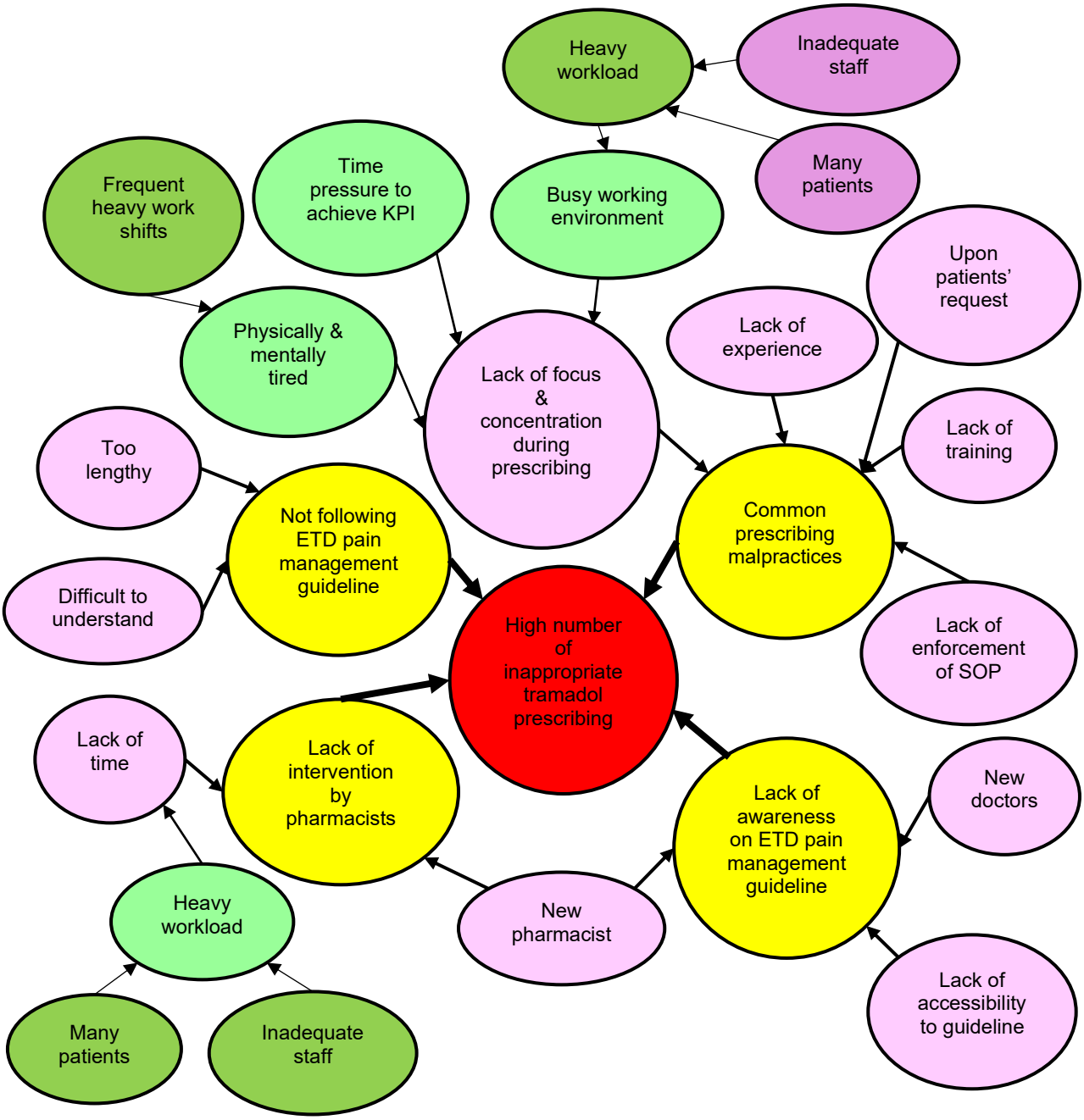

Figure 1: Problem Analysis Chart (ETD: Emergency and Trauma Department; KPI: Key Performance Indicator; SOP: Standard Operating Procedure)

The current process of care was reviewed, and critical steps were identified, as shown in Figure 2. Two critical steps were highlighted: the “prescription prescribed by doctor” step in the ETD, which serves as the main indicator, and the “prescription screened by pharmacist” step at the Emergency Pharmacy, analysed as a sub-process. Pharmacist intervention at this stage is important, as it can educate prescribers and improve prescribing practices for subsequent patients. The Model of Good Care (MOGC) was developed, and baseline data revealed that only 170 out of 726 tramadol prescriptions (23.4%) were appropriately prescribed by doctors. At the Emergency Pharmacy, pharmacist intervention occurred in only 150 out of 726 prescriptions (20.7%).

