RESEARCH ARTICLE

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Adherence to *Helicobacter pylori* Management Consensus in Clinical Practice at Two Tertiary Hospitals: A Large Cohort Study

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Abstract

Background: Many countries have launched *Helicobacter pylori* (HP) management guidelines to assist physicians, based on regional data. However, adherence is often assessed using questionnaires, which may not accurately reflect real-world practice. This study aimed to assess adherence to the Thailand Consensus on HP management through a retrospective chart review conducted at two tertiary hospitals in Thailand. **Materials And Methods:** This retrospective study was conducted at King Chulalongkorn Memorial Hospital (KCMH), located in the capital, and Phrapokklao Hospital (PPK), located in a province. Medical records of patients diagnosed with *Helicobacter pylori* (HP) infection via esophagogastroduodenoscopy (EGD) with a rapid urease test (RUT) between 2019 and 2021 were reviewed. Collected data included demographics, indications for HP testing, pre-EGD preparation, treatment regimens, and follow-up practices. **Results:** 2,136 medical records were reviewed: 1,987 KCMH and 149 PPK. Most patients were Thai under universal health coverage. Pre-diagnostic preparation at KCMH showed 98.5% discontinued proton pump inhibitors (PPIs) ≥2 weeks, compared to 83.9% at PPK ($p < 0.001$). Antibiotic discontinuation ≥4 weeks was higher at KCMH (98.6% vs 95.3%, $p = 0.009$). For first-line, KCMH (74.6%) received PPI-based triple therapy for 14 days, while 77.5% at PPK received concomitant therapy. 78% at KCMH confirmed HP eradicate vs 44.1% at PPK ($p < 0.001$). Eradication rates were comparable (95.9% at PPK vs 89.4% at KCMH: $p = 0.139$). **Conclusion:** This study highlights suboptimal adherence to the *Helicobacter pylori* (HP) consensus in provincial hospitals in Thailand, suggesting that future guidelines should address healthcare limitations outside the capital to enhance the overall quality of national healthcare.

Keywords: *Helicobacter Pylori*- Clinical Guidelines- Real-world practice- adherence

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Introduction

Helicobacter pylori (HP), first identified in 1982 [1], is a major pathogen associated with various upper gastrointestinal disorders, including peptic ulcer disease, gastritis, and gastric cancer [2, 3]. The global prevalence of HP infection exceeds 50% [4], with significant regional variations. In Southeast Asia, the prevalence of HP infection varies widely, ranging from 20% to 70% across countries, with a pooled estimated prevalence is approximately 43.1% [4-7]. Managing HP requires proper diagnosis, suitable treatment, and follow-up while following regional guidelines that consider local antibiotic resistance and healthcare systems.

Many countries have developed national consensus guidelines [8-13] to assist physicians in the management of HP. Thailand's most recent consensus guidelines, published in 2016 [14], recommend proton pump inhibitor (PPI)-based triple therapy for 14 days as the first-line treatment. Alternative regimens, including sequential and concomitant therapies, are also suggested. However, adherence to these guidelines in routine clinical practice, particularly in provincial areas, remains uncertain.

Previous assessments of adherence to HP management guidelines have primarily relied on physician questionnaires [15-19], which may not accurately reflect real-world clinical practice. A more reliable approach involves retrospective chart reviews to objectively evaluate clinical decision-making. This study aimed to assess adherence to the Thailand Consensus on HP management through a retrospective review of medical records from two tertiary care hospitals in Thailand, representing both urban and provincial settings. By evaluating diagnosis, treatment regimens selection, and follow-up practices, this study seeks to provide insights into guideline implementation and identify potential gaps in clinical practice.

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Materials and Methods

Study design

This descriptive, retrospective large cohort study was conducted at two tertiary care hospitals in Thailand: King Chulalongkorn Memorial Hospital (KCMH) in Bangkok, an urban hospital, and Phrapokklao Hospital (PPK) in Chanthaburi, a provincial hospital. The study reviewed medical records of patients diagnosed with HP infection between 2019 and 2021.

Study population

All eligible patients aged 18 years or older diagnosed with HP infection confirmed by EGD with rapid urease test and/or with histological examination from the division of Gastroenterology, Department of Internal Medicine at KCMH and PPK between 2019 and 2021, were included. Patients with upper gastrointestinal bleeding or incomplete medical records were excluded. All included patients were first categorized into the pre-treatment group to assess diagnostic adherence. Those who did not have the record of HP treatment were later excluded from the treatment and follow-up period assessment.

