

Antibiotics Smart Use: a workable model for promoting the rational use of medicines in Thailand

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Abstract The Antibiotics Smart Use (ASU) programme was introduced in Thailand as a model to promote the rational use of medicines, starting with antibiotics. The programme's first phase consisted of assessing interventions intended to change prescribing practices; the second phase examined the feasibility of programme scale-up. Currently the programme is in its third phase, which centres on sustainability. This paper describes the concept behind ASU, the programme's functional modalities, the development of its conceptual framework and the implementation of its first and second phases. To change antibiotic prescription practices, multifaceted interventions at the individual and organizational levels were implemented; to maintain behaviour change and scale up the programme, interventions at the network and policy levels were used. The National Health Security Office has adopted ASU as a pay-for-performance criterion, a major achievement that has led to the programme's expansion nationwide. Despite limited resources, programme scale-up and sustainability have been facilitated by the promotion of local ownership and mutual recognition, which have generated pride and commitment. ASU is clearly a workable entry point for efforts to rationalize the use of medicines in Thailand. Its long-term sustainability will require continued local commitment and political support, effective auditing and integration of ASU into routine systems with appropriate financial incentives.

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Background

Antimicrobial resistance poses a serious threat to human health and welfare and undermines national economies worldwide. Annual losses stemming from antimicrobial resistance are estimated to range from 21 000 million to 34 000 million dollars in the United States of America¹ and about 1500 million euros in Europe.² According to a recent study in Thailand, in 2010 antimicrobial resistance was responsible for at least 3.2 million extra hospitalization days and 38 481 deaths, and for losses amounting to 84.6–202.8 million United States dollars (US\$) (exchange rate: 30 Thai baht per US\$) in direct medical costs and more than US\$ 1333 million in indirect costs.³

There is a positive correlation between antimicrobial resistance and the consumption of antibiotics.^{4–6} In Thailand, the use of new generation antibiotics, such as ceftriaxone and oral azithromycin, has increased over time.⁷ Since 2000, antibiotics and other antimicrobials have been the most manufactured and imported drugs in Thailand. In 2009, the total value of antibiotic manufacturing and importation into Thailand amounted to approximately US\$ 367 million, with penicillins, cephalosporins and carbapenems in the lead.⁸

Unnecessary use of antibiotics is seen among both health professionals and the public.^{9–12} In European countries, systemic antibiotics are prescribed in the greatest volumes to ambulatory patients, mostly for respiratory tract infections.¹³ In Thailand, a study in a tertiary care hospital revealed that only 7.9% of the upper respiratory tract infections (URIs) in the facility were caused by bacteria.¹⁴ Despite this, in Thailand most URIs are treated with antibiotics by hospitals, health centres, drug stores and patients themselves.^{10,15–18} Liberal use of antibiotics endangers the health of patients without observable clinical benefits, since it neither reduces the rate of complications nor quickens recovery when the illness is caused by a virus.^{14,19}

Increasing awareness of antimicrobial resistance and promoting the rational use of antibiotics among prescribers and the general public are key to combating the unnecessary use of these drugs.^{13,20–24} Some important programmes have been launched in developed countries. They include Strama in Sweden;²² the *Get Smart: know when antibiotics work* programme of the US Centers for Disease Control and Prevention,²³ and several national public campaigns in Europe.^{20,24} A 2007 review showed that the interventions undertaken by Thailand so far to contain antibiotic resistance had only been partially suc-

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cessful,⁷ probably because of the vertical nature of the organizations responsible for the prevention of antimicrobial resistance, the lack of inter-agency coordination and the absence of a focal point in charge of synchronizing activities across agencies. Thailand's efforts to promote the rational use of antibiotics were inconsistent, unfocused and scattered across different organizations.²⁵

Antibiotics Smart Use (ASU) was introduced in 2007 as an innovative model to promote the rational use of medicines and counteract antimicrobial resistance. It was established for two major reasons. First, few resources were available for the fight against the irrational use of antibiotics, which was rampant. Using these few resources to empower health professionals and the public was seen as an expedient and efficient way to galvanize improvements by inducing individual behaviour change while creating a critical mass of people who could conduct advocacy and promote the rational use of antibiotics. Second, the rational use of medicines as a concept was not always getting translated into practice, and the ASU model was felt to be useful in bridging this gap.

ASU is action research that has evolved through three phases. During phase 1 (2007–2008), behaviour change interventions targeting antibiotic prescription practices were implemented and assessed; in phase 2 (2008–2009), the feasibility of scaling up the programme was examined; in phase 3 (2010–present), in progress, steps are being taken to identify mechanisms for programme sustainability. This paper describes the concept of ASU and explains the programme's operation, as well as how the rational use of medicines gets translated from theory into practice through ASU activities. It also discusses the factors influencing prescription practices and the challenges observed and lessons learnt in phase 1 and phase 2. Phase 3 is not included, as it is not yet completed. The outcomes of ASU evaluation will be presented in a separate paper.

The concept of Antibiotic Smart Use

The guiding principle of ASU is that antibiotics should not be used to treat non-bacterial infections. This notion derives from a fundamental precept

of the rational use of medicines: that these should be used appropriately, in accordance with clinical needs.^{26,27} ASU started by attempting to reduce the unnecessary use of antibiotics in patients with three conditions: URIs, especially the common cold with sore throat; acute diarrhoea and simple wounds. The ASU programme targets ambulatory patients older than 2 years and in good general health. Patients who are hospitalized or who have diabetes, a compromised immune system or any other serious health condition are not eligible for participation in ASU.