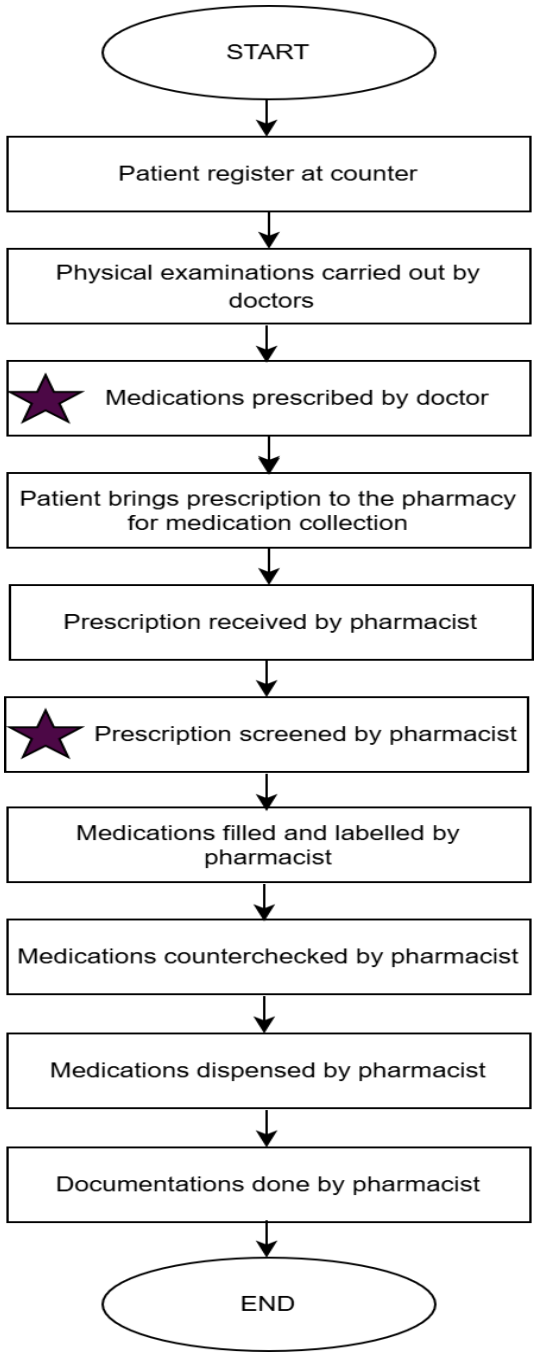

Figure 2: Process of care in ETD and Emergency Pharmacy

METHODOLOGY

A quality improvement study was conducted over a 17-month period using universal sampling of tramadol-containing prescriptions in the ETD. This study was conducted in three phases: problem verification, identification of contributing factors, and implementation of remedial measures. Problem verification was performed by analysing ETD prescription statistics from October to December 2020. The inclusion criteria included all adult ETD prescriptions containing tramadol. The study focused on adult patients because tramadol is generally not recommended for paediatric use due to safety concerns, including the risk of respiratory depression, seizures, and opioid-related adverse effects.[7] In December 2020, a verification study was conducted using an online questionnaire to identify the main factors contributing to the high rate of inappropriate tramadol prescriptions in the ETD. The questionnaire was developed based on the study objectives and input from ETD doctors and pharmacists. Prior to distribution, the questionnaire was pilot-tested among a small group of participants representative of the target population. Feedback from the pilot was used to refine the clarity, flow, and technical functionality of the questions. The finalised questionnaire was then distributed online via messaging platforms (e.g., WhatsApp or Telegram). Participants were provided with clear instructions and informed consent information before commencing the survey.