Data collection

Data from outpatient and inpatient electronic medical records, including endoscopy logs from the division of Gastroenterology, Department of Internal Medicine at KCMH and PPK, were recorded in a case record form designed for this study. Collected variables included:

Patient demographics

Gender, age, nationality, currently use of aspirin/NSAIDs, comorbidities, medicals rights, family history of gastric cancer, type of specialty providing treatment.

Pre-EGD preparation and diagnostic details

Indications for HP testing and the duration of discontinuation of PPIs and antibiotic before HP testing.

HP treatment details

Number of patients who received treatment, type and duration of treatment regimens.

Confirmation tests preparation and follow-up details: Eradication rate for each line of treatment, type and duration of eradication confirmation tests.

These variables, including patient demographics, were analyzed to assess adherence in three main aspects: diagnosis, treatment, and follow-up, based on Thailand Consensus on HP Treatment 2015 [14]

Study outcomes

The outcome of this study is adherence to Thailand Consensus on HP Treatment 2015[14] in clinical practice for diagnosis, treatment, and follow-up of patients with HP infection in KCMH in the capital and PPK in a province of Thailand.

Operative definitions

Adherence to diagnostic guidelines

Measured by the percentage of patients who comply with pre-diagnostic and diagnostic recommendations according to Thailand Consensus on HP Treatment 2015 [14]. This includes the Indications for HP testing and the duration of discontinuation of PPIs and antibiotic before HP testing.

Adherence to treatment guidelines

Measured by the percentage of patients who received the recommended first-line, second-line and third-line treatment according to Thailand Consensus on HP Treatment 2015 [14].

Adherence to follow-up guidelines

Measured by the percentage of patients who comply with confirmation tests preparation and follow-up recommendations according to Thailand Consensus on HP Treatment 2015 [14]. This includes the type of the confirmation tests and the duration of discontinuation of PPIs and antibiotic before confirmation tests.

Statistical analysis

Descriptive statistics were used to summarize baseline characteristics and adherence outcomes. Continuous variables, such as age, were presented as means ± standard deviations (SD) and compared using independent t-tests. Categorical variables were expressed as frequencies and percentages and analyzed using the chi-square test. A p-value < 0.05 was considered statistically significant. Eradication rates and adherence to diagnostic, treatment, and follow-up guidelines were compared between the two hospitals.

Ethical considerations

The study was approved by the Institutional Review Boards of both hospitals (IRB number 0170/66 at KCMH and 047/67 at PPK). Patient confidentiality was ensured by anonymizing records and removing identifiers. The study adhered to ethical principles outlined in the Declaration of Helsinki.

Results

Study population and baseline characteristics

Between 2019 and 2021, a total of 2,344 confirmed HP infection cases confirmed by EGD with rapid urease test and/or histology were identified (2,132 from KCMH and 212 from PPK). After excluding 208 patients (145/2,132, 6.8% from KCMH and 63/212, 29.7% from PPK) due to either incomplete medical records (50/145 from KCMH and 1/63 from PPK) or upper gastrointestinal bleeding (95/145 from KCMH and 62/63 from PPK), 2,136 medical records were included in the pretreatment group and reviewed for this analysis (1,987 from KCMH and 149 from PPK). Patients who did not have the record of HP treatment (231 from KCMH and 37 from PPK) were subsequently excluded, resulting in a treatment group of 1,756 patients at KCMH and 112 at PPK as shown in Figure 1.

The demographic and baseline clinical characteristics of the participants are summarized in Table 1. Male patients accounted for 43.3% of the KCMH and 51% of