To facilitate its adoption, ASU is assessed in terms of five dimensions: simplicity, compatibility with providers' values, advantages relative to current practice, testability and observability (i.e. the extent to which anyone can observe ASU activities and outcomes).²⁸ In focus group discussions, health professionals have expressed the view that ASU is not complex and that it is compatible with their professional values, which are, namely, to procure patients' safety and good health. ASU is easy to test and its outcomes can be easily observed, since the targeted diseases are self-limiting and not life-threatening. However, opinions were mixed when it came to the relative advantages of ASU. Its financial advantages were discussed at length. Under the capitation payment system – in which health-care providers are paid in accordance with the number of registered members of health insurance schemes in their catchment areas rather than the quantity of the services they provide – ASU is beneficial because it minimizes expenditure on unnecessary antibiotics and allows profit margins. However, in a fee-for-service payment system, in which health-care providers' income depends on the quantity of the services provided, including the number of drugs prescribed, ASU is not attractive to hospitals unless they can somehow cover the income loss resulting from fewer antibiotic prescriptions. We believe that, when judged in light of these five dimensions, ASU has features that make its adoption by health professionals likely.

Operational modalities

ASU is run by a multidisciplinary team of health professionals whose common objective is to promote the rational use

of antibiotics. The programme is organized on two levels: a network of multidisciplinary groups (i.e. local partners) at the health-care delivery level, and a network of policy-makers, academics and researchers from national agencies and universities (i.e. central partners).

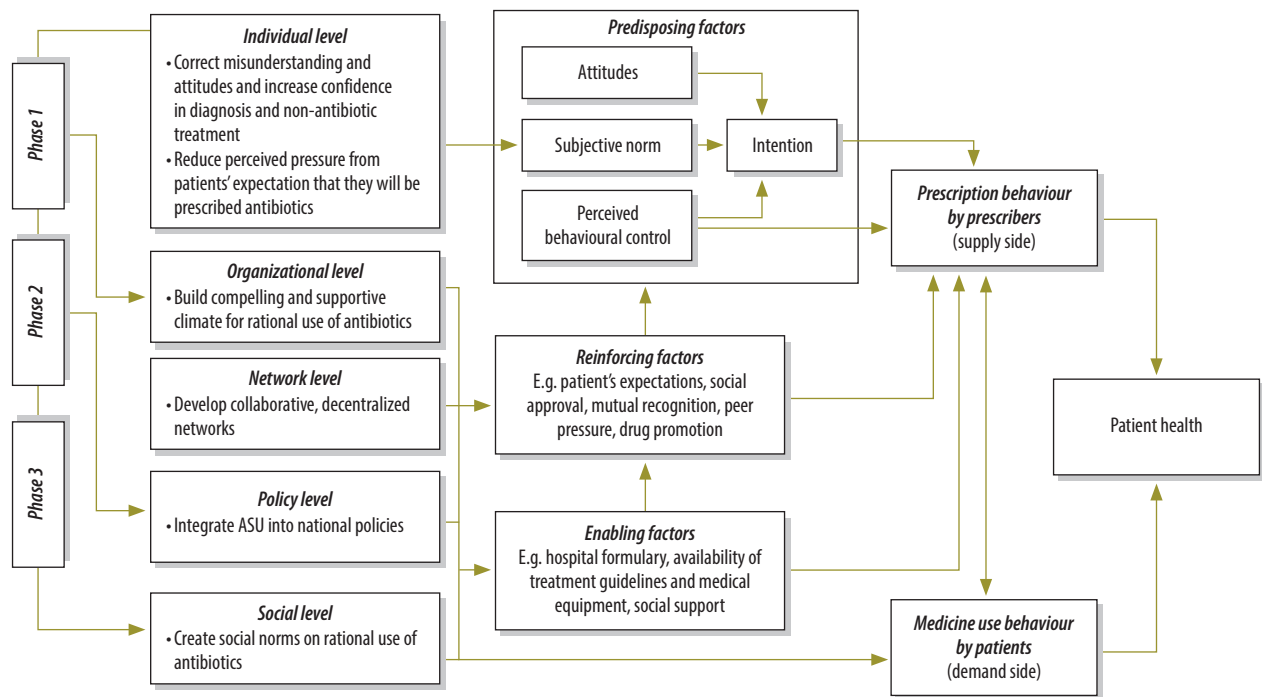
ASU was first organized as a research project to be tested in one province (phase 1) and directed by researchers from Thailand's Ministry of Public Health and from schools of medicine and pharmacy. In subsequent phases, this team collaborated with policy-makers, academics and researchers from national health agencies to form central partners. The ASU network follows a modified starfish model, in which management has no hierarchical leadership.²⁹ The local partners include physicians, pharmacists, nurses, health volunteers, local administrators and community leaders who promote the rational use of antibiotics in their health-care settings and communities. They name their own projects and design their own methods for improving the use of antibiotics among health professionals and the public. The central partners play catalytic and supportive roles; they guide and harmonize activities across local partners and disseminate examples of good practice and success stories drawn from local partners. In this manner, ASU gradually came to be owned by the local partners, who work with central partners as part of a collaborative network designed to translate the concept of ASU into practice.

Conceptual framework

ASU promotion efforts were described in the conceptual framework based on separate but interrelated planning models from three phases (Fig. 1). The framework integrates theories with observed, contextual information and with lessons learnt in the field. The PRECEDE-PROCEED planning model³⁰ and the theory of planned behaviour³¹ were used in phase 1 to plan interventions designed to change prescription practices among health professionals. The diffusion of innovation theory²⁸ and the programme sustainability framework³² are being applied in phases 2 and 3 to guide programme scale-up and sustainability, respectively.

Within the framework described in Fig. 1 patients' health is affected by

Fig. 1. Conceptual framework of the Antibiotics Smart Use (ASU) model



Sources: Adapted from Green & Kreuter³⁰ and Ajzen.³¹

prescribing practices (supply side) and self-medication (demand side). Since patients with acute conditions are more likely to adhere to medication than those who have chronic conditions,³³ patients with conditions such as URIs, acute diarrhoea and simple wounds are likely to take their antibiotics as prescribed.