Following completion of the verification study, remedial actions were implemented from January to August 2021. Several strategies were brainstormed and prioritised to address the identified contributing factors. The initial remedial measure focused on the primary contributing factor: non-adherence to the ETD pain management guidelines among doctors and pharmacists. Both groups reported that the guidelines were lengthy and difficult to understand. As a result, the 46-page Pain Management in Emergency & Trauma Department Guideline (2nd edition) was summarised into a concise two-page ETD Pain Management Quick Note (Figure 3). This quick note was developed by a pharmacist, reviewed by an emergency physician, and endorsed by the ETD Head of Department. It is currently used by doctors and pharmacists at HTAN and is readily accessible in the ETD (Figures 3a and 3b) as well as in the Emergency Pharmacy.

This quick note was designed to guide doctors in prescribing analgesics, thereby influencing prescribing behaviour. It serves as a practical reference by outlining the types and dosage ranges of pain-relieving medications for various clinical pain scenarios. For pharmacists, the quick note functions as a reference tool when screening prescriptions that contain analgesics. The quick note is accessible via a QR code (Figure 3c). To further enhance accessibility, the ETD Pain Management Quick Note was printed in a pocket-sized format (Figure 3d) and distributed to all ETD doctors. Its compact design allows for convenient carriage and rapid reference during clinical practice.

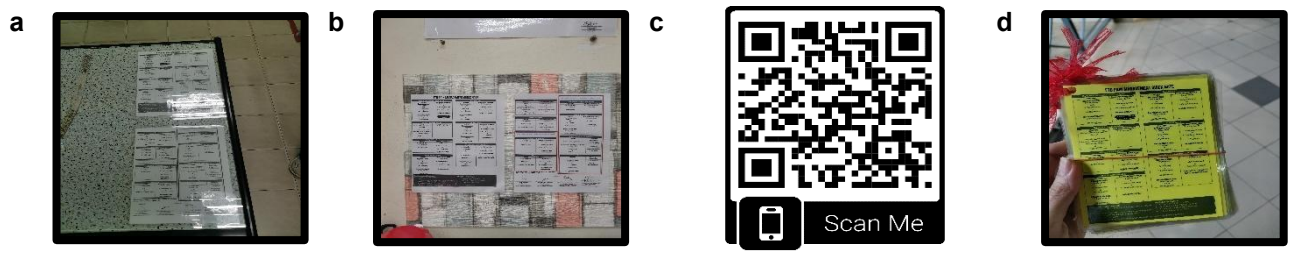

Figure 3: ETD Pain Management Quick Note with (a) printed version in Green Zone, ETD, (b) printed version in Yellow Zone, ETD, (c) QR code and (d) handy pocket-sized quick note

To further improve the utilisation of the ETD Pain Management Quick Note, a memorandum was issued by the Pharmacy Department regarding its distribution. This intervention aimed to encourage more frequent reference to and use of the quick guideline among doctors and pharmacists in clinical practice.

Subsequently, a collaborative approach between the Pharmacy Department and the ETD was implemented through three focus group discussions conducted from June to August 2021. These discussions aimed to promote adherence to and consistent use of the quick note among all ETD doctors as a reference tool, thereby standardising tramadol prescribing practices within the ETD. The focus group discussions were led by the ETD Head of Department, an emergency physician, and five pharmacists involved in the study.

In addition, a series of online continuing medical education (CME) sessions was conducted to emphasize the importance of preventing the inappropriate tramadol use in the ETD. These sessions aimed to improve tramadol prescribing practices in accordance with the ETD Pain Management guidelines and to support the Emergency Pharmacy in intervening when inappropriate tramadol use was identified. One of the key components of the sessions was reinforcing the criteria and standards defined in the Model of Good Care (MOGC) for this study. To date, 20 ETD doctors and 45 pharmacists have attended these sessions.

Post-remedial data collection was conducted over a six-month period, from September 2021 to February 2022, using the same data collection form (Appendix 1) to assess the effectiveness of the remedial actions. Data analysis was performed using Microsoft Excel, with descriptive data expressed as percentages. The data were analysed by calculating the inappropriate prescribing rate (b/a × 100%) and the intervention rate (c/b × 100%) for each month. These rates were used to evaluate prescribing practices and determine the effectiveness of the remedial interventions.