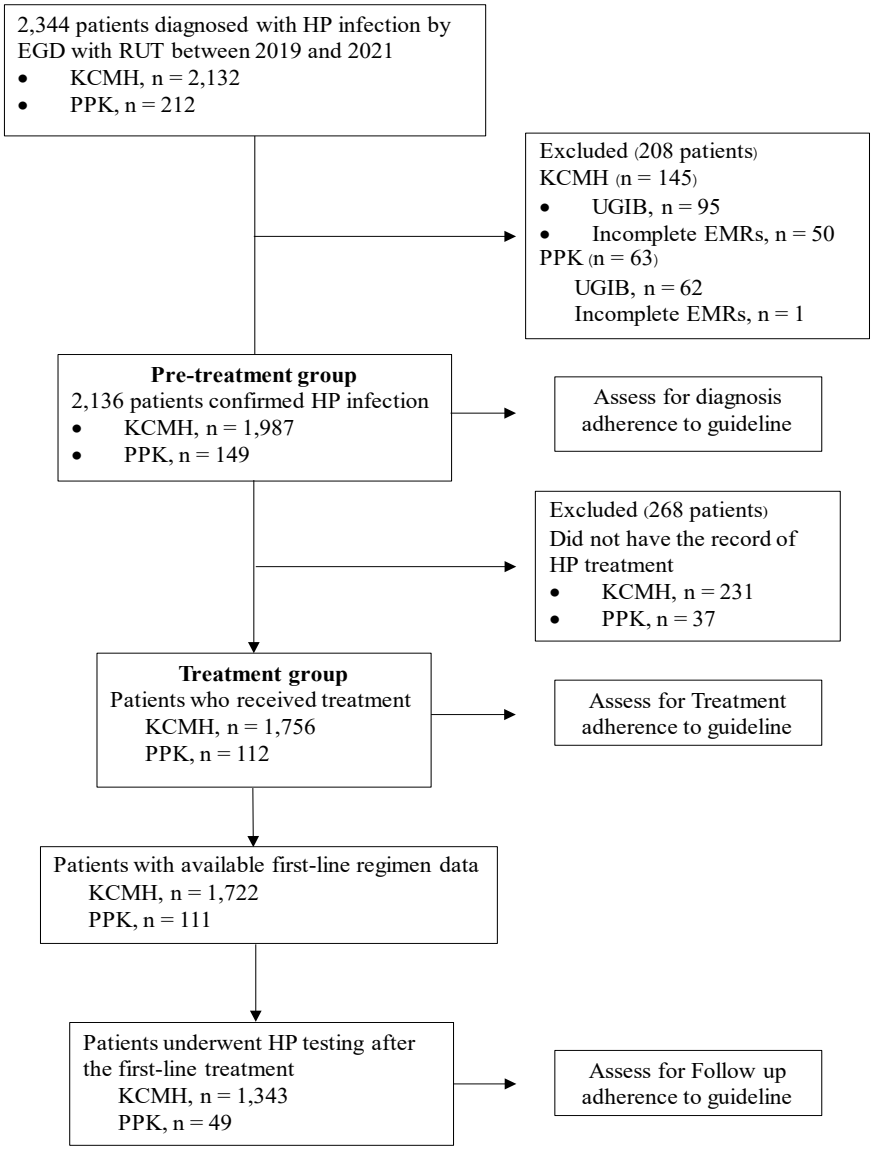

Figure 1. Study Flowchart

Table 1. Baseline Characteristics of the Participant

	KCMH (n=1987)	PPK (n=149)	P value
Gender			0.06
Male (n), %	861 (43.3)	76 (51)	
Age (years), mean (SD)	58.17 ± 12.93	58.48 ± 14.63	0.803
Nationality			0.088
Thai (n), %	1918 (96.5)	148 (99.3)	
Others (n), %	69 (3.5)	1 (0.7)	
Currently using Aspirin (n), %	68 (3.4)	13 (8.7)	0.001
Currently using NSAIDs (n), %	19 (1)	1 (0.7)	0.022
Comorbidities (n), %	1356 (68.2 %)	97 (65.1 %)	0.886
Medical rights			0.107
Universal coverage (n), %	1948 (98)	148 (99.3)	
Cash (n), %	38 (1.9)	1 (0.7)	
Family history of gastric cancer (n), %	8 (0.4)	-	1
Type of Primary doctor			0.516
Gastroenterologist (n), %	1978 (99.5)	148 (99.3)	
Others (n), %	9 (0.5)[1]	1 (0.7)[2]	

[1], Internal medicine resident n=4, General surgeon n=3, Colorectal surgeon n=1, infectious disease specialist n=1; [2], General surgeon n=1

the PPK with a mean age at KCMH of 58.17 ± 12.93 years and 58.48 ± 14.63 years at PPK (p = 0.803). The majority of participants at both centers were Thai nationals, comprising 96.5% of the KCMH and 99.3% of the PPK (p = 0.088). Current aspirin use was significantly higher at PPK (8.7%) than at KCMH (3.4%, p = 0.001), whereas NSAID use did not differ significantly between centers (0.7% at PPK vs 1% at KCMH, p = 0.022). Comorbidities were reported by 68.2% of KCMH patients and 65.1% of PPK patients (p = 0.886). Universal coverage was similar in the PPK (99.3%) and KCMH (98%, p = 0.107). Only 0.4% of KCMH patients reported a family history of gastric cancer, and no patients in PPK reported. Additionally, Gastroenterologists were the primary providers of care, with comparable proportions between the two hospitals (99.5% at KCMH vs 99.3% at PPK, p = 0.516).