Prescription behaviour can be influenced by predisposing, reinforcing and enabling factors. The first of these categories includes knowledge, attitudes and subjective norms; the second consists of factors such as peer pressure, patient expectations and drug promotion; and the third includes factors that facilitate prescription, such as the prescriber's diagnostic skill and exposure to hospital formularies and treatment guidelines. Local partners participating in the ASU indicated that, in their settings, irrational drug prescription practices were primarily due to prescribers' poor understanding of antibiotics and their role in disease management, and to perceived pressure from patients who expected or requested antibiotics.

What patients know about antibiotics they learn primarily from health professionals during medical visits and from their social milieu. Local partners participating in ASU have reported

that patients often have misconceptions and erroneous beliefs about antibiotics and are seldom aware of the existence of antimicrobial resistance. Interventions focusing on patient education are therefore focused on three key messages. The first is that antibiotics are not anti-inflammatory agents. In Thailand, antibiotics are commonly referred to as *ya-gae-ug-sep*, or "drugs that counter inflammation". This colloquial name is highly misleading, as patients interpret it to mean that antibiotics can alleviate symptoms of inflammation and infection such as swelling, fever and pain. The second message is that antibiotics are classified by Thailand's Drug Act as potentially dangerous drugs (*ya-antalai*). Patients should be made aware that they can produce serious side-effects and that their inappropriate use contributes to antimicrobial resistance. Wherever they are available without a prescription, they must be dispensed by pharmacists only. The third message is that the three conditions targeted by ASU, namely URIs, acute diarrhoea and simple wounds, can be cured without antibiotics. If widely disseminated, these messages will gradually improve the public's understanding of antibiotics and their use and reorient social norms.

When planning interventions, attention must be paid to the complex interplay of knowledge, attitudes and behaviour on the part of prescribers and patients and to the contextual influences emanating from specific health-care settings and communities. Two assumptions underlie ASU interventions: that the rational use of medicines is a behavioural issue,³⁴ and that multifaceted, multilevel interventions are essential.³⁵ Bottom-up approaches at the individual and organizational levels are essential for modifying behaviour; top-down, policy-level approaches and social measures are also needed, on the other hand, to sustain behaviour change.

Phase 1

To assess the effectiveness of the multifaceted interventions implemented in phase 1 to facilitate behaviour change (Table 1), we used a quasi-experimental pre-post design plus a control group. The ASU project was piloted in 10 district hospitals and 87 primary health centres in Saraburi, a medium-sized province in Saraburi, a medium-sized province with a population of 0.6 million that is located in central Thailand, 200 km from Bangkok. It has typical health-care delivery services, similar to those in other

Table 1. A summary of key multifaceted and multilevel interventions conducted as part of the Antibiotics Smart Use (ASU) programme, Thailand

Multilevel interventions	Multifaceted interventions			
	Educational measures	Managerial measures	Incentives	Policies and regulations
Individual and organizational levels	<ul style="list-style-type: none"> – Training on treatment guidelines, provision of materials facilitating behaviour change – Increasing physician confidence in not prescribing antibiotics in responding appropriately to patients' expectations and requests on antibiotics 	<ul style="list-style-type: none"> – Revising antibiotics listed in hospital formulary – Using a white light illuminator to examine the throat and improve diagnostic accuracy – Prescribing herbal medicines for non-bacterial infections – Providing patients with accurate information before they see a doctor – Providing a guideline on ASU planning, implementation and evaluation, including evaluation tools 	<ul style="list-style-type: none"> – Promoting good practices via the ASU web site, social media and newsletters distributed to all health facilities and provincial health offices 	<ul style="list-style-type: none"> – ASU-related policy at the hospital and/or provincial level
Network level	<ul style="list-style-type: none"> – Training of trainers for drug prescribers and ASU project managers – Education via social media and peers 	<ul style="list-style-type: none"> – Developing a set of computer software commands to support the auditing of antibiotic use – Encouraging local ASU partners to conduct parallel ASU-related research and present their work in technical forums – Sharing tools and materials produced by local partners to facilitate cross-sharing and learning 	<ul style="list-style-type: none"> – Sharing lessons learned within and outside the ASU network – Supporting and promoting ASU good practice sites for domestic and international study visits 	NA
Policy level	NA	NA	<ul style="list-style-type: none"> – Advocating the inclusion of ASU among the pay-for-performance criteria of Thailand's National Health Security Office 	

NA, not applicable

provinces. Its provincial health office was willing to participate in this project and able to facilitate ASU implementation and data collection. Phra Nakhon Si Ayutthaya, a neighbouring province with similar geography, population and health-care delivery system, was purposively selected as the control group.

On-site training for health professionals consisting of half-day sessions was conducted in the 10 district hospitals. The training focused on educating prescribers and making them feel confident enough to not prescribe antibiotics. Successful experiences were shared during sessions.³⁶

Educational materials were given to health professionals for display or distribution to patients, along with instructions on their proper use. Health-care workers were told, for example, to display posters or play DVDs in waiting areas and to distribute brochures to patients during consultations. They were also given ASU treatment guidelines for URIs, diarrhoea and simple wounds, posters showing diagnosis and treatment algorithms, and diagnostic

tools such as white light illuminators for throat examination. Hospitals received seed money for project implementation and evaluation.

Intervention effectiveness was assessed in terms of four indicators: a reduction in antibiotic prescription rates; improved knowledge and attitudes on the part of prescribers; percentage of patients with the targeted conditions who were not prescribed antibiotics (since they did not need them), and patients' perceived health and satisfaction with the treatment outcome. The pilot phase aimed to reduce antibiotic prescriptions by at least 10%; to increase by at least 10% the number of patient-provider encounters not resulting in the prescription of an antibiotic; and to attain relief of symptoms or full recovery, as well as satisfaction with treatment outcome, in at least 70% of targeted patients.