RESULT

The findings showed that, of the 1,198 tramadol prescriptions received from the ETD after the interventions, 222 (18.5%) were inappropriate. This represents a substantial reduction in inappropriate tramadol prescribing, from 556 of 726 prescriptions (76.6%) before the intervention to 222 of 1,198 prescriptions (18.5%) after the intervention. The Achievable Benefit Not Achieved (ABNA) decreased from 56.6% to −1.5% (Figure 4). Consequently, the predefined standard of 20% was achieved.

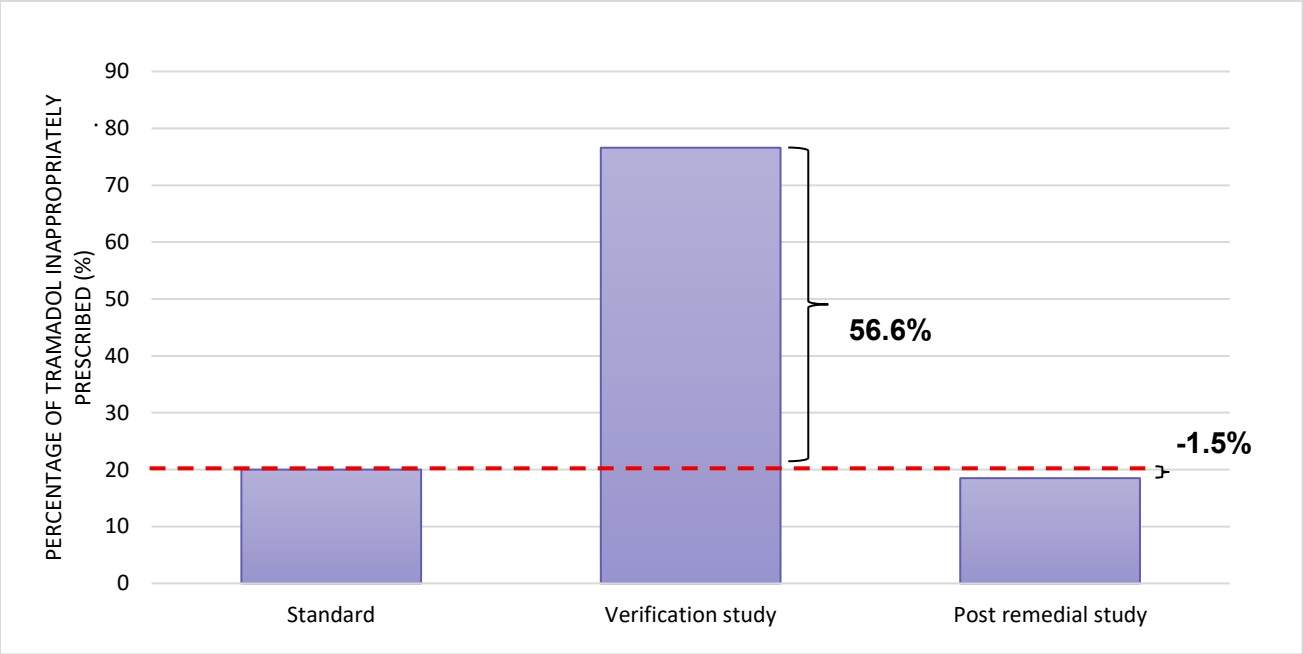

Figure 4: Inappropriate tramadol prescribing according to ETD Pain Management Guideline (ABNA Analysis)

For the Model of Good Care (MOGC), both critical steps demonstrated significant improvement following the interventions, although the predefined standards were not fully achieved (Table 1). Prior to the implementation of remedial measures, only 23.4% of tramadol prescriptions were prescribed appropriately by doctors, while pharmacists in the Emergency Pharmacy intervened in only 20.7% of inappropriate tramadol prescriptions. After the remedial measures were implemented, appropriate prescribing by doctors increased to 81.5%, and pharmacist intervention during prescription screening improved to 90.9%.