Primary outcomes (Table 2)

Adherence to diagnostic guidelines

Peptic ulcer and gastric erosions were the most common indications for HP testing in both hospitals, which were found more frequently at KCMH (1,841/1,987, 92.6%) than at PPK (130/149, 87.2%) (p = 0.017). All indications followed Thailand Consensus on HP Treatment 2015[14]. In term of pre-diagnosis preparation as recommended by the guidelines, discontinuation of PPIs for at least two weeks before HP testing at KCMH was significantly higher than at PPK (1,959/1,987, 98.5% vs 125/149, 83.9%; p < 0.001). Antibiotic discontinuation for at least four weeks prior to testing was higher at KCMH (1,958/1,987, 98.6%) compared to PPK (142/149 95.3%; p = 0.009).

Adherence to treatment guidelines

From the treatment group (1,756 patients at KCMH and 112 patients at PPK), first-line therapy was administered to 1,722/1,756 patients at KCMH and 111/112 patients at PPK. Among those receiving first-line therapy, the majority of patients at KCMH (1,284/1,722, 74.6%) received PPI-based triple therapy for 14 days, in line with consensus recommendations. In contrast, most of the patients at PPK (86/111, 77.5%) received concomitant therapy, an alternative first-line treatment recommended by the consensus. Non-adherence to first-line regimens due to documented penicillin allergies or unspecified reasons was more common at KCMH (430/1,722, 25% vs 5/111, 4.5%; p < 0.001), which included documented penicillin allergies in 9.8% (n = 42/430) at KCMH and 60% (3/5) at PPK. Both hospitals followed the consensus on the second-line treatment (25 patients at KCMH and 1 patient at PPK).

Table 2.Comparing the Adherence to *H. pylori* Infection Consensus between Two Hospitals

	KCMH (n=1987)	PPK (n=149)	P value
Indications for Helicobacter pylori test			
Peptic ulcer diseases and gastric erosions (%)	1841 (92.6)	130 (87.2)	0.017
Chronic NSAIDs/ASA use with a history of peptic ulcer diseases or multiple risk factors of upper GI bleeding (%)	118 (5.9)	13 (8.7)	0.172
Marginal zone B-cell lymphoma (MALT type) (%)	3 (0.2)	1 (0.7)	0.251
Dyspepsia that did not respond to anti- secretory drugs (%)	10 (0.5)	-	1
Family history of gastric cancer in the first degree relative without GI symptom (%)	2 (0.1)	-	1
Gastric cancer (%)	13 (0.7)	5 (3.4)	0.006
Preparation before H. pylori test			
Stop antibiotic more than 4 weeks before the test (%)	98.60%	95.30%	0.009
Stop proton-pump inhibitor more than 2 weeks (%)	98.50%	83.90%	<0.001
Treatment			
Receiving the first-line therapy regimen	KCMH (n= 1722)	PPK (n = 111)	P value
First line therapy recommendation			
PPI-based triple therapy 14 days (%)	1284 (74.6)	20 (18)	< 0.001
Alternative first-line therapy recommendation			
Sequential therapy (%)	4 (0.2)	-	1
Concomitant therapy (%)	4 (0.2)	86 (77.5)	< 0.001
Did not follow the recommendation for the 1st line treatment (%)	430 (25)	5 (4.5)	< 0.001
Due to penicillin allergy	42	3	
Unknown	388	2	
Number of patients underwent HP testing after the first-line treatment (%)	1343 (78)	49 (44.1)	< 0.001
Eradication rate of first-line therapy regimen	89.40%	95.90%	0.139
Receiving second-line therapy regimen	KCMH (n= 25)	PPK (n = 1)	
Levofloxacin-amoxycillin triple therapy (%)	5 (20)	1 (100)	0.31
Bismuth-containing quadruple therapy (%)	18 (72)	-	0.621
Did not follow the 2nd line treatment (%)	2 (8)	-	1
Eradication rate of second-line therapy regimen	81%	100%	1

Adherence to follow up guidelines

For first-line treatment, two-thirds (1,343/1,722, 78%) of KCMH patients underwent testing to confirm HP eradication, while only half (49/111, 44.1%) of PPK patients had the confirmation test after HP treatment ($p < 0.001$). The most common method for confirming eradication after treatment across all-lines, including first-line, second-line and third-line treatments is urea breath test (1,256/1,372, 91.5%) at KCMH, while PPK is EGD with RUT (34/50, 68%). All patients discontinued PPIs for at least two weeks and antibiotics for at least four weeks before confirmation tests.