Phase 2

In phase 2, the focus was on scaling up effective interventions for promoting the rational use of medicines.^{21,37-39}

Although in 2004 and 2011 the International Conference on Improving Use of Medicines emphasized the need to scale up successful interventions and move from small-scale research projects to large-scale programmes having broad public health impact,^{38,40} little was known about effective and practical ways to scale up such interventions. Phase 2 of ASU tested the feasibility of scaling up the programme with an ongoing focus on sustainability.⁴¹ In this phase, ASU expanded to cover 44 hospitals and 621 primary health centres in three provinces (one large, one medium, one small) as well as two hospital networks – a public network in the south of the country and a private one in Bangkok.

To increase the likelihood of sustainability, ASU scale-up was conducted with an emphasis on integrating ASU into routine practice. In phase 2, ASU focused on two approaches. The first was to decentralize networks among local and central partners and strengthen the capacity of local partners to implement and evaluate ASU.

Table 2. Characteristics of the Antibiotics Smart Use (ASU) programme, by programmatic phase, Thailand

Characteristics	Phase 1 (Aug 2007–Aug 2008)	Phase 2 (Sep 2008–Dec 2009)	Phase 3, ongoing (transition period) (Mar 2010–Aug 2011)
Goals	Test the effectiveness of ASU in changing antibiotic prescription behaviour	Test feasibility of scaling up ASU model	Strengthen networks and assess scaling-up mechanisms
Target	1 province ^a	3 provinces and 2 networks of public and private hospitals ^b	22 public hospital networks in 15 provinces
Funding agencies	WHO, Thai FDA	HSRI, NHSO, Thai FDA	DSMDC, Thai FDA
Coordinating agencies	Thai FDA	Thai FDA	DSMDC, Thai FDA, IHPP
Budget spending ^c	US\$ 33 000 ^d	US\$ 73 000	US\$ 123 000
Spillover effect ^e	No	Yes	Yes

DSMDC, Drug System Monitoring and Development Centre; FDA, Food and Drug Administration; HSRI, Health Systems Research Institute; IHPP, International Health Policy Program; NHSO, National Health Security Office; US\$, United States dollar; WHO, World Health Organization.

^a 10 district hospitals and 87 primary health centres.

^b 44 hospitals and 621 primary health centres.

^c The budget spending reported here is for the amount received from funding agencies; it does not include budget funds received from local partners.

^d The exchange rate was 30 Thai baht to one US dollar.

^e This is the extent to which health-care facilities, organizations and individuals not targeted by ASU implement ASU methods.

Activities included training of trainers, sharing and promoting ASU good practices and encouraging local partners to conduct ASU-related research in parallel with routine ASU practice to generate scientific evidence for guiding the work of ASU. Second, policy advocacy aimed at creating a favourable climate for hospital directors or provincial health administrators to support ASU and integrate it into their routine work. ASU champions from schools of medicine and pharmacy and from the Thai Ministry of Public Health succeeded, owing to the good results obtained in phase 1, in having ASU practice included among the pay-for-performance (P4P) criteria of the National Health Security Office (NHSO), the agency responsible for Thailand's universal health-care coverage scheme. The P4P is a financial reward mechanism that provides stepwise financial incentives to hospitals based on the degree to which they have implemented ASU. P4P scores, based on self-assessment, range from 1 to 5: 1 indicates that a given hospital has agreed to implement ASU; 2 indicates that it is taking preparatory steps, such as revising the hospital formulary and developing treatment guidelines; 3 shows that ASU is being implemented through training

sessions, observance of the ASU treatment guidelines and patient education; 4 indicates that outcome evaluation is under way and that changes in antibiotic prescription practices are being monitored; and 5 signals that ASU outcomes are being disseminated or published. ASU was included among the P4P criteria for district hospitals in 2009 and for all types of hospitals in 2010. Subsequently, the Drug System Monitoring and Development Centre, a civil society organization funded by the Thai Health Promotion Foundation, supported 22 ASU networks in 15 provinces between 2010 and 2011 to strengthen their activities and boost programme scale-up. Table 2 summarizes the contents of the ASU programme and Box 1 summarizes the lessons learnt in phases 1 and 2.

Successes and challenges

The multifaceted, multilevel interventions undertaken in phase 1 and phase 2 to implement and scale up the ASU were successful. The adoption of ASU practice as a P4P criterion by the NHSO, a major purchaser of health care for Thailand,⁴² was an important achievement that prompted nationwide expansion of ASU. The decentralized network

approach promotes local ownership, mutual respect and social recognition. Local partners are given full autonomy in naming their own ASU projects and designing culturally sensitive interventions and media materials. This, in turn, generates a sense of ownership, pride and long-term commitment. Despite limited resources, the interventions implemented at the network and policy levels showed the feasibility of programme scale-up and sustainability. Some local partners applied ASU methods to promote the rational use of medicines other than antibiotics. Others conducted parallel ASU-related research and won research awards.

Whether or not the NHSO will continue to support the policy of including ASU participation among the P4P criteria is not known at present. In recent years, the financial incentives used in connection with P4P have been greatly reduced. The NHSO views its role as that of a service purchaser, and P4P criteria, intended to improve efficiency and service quality, lie beyond its mandates. It is crucial that ASU be incorporated into relevant national policies. The 2011 National Drug Policy on the rational use of medicines, which comprises national strategies for the containment of antimicrobial resistance, as well as other policy movements offer an opportunity to consolidate ASU and other initiatives pursuing the same ends into a comprehensive roadmap for the containment of antimicrobial resistance in Thailand. These policies, despite not being law, reflect a strong commitment to support the rational use of medicines in Thailand.