Table 1: Improvement on the Model of Good Care (MOGC) in ETD and Pharmacy

Step	Process	Criteria	Standard	Verification Data (N=726)	Post Remedial Study (N=1,198)
1	Prescribe medications	• All medications must be prescribed appropriately based on the indication and patient's pain score.	100%	**23.4%**	↑ **81.5%**
2	Screen prescriptions	• Check whether medications are prescribed appropriately based on the indication and patient's pain score and contact prescribers if there is any prescribing error.	100%	**20.7%**	↑**90.9%**

LESSONS AND LIMITATIONS

The primary strength of this study was the collaborative effort between ETD doctors and Pharmacy Department pharmacists, supported by strong involvement from HTAN senior management, which significantly contributed to the success of the project. The effective implementation of remedial measures not only improved the appropriateness of tramadol prescribing but also increased the rate of pharmacist interventions, thereby promoting the safe use of tramadol. In addition, verbal feedback from both physicians and pharmacists indicated that the pocket-sized quick reference note was a highly useful tool.

As this study involved only a single improvement cycle, the long-term sustainability of the remedial measures could not be determined. Factors such as staff turnover in the ETD and Emergency Pharmacy result in the regular arrival of new cohorts of doctors and pharmacists. Without ongoing implementation of the remedial measures, non-adherence to the quick reference note may occur, potentially affecting tramadol prescribing patterns in the ETD and the intervention process in the Emergency Pharmacy.

If this study were to be repeated, it would be valuable to collect data on tramadol-related costs during both the pre-remedial and post-remedial phases. This would allow for a comprehensive cost analysis to evaluate the financial impact of inappropriate tramadol prescribing practices. Such an analysis could highlight potential cost savings achieved through the implementation of standardised prescribing guidelines and other remedial measures. Furthermore, cost data would serve as a useful indicator for assessing the overall effectiveness and sustainability of the interventions, providing a strong justification for the continued enforcement of best practices and potential expansion of the initiative to other facilities.

NEXT STEP

To ensure the sustainability of the remedial measures, several actions were planned. First, a joint orientation session conducted by the ETD and the Pharmacy Department is proposed to provide continuous education and monitoring of appropriate tramadol prescribing in the ETD. Concurrently, designated team members will oversee tramadol prescriptions issued in the ETD and implement timely corrective actions as needed to sustain the current interventions and support ongoing improvements.

Second, ongoing efforts by HTAN senior management, the ETD team, and the Pharmacy Department are essential to ensure that the quick reference note is consistently updated in accordance with the latest guidelines. These efforts help maintain the relevance and accuracy of the remedial measures, ensuring their continued effectiveness over time. Regular updates and close collaboration among these departments are critical to adapting to changes or new evidence, thereby supporting the organisation's commitment to compliance and continuous quality improvement.

To ensure the successful expansion of the ETD Pain Management Quick Reference Note to Emergency Departments in other hospitals across Negeri Sembilan, strong collaboration between the ETD and Pharmacy Departments at each hospital is essential. This coordinated approach will help ensure that tramadol is prescribed strictly in accordance with established guidelines, thereby promoting safe and effective pain management practices. In addition, to formalise and legitimise this initiative, presentations should be made to the State Health Department. Securing their support and approval is critical to facilitating implementation, ensuring alignment with regional health policies, and obtaining the necessary resources for statewide adoption.

CONCLUSION

In conclusion, the remedial measures successfully reduced inappropriate tramadol prescribing in the ETD at HTAN. The development of the ETD Pain Management Quick Reference Note—available via QR code and in a pocket-sized printed format—together with interdepartmental collaboration through focus group discussions to standardise tramadol prescribing practices in the ETD and strengthen the role of the Emergency Pharmacy in addressing inappropriate prescriptions, were key contributors to this success. Support from HTAN senior management and a series of continuing medical education (CME) sessions highlighting the criteria and standards for critical steps in tramadol prescribing further reinforced these positive outcomes.

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APPENDIX

Appendix 1: Data collection form

Month/Year	Number of tramadol prescriptions from ETD (a)	Number of tramadol prescriptions not following the ETD Pain Management Guideline before intervention (b)	Number of tramadol prescriptions not following the ETD Pain Management Guideline AND intervened by Pharmacist (c)	Inappropriate prescribing rate b/a x 100%	Intervention rate c/b x 100%