Eradication rates

The overall eradication rate of first-line therapy was slightly higher at PPK (47/49, 95.9%) than at KCMH (1,200/1,343, 89.4%), although the difference was not statistically significant ($p = 0.139$). Stratified by first-line regimen, PPI-based triple therapy for 14 days achieved eradication in 89.6% of patients at KCMH (907/1,012) and 77.8% at PPK (7/9), with no statistically significant difference between hospitals ($p = 0.241$). Sequential therapy, which was used only at KCMH, achieved an eradication rate of 66.7% (2/3). Concomitant therapy achieved eradication rate in 33.3% of patients at KCMH (1/3) and in all patients at PPK (39/39, 100%) ($p = 0.003$). For second-line therapy, both hospitals demonstrated excellent adherence to consensus recommendations, with PPK achieving a 100% eradication rate (1/1) compared to 81% (17/21) at KCMH. Stratified by second-line regimen, levofloxacin–amoxicillin triple therapy achieved eradication rates of 50% (2/4) at KCMH and 100% (1/1) at PPK, whereas bismuth-containing quadruple therapy achieved an eradication rate of 93.3% (12/15) at KCMH. However, these findings should be interpreted with caution due to small sample sizes and imbalanced regimen use across centers for both first-line and second-line therapies.

Discussion

This study highlighted significant differences in adherence to certain aspects of the Thailand HP Consensus 2015 [14] between urban and provincial settings. KCMH which is located in the capital, had better adherence in diagnostic preparation and follow-up practices than PPK which is located outside capital. This was demonstrated by a higher proportion of patients discontinuing PPIs and antibiotics before testing, as well as a greater number returning for eradication confirmation.

Consistent with these findings, differences in adherence between urban and provincial hospitals remain challenging, as demonstrated in the previous studies relating to HP management [19, 20] and other diseases [21, 22], where provincial or rural populations often face greater barriers, leading to lower adherence despite national guidelines and usually contributing to poorer clinical outcomes [23].

Within the Thai healthcare context, structural differences between healthcare settings provide important insight into barriers to adherence to HP management. University-based tertiary referral centers in the capital, such as KCMH, operate within a more comprehensive healthcare system, with greater institutional and insurance support, whereas provincial tertiary hospitals like PPK, may have more limited access. Accordingly, several factors are believed to contribute to differences in adherence to HP management. We broadly categorized them into three main domains: healthcare infrastructure, patient-related factors, and physician-related factors.

Healthcare infrastructure, such as the availability of diagnostic tools [24, 25], systematic guideline dissemination and universal insurance coverage [26], directly influences both diagnostic and confirmation preparation. These resources are available in urban hospitals like KCMH, allowing for appropriate testing as guideline recommendation. In contrast, provincial hospitals like PPK have limited accessibility to testing, and patients have to pay for non-invasive tests eg. urea breath test, leading to lower adherence to diagnosis and follow-up. Patient-related factors including financial constraints [24, 25], transportation barriers [25, 27], caregiving responsibilities [25], and limited health knowledge [24, 25, 27] contribute to the challenges faced in provincial areas when preparing for diagnostic testing and returning for eradication confirmation. Patients in these areas often struggle with transportation difficulties, and the need for frequent follow-up visits can lead to lost income, making it harder for them to attend appointments regularly or at all. Physician-related factors are another key determinant of adherence disparities. Although the primary doctors responsible for managing HP treatment in both hospitals were gastroenterologists, at PPK, gastroenterologists primarily serve as consultants and collaborate with general physicians in patient management, which may lead to inconsistencies in HP management [27, 28]. Additionally, follow-up care is sometimes transferred to general physicians, which may result in suboptimal management, affecting follow-up practices [29, 30].