Implementing ASU in large hospitals, where antibiotics are used indiscriminately to treat URIs, is difficult. ASU's primary aim is not to reduce costs; it cannot generate attractive savings for these hospitals, unlike other interventions targeting high-cost medicines. Furthermore, in district hospitals physicians trained in ASU are often rotated to other settings, which makes it necessary to train incoming physicians. Resistance to change is common among physicians. Finally, Thailand is short on the resources and capacities required to audit antibiotic prescriptions.

Conclusion

ASU is a workable model for promoting the rational use of medicines. The pro-

Box 1. Lessons learnt during phase 1 and phase 2 of the Antibiotics Smart Use (ASU) programme, Thailand

Changing prescription behaviour (phase 1)

- Although ASU is a well-planned project, it must inevitably be adapted to the local context. For example, an individual training programme was delivered on-site in every district hospital to adapt to the tight schedule of district hospital physicians.
- Priming patients with accurate information about diseases and antibiotics before they see a physician is useful. However, the setting and medium should be carefully selected. For example, playing an educational DVD in a crowded waiting area proved ineffective in some settings because patients were more attentive to being called than to the DVD.
- Prescribers' confidence can be bolstered by having them experiment with not prescribing antibiotics and monitoring patients' clinical outcomes. In one district hospital, the hospital director had physicians, nurses and pharmacists collectively observe his practice of not prescribing antibiotics and co-monitor patients' clinical outcomes. Successful treatment outcomes boosted health professionals' confidence in not prescribing antibiotics for URIs, diarrhoea and simple wounds.
- Providing a choice of alternative, non-antibiotic therapies facilitates behaviour change. Prescribers who are reluctant to prescribe nothing for a viral infection, who fear that patients may get worse without antibiotics or who feel pressured by patients' expectations can prescribe the herbal medicines listed in Thailand's National List of Essential Medicines, such as *Andrographis paniculata*. This comes in capsules that resemble antibiotic capsules and is used to relieve fever and sore throat from viral infection. This can alleviate tensions during the transition period in which prescribers undergo behaviour change.

Scaling up ASU to ensure sustainability (phase 2)

- Presenting evidence on a programme's benefits and feasibility is not enough to successfully conduct policy advocacy. Policy champions from academia, the Health Systems Research Institute and the Ministry of Public Health play an essential role in garnering support for the ASU concept and bringing about changes in public policy.
- Generic, evidence-based campaign materials developed by central partners to convey key messages can be adapted by local partners for their own use. Local partners should develop campaign materials that are appropriate for their cultural contexts. Using locally-developed campaign materials presented by family or community members promotes a sense of community ownership.
- Understanding the contexts in which local partners work is very important. Local partners are generally overwhelmed by the plethora of policies, health programmes and activities generated by national health agencies, provincial or community-based organizations and other entities. To avoid this, local partners integrate ASU into the general health service structure and community activities in their areas. Local teams can arrange for specific ASU events if necessary.
- ASU owes its successes mainly to personal commitment, especially among executives and health professionals who act as champions or catalysts in health-care facilities.
- Disseminating ASU network news and activities to all partners and relevant stakeholders (e.g. provincial health offices, civil society organizations, funding agencies, etc.) helps generate an atmosphere that is supportive to the ASU network and creates spillover effects.

URI, upper respiratory tract infection.

gramme developed as a decentralized collaborative network was expanded on a wider scale and the feasibility of making it sustainable over the long term was shown. Its multifaceted, multilevel interventions involve health-care professionals and local communities.

The ASU programme has yielded several lessons. First, strong political commitment is a crucial element for success, as seen in other countries. In France, which is one of Europe's largest consumers of outpatient antibiotics and one of the biggest users of antimicrobials worldwide,^{24,43} the government initiated a long-term, nationwide campaign

that resulted in a marked reduction in unnecessary antibiotic prescriptions.²⁴ In Sweden, Strama's proposal for the containment of antimicrobial resistance was finally legislated into a bill, and the Strama that began as an informal multidisciplinary network was later institutionalized and made into an independent government body.²² In Thailand, political commitment to combat antimicrobial resistance is expected to strengthen thanks to the country's national strategies and to its adherence to the Jaipur Declaration.

Second, in some Latin American countries, dispensing antibiotics by

prescription only has reduced their consumption in the short term, but the long-term effect of such a policy remains undetermined.⁴⁴ This suggests that the rational use of medicines is indeed a complex issue that cannot be addressed by top-down approaches, which trigger resistance and non-compliance. In addition, the Thai health system is structurally conducive to the overuse of antibiotics⁷ because it allows physicians to dispense drugs, pharmacists to prescribe them and patients to medicate themselves. Regulatory capacity is insufficient and measures limiting people's access to antibiotics are not properly enforced. Therefore, top-down approaches (e.g. regulation) must be supplemented with bottom-up approaches (e.g. community empowerment) for long-term results to be achieved.

Third, in Europe and the United States, public campaigns to promote the rational use of antibiotics, with correct treatment of URIs as a common theme, have reduced the unnecessary use of these drugs.^{13,20,23} Thus, the concept of ASU and awareness of antimicrobial resistance should be promoted through public campaigns targeting individuals, organizations and the community at large, as in the fights against tobacco and alcohol. However, achieving a meaningful reduction in unnecessary antibiotic use without jeopardizing the successful treatment of bacterial infections⁷ and without generating public panic with respect to antimicrobial resistance or a fear of lawsuits due to preventable nosocomial infection of bacterial resistant strains is a challenge.

ASU has several limitations. Because the network is decentralized, there is no formal reporting to a central authority on local activities or spending by local partners. This makes the cost-effectiveness of the programme difficult to assess, especially since ASU has been integrated into health professionals' routine work. Inconsistencies between the diagnostic codes of the International Classification of Diseases, 10th Revision, and the conditions listed in ASU's treatment guidelines make it difficult to assess the use of antibiotics for the treatment of specific conditions, especially simple wounds. ASU is vulnerable to the influence of external, uncontrollable factors, such as sudden influenza outbreaks or changes in policy, or in the political interests of relevant stakeholders; out-

comes may not be as expected despite attempts to adjust the programme in the face of changing circumstances.

Antimicrobial resistance and the irrational use of antibiotics have no simple solution. ASU is a cross-cutting exercise that seeks to promote the rational use of medicines by strengthening human resources, improving health facility infrastructure and empowering communities. It can be applied to rationalize the use of medicines other than antibiotics.

ASU's sustainability depends on programme ownership and commitment by local teams, an enabling environment and integration into routine systems with appropriate financial incentives and an effective audit system. ■

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ملخص

الاستخدام الذكي للمضادات الحيوية: نموذج عملي لتعزيز الاستخدام الرشيد للأدوية في تايلند
تم إدخال برنامج الاستخدام الذكي للمضادات الحيوية (ASU) في تايلند كنموذج لتعزيز الاستخدام الرشيد للأدوية، مع البدء بالمضادات الحيوية. وتكونت المرحلة الأولى من البرنامج من تقييم التدخلات الهادفة لتغيير ممارسات وصف الأدوية؛ وفحصت المرحلة الثانية جدوى توسيع البرنامج. ويعتبر البرنامج في الوقت الراهن في مرحلته الثالثة التي تركز على الاستدامة. وتصف هذه الورقة المفهوم وراء الاستخدام الذكي للمضادات الحيوية والأساليب الوظيفية للبرنامج وتطوير إطاره المفاهيمي وتنفيذ مرحلته الأولى والثانية. ولتغيير ممارسات وصف الأدوية المضادات الحيوية، تم تنفيذ تدخلات متعددة الأوجه على المستويين الفردي والتنظيمي؛ ولمواصلة تغيير السلوك وتوسيع البرنامج، تم استخدام

تدخلات على مستوى الشبكة والسياسات. وقد تبني مكتب الأمن الصحي الوطني الاستخدام الذكي للمضادات الحيوية كمييار دفع مقابل الأداء، وهو إنجاز رئيسي أدى إلى توسيع نطاق البرنامج على الصعيد الوطني. وعلى الرغم من الموارد المحدودة، فقد تم تسير توسيع البرنامج واستدامته من خلال تعزيز الملكية المحلية والتقدير المشترك اللذين تولد عنهما الفخر والالتزام. ويمثل الاستخدام الذكي للمضادات الحيوية مدخلا عمليا للجهود الرامية إلى ترشيد استخدام الأدوية في تايلند. وستتطلب استدامته على الأمد الطويل مواصلة الالتزام المحلي والدعم السياسي والمراجعة الفعالة للاستخدام الذكي للمضادات الحيوية ودمجه في النظم الروتينية مع الحوافز المالية المناسبة.

摘要

抗生素合理使用：促进在泰国合理使用药物的可行模型

作为促进药物合理利用的模型，泰国从抗生素开始引入抗生素合理使用（ASU）计划。计划的第一阶段包括旨在改变处方实践的评估干预；第二阶段审查计划推广的可行性。目前计划处于第三阶段，这个阶段以可持续发展为中心。本文介绍了ASU背后的概念、计划的功能模式、其概念化框架的发展及其第一阶段和第二阶段的实施。为了改变抗生素处方实践，实施了个人和组织层面的多方位干预；为了保持行为改变并进行计划的推广，使用网络和政

策层面的干预。国家医药保障办公室已将ASU采纳为按绩效支付的标准，这是让计划在全国铺开的一大成就。尽管资源有限，促进当地的所有权和相互认可产生了荣誉感和全力的投入，推动了计划的推广和可持续发展。ASU显然是在泰国药物合理使用工作的可行切入点。其长期的可持续发展将需要地方持续的大力投入和政治支持、有效的审计以及通过适当的财政奖励将ASU纳入日常体系。

Résumé

Utilisation intelligente des antibiotiques: un modèle viable visant à promouvoir l'usage rationnel des médicaments en Thaïlande

Le programme d'utilisation intelligente des antibiotiques (ASU) a été lancé en Thaïlande comme un modèle visant à promouvoir l'usage rationnel des médicaments, à commencer par les antibiotiques. La première phase du programme a consisté à évaluer les interventions visant à modifier les pratiques de prescription. La deuxième phase a examiné la faisabilité d'une extension du programme. Actuellement, le programme en est à sa troisième phase, qui se concentre sur sa viabilité. Cet article décrit le concept sur lequel repose l'ASU, les modalités de fonctionnement du programme, l'élaboration de son cadre conceptuel et la mise en œuvre des deux premières phases. Pour changer les pratiques de prescription des antibiotiques, des interventions multiformes aux niveaux individuels et organisationnels ont été réalisées. Pour gérer le changement de comportement et développer

le programme, on a recouru à des interventions au niveau du réseau et de la politique. Le Bureau national de la Sécurité sanitaire a adopté l'ASU comme critère de rémunération au rendement, une réalisation majeure qui a conduit à l'expansion du programme à l'échelle nationale. Malgré des ressources limitées, le développement du programme et sa viabilité ont été facilités par la promotion de la propriété locale et de la reconnaissance mutuelle, qui ont généré fierté et engagement. L'ASU est clairement un point de départ viable pour les efforts visant à rationaliser l'utilisation des médicaments en Thaïlande. Sa viabilité à long terme nécessitera un engagement local et un soutien politique continu, un contrôle efficace et l'intégration de l'ASU dans les systèmes de routine avec les incitations financières appropriées.