To improve accessibility and standardize care, targeted policy interventions are required, particularly in resource-limited settings [31]. This includes the expansion of diagnostic services into community settings by using non-invasive testing through hospitals and primary care facilities [32]. Moreover, increasing subsidies for non-invasive tests through the Universal Coverage Scheme and integrating at-home testing options such as stool antigen tests [33] with mail-in return services, would further improve accessibility and reduce transportation burdens for patients. Beyond improving infrastructure, interventions addressing patient attitudes, health awareness, and behavioral adherence also contribute to improve adherence. A recent study [34] identified that common reasons for non-adherence are patients forgetting or being unaware of their HP infection, being too busy to attend appointments and remaining asymptomatic after treatment. Implementing communication interventions, such as family-based or technology-enhanced follow-up systems, including integrating mobile platforms for appointment reminders and involving family members in the care process have been shown to significantly

improve patient adherence to follow-up and eradication confirmation. Simultaneously, enhancing physician awareness, maintaining updated knowledge of guideline recommendations, and promoting attitudes toward follow-up and patient education are essential to optimize adherence and treatment outcomes [19].

For treatment, most patients at both hospitals received treatment in guideline-recommended regimens, PPK more frequently used an alternative first-line therapy (concomitant regimen), whereas standard PPI-based triple therapy for 14 days regimen was more commonly used at KCMH. Despite differences in first-line regimen selection, both hospitals achieved high eradication rates, with 95.9% at PPK and 89.4% at KCMH, without a statistically significant difference ($p = 0.139$). In this context, the results align with international guidelines [8, 10, 12] that have recommended concomitant therapy as a first-line options, while also indicating that PPI-based triple therapy for 14 days remains an effective option in regions where clarithromycin resistance rates are below 15%, such as Thailand [5]. This information supports the strategy to address the alternative first-line treatment in the guideline to serve the limitation in some areas.

The strengths of this study include its systematic comparison of adherence to HP management between urban and provincial settings in Thailand, providing real-world evidence of adherence to the Thailand Consensus on HP Management 2015 [14]. This is crucial to optimize HP management outcomes and improve the quality of national healthcare in the country. The large sample size (2,136 records) and objective measurement strengthen its reliability and validity, offering a comprehensive analysis of practice patterns. From our findings, future guidelines should be adapted to comply with real-life practice. For instance, selecting first-line treatment regimens with higher eradication rates may be preferable to reduce the need for confirmation of eradication. Furthermore, studies evaluating the cost-effectiveness of follow-up testing remain warranted.

However, there are several limitations. First, the guideline assessed in this study was published in 2016 [14] and did not emphasize antibiotic susceptibility testing or screening programs for gastric cancer, which have been increasingly highlighted in recent evidence as part of resistance-driven strategies [12, 13] and gastric cancer surveillance programs[12]. Second, as a retrospective study, data were collected from patients diagnosed using a single method EGD with RUT within the gastroenterology department, which may not fully represent all diagnostic methods. In addition, indications for HP testing were grouped according to the Thailand Consensus 2015 [14], limiting further differentiation between peptic ulcer disease and gastric erosions. Third, although we attempted to include all eligible patients, ensuring a representative sample and minimize selection bias, the absence of treatment data in more than 10% of cases at both KCMH and PPK could affect the accuracy of the results of this study. Fourth, the large sample disparity between hospitals could affect the data homogeneity, with KCMH data dominating trends and PPK's smaller sample limiting provincial variability. Finally, as this study was conducted in only two tertiary hospitals, the findings may not fully represent the real clinical practice across Thailand.

In conclusion, adherence to the consensus of HP management remains suboptimal, influenced by several factors, including healthcare infrastructure, patient-related factors, and physician-related factors. Developing a strategy to address the alternative recommendations in the guideline and to overcome limitations in certain regions would provide an effective resolution.

Author Contribution Statement

Rapat Pittayanon conceptualized the study design, revised the manuscript draft, and approved the final version. Pudit Chinniyomwanich collected and analyzed the data and drafted the manuscript. Puth Muangpaisarn served as the second reviewer and coordinated research activities.

Acknowledgements

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Patient Consent Statement

The requirement for informed consent was waived by the institutional review board due to the retrospective design of the study and the use of anonymized patient data.

Ethical considerations

The study was approved by the Institutional Review Boards of both hospitals (IRB number 0170/66 at KCMH and 047/67 at PPK). Patient confidentiality was ensured by anonymizing records and removing identifiers. The study adhered to ethical principles outlined in the Declaration of Helsinki.

Permission to Reproduce Material from Other Sources

This study does not contain any previously published material that requires permission to reproduce.

Clinical Trial Registration

This study does not involve a clinical trial and was therefore not subject to clinical trial registration requirements.

Conflicts of interest

The authors declare no conflicts of interest.

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