Резюме

Разумное использование антибиотиков: работающая модель обеспечения рационального использования лекарственных препаратов в Таиланде

Программа разумного использования антибиотиков (ASU) была внедрена в Таиланде в качестве модели обеспечения рационального использования лекарственных препаратов, начиная с антибиотиков. Первая фаза программы состояла из оценки мероприятий, предназначенных для изменения схем приема лекарства; во второй фазе изучалась обоснованность расширения программы. В настоящее время программа находится в третьей фазе, сфокусированной на устойчивом развитии программы. В настоящей работе описывается концепция ASU, функциональные методы программы, разработка ее концептуальной основы и реализация первой и второй фаз. Для изменения практики назначения антибиотиков были проведены многосторонние мероприятия на индивидуальных и организационных уровнях; для изменения модели поведения и расширения программы были проведены мероприятия на сетевом и политическом уровне. Национальное бюро по

вопросам безопасности в области здравоохранения приняло ASU в качестве показателя оплаты по результатам, что стало главным достижением, которое привело к расширению программы в национальном масштабе. Несмотря на ограниченные ресурсы, расширение программы и ее устойчивое развитие облегчалось обеспечением принципа «местной собственности» и взаимного признания, что способствовало возникновению чувства гордости и приверженности программе. ASU является несомненно работающим исходным пунктом для усилий по рационализации использования лекарственных препаратов в Таиланде. Долгосрочное устойчивое развитие программы потребует непрерывного участия общественности и политической поддержки, эффективного контроля и интеграции ASU в существующие системы с соответствующим финансовым стимулированием.

Resumen

Uso inteligente de los antibióticos: un modelo factible para fomentar el uso racional de los medicamentos en Tailandia

El programa Uso inteligente de los antibióticos (ASU, por sus siglas en inglés) se introdujo en Tailandia como un modelo para fomentar el uso racional de los medicamentos, comenzando por los antibióticos. La primera fase del programa consistió en evaluar las intervenciones con el fin de cambiar las prácticas de prescripción de medicamentos y la segunda fase examinó la viabilidad de la ampliación del programa. El programa se encuentra en la actualidad en la tercera fase, centrada en la sostenibilidad. El presente documento describe el concepto de ASU, los modos de funcionamiento del programa, el desarrollo de su marco conceptual y la puesta en práctica de la primera y la segunda fase. Con objeto de cambiar las prácticas de prescripción, se pusieron en práctica intervenciones multifacéticas a nivel individual y organizativo, y se emplearon intervenciones en la red y a nivel normativo para

mantener ese cambio en el comportamiento y la ampliación del programa. La organización nacional de seguridad sanitaria (NHSO, por sus siglas en inglés) ha adoptado el programa ASU como criterio de remuneración basada en el desempeño, un logro muy importante que ha conseguido que el programa se expanda a nivel nacional. A pesar de los limitados recursos, el fomento del sentido de la propiedad local y el reconocimiento mutuo, que han generado orgullo y compromiso, han facilitado la ampliación y sostenibilidad del programa. ASU es, sin duda, una vía de acceso factible para los esfuerzos por racionalizar el uso de los medicamentos en Tailandia. La sostenibilidad a largo plazo requiere un compromiso local continuo, así como el apoyo político, la auditoría eficaz y la integración de ASU en los sistemas rutinarios por medio de incentivos financieros adecuados.

References

- Infectious Disease Society of America. Combating antimicrobial resistance: policy recommendations to save lives. *IDSA Policy Paper* 2011;52:S397–428.
- European Commission. *EU research on antimicrobial resistance: EU projects 2007–2010*. Brussels: UC; 2011. Available from: http://ec.europa.eu/research/health/infectious-diseases/antimicrobial-drug-resistance/pdf/eu-research-on-antimicrobial-resistance_en.pdf [accessed 13 September 2012].
- Pumart P, Phodha T, Thamlikitkul V, Riewpaiboon A, Prakongsai P, Limwattananon S. Health and economic impacts of antimicrobial resistance in Thailand. *J Health Systems Res* 2012;6:352–60.
- Goossens H. Antibiotic consumption and link to resistance. *Clin Microbiol Infect* 2009;15:12–5. doi:10.1111/j.1469-0691.2009.02725.x PMID:19366364
- Albrich WC, Monnet DL, Harbarth S. Antibiotic selection pressure and resistance in *Streptococcus pneumoniae* and *Streptococcus pyogenes*. *Emerg Infect Dis* 2004;10:514–7. doi:10.3201/eid1003.030252 PMID:15109426
- Apisarnthanarak A, Mundy LM. Correlation of antibiotic use and antimicrobial resistance in Pratumthani, Thailand, 2000 to 2006. *Am J Infect Control* 2008;36:681–2. doi:10.1016/j.ajic.2007.10.022 PMID:18992648
- Chokejindachai W. *Current situation of antimicrobial resistance in Thailand: a review*. Nonthaburi: Health System Research Institute; 2007.
- Jitkrakate A. Antibiotic values. In: Niyada Kiatying-Angsulee, Nusaraporn Kessomboon, Usawadee Maleewong, editors. *Situation report on drug system 2010: antimicrobial resistance*. Bangkok: Drug System Monitoring and Development Center; 2011.
- Bhavnani D, Phatinawin L, Chantra S, Olsen SJ, Simmerman JM. The influence of rapid influenza diagnostic testing on antibiotic prescribing patterns in rural Thailand. *Int J Infect Dis* 2007;11:355–9. doi:10.1016/j.ijid.2006.09.009 PMID:17324602
- Suttajit S, Wagner AK, Tantipidoke R, Ross-Degnan D, Sitthi-amorn C. Patterns, appropriateness, and predictors of antimicrobial prescribing for adults with upper respiratory infections in urban slum communities of Bangkok. *Southeast Asian J Trop Med Public Health* 2005;36:489–97. PMID:15916061
- Udomthavornsak B, Tatsanavivat P, Patjanasoontorn B, Khomthing R, Bhuripanyo K, Saengnipanthkul S et al. Intervention of inappropriate antibiotic use at a university teaching hospital. *J Med Assoc Thai* 1991;74:729–36.
- Pagaiya N, Garner P. Primary care nurses using guidelines in Thailand: a randomized controlled trial. *Trop Med Int Health* 2005;10:471–7. doi:10.1111/j.1365-3156.2005.01404.x PMID:15860094
- Earnshaw S, Monnet DL, Duncan B, O'Toole J, Ekdhah K, Goossens H; European Antibiotic Awareness Day Technical Advisory Committee, European Antibiotic Awareness Day Collaborative Group. European antibiotic awareness day 2008: the first Europe-wide public information campaign on prudent antibiotic use; methods and survey activities in participating countries. *Eurosurveillance* 2009;14:418–25. PMID:19643056

14. Treebupachatsakul P, Tiengrim S, Thamlikitkul V. Upper respiratory tract infection in Thai adults: prevalence and prediction of bacterial causes, and effectiveness of using clinical practice guidelines. *J Med Assoc Thai* 2006;89:1178–86. PMID:17048427
15. Panpanich R, Siviroj P, Chansung K, Sanchaisuriya P, Laohasiriwong L, Tasaniyom S et al. Antibiotics prescription rates for upper respiratory tract infections in Thai National Health Insurance System. *J Health Sci* 2003;12:522–9.
16. Thamlikitkul V. Antibiotic dispensing by drug store personnel in Bangkok, Thailand. *J Antimicrob Chemother* 1998;21:125–31. doi:10.1093/jac/21.1.125 PMID:3356619
17. Apisarnthanarak A, Mundy LM. Comparison of methods of measuring pharmacy sales of antibiotics without prescriptions in Pratumthani. *Infect Control Hosp Epidemiol* 2009;30:1130–2.
18. Sirirussamee B. *Antibiotics use behavior of people in Nakhon Pathom Province*. Nakhon Pathom: Mahidol University, Institute for Population and Social Research; 1997.
19. Heaton P. The diagnostic problem of prescribing antibiotics in URI. *Can Fam Physician* 1973;19:55–8. PMID:20468932
20. Huttner B, Goossens H, Verheij T, Harbarth S. Characteristics and outcomes of public campaigns aimed at improving the use of antibiotics in outpatients in high-income countries. *Lancet* 2010;10:17–31. doi:10.1016/S1473-3099(09)70305-6
21. *The world medicines situation 2011*. Geneva: World Health Organization; 2011.
22. Mölstad S, Cars O, Struwe J, Strama – a Swedish working model for containment of antibiotic resistance. *Eurosurveillance* 2008;13:22–5. PMID:19021951
23. Gonzales R, Corbett KK, Wong S, Glazner JE, Deas E, Leeman-Castillo B et al. “Get Smart Colorado”: impact of a mass media campaign to improve community antibiotic use. *Med Care* 2008;46:597–605. doi:10.1097/MLR.0b013e3181653d2e PMID:18520314
24. Sabuncu E, David J, Bernède-Bauduin C, Pépin S, Leroy M, Boëlle PY et al. Significant reduction of antibiotic use in the community after a nationwide campaign in France, 2002–2007. *PLoS Med* 2009;6:e1000084. doi:10.1371/journal.pmed.1000084 PMID:19492093
25. World Health Organization, Regional Office for South-East Asia. *Prevention and containment of antimicrobial resistance: Report of a Regional Meeting in Chiang Mai, Thailand*. New Delhi: World Health Organization; 2010.
26. World Health Organization. Promoting rational use of medicines: core components. *WHO Policy Perspect Med* 2002;5. (September)
27. Ozkurt Z, Erol S, Kadanali A, Ertek M, Ozden K, Tasyaran MA. Changes in antibiotic use, cost and consumption after an antibiotic restriction policy applied by infectious disease specialists. *Jpn J Infect Dis* 2005;58:338–43. PMID:16377863
28. Rogers EM. *Diffusion of innovations*. 5th ed. New York: Free Press; 2003.
29. Brafman O, Beckstrom RA. *The starfish and the spider: the unstoppable power of leaderless organizations*. London: Penguin Books; 2006.
30. Green LW, Kreuter MW. *Health promotion planning: an educational and environmental approach*. 2nd ed. Mountain View: Mayfield Publishing; 1991.
31. Ajzen I. Theory of planned behavior. *Organ Behav Hum Decis Process* 1991;50:179–211. doi:10.1016/0749-5978(91)90020-T
32. Shediac-Rizkallah MC, Bone LR. Planning for the sustainability of community-based health programs: conceptual frameworks and future directions for research, practice and policy. *Health Educ Res* 1998;13:87–108. doi:10.1093/her/13.1.87 PMID:10178339
33. Osterberg L, Blaschke T. Adherence to medication. *N Engl J Med* 2005;353:487–97. doi:10.1056/NEJMr050100 PMID:16079372
34. Gilbert A. Achieving QUM: We know what works, why isn't it used? In: *National Medicines Symposium 2010, Melbourne, 26–28 May 2010*. Available from: http://www.nps.org.au/topics/nms/nms_2010_medicines_in_peoples_lives [accessed 13 September 2012].
35. Ory MG, Jordan PJ, Bazzarre T. The Behavior Change Consortium: setting the stage for a new century of health behavior-change research. *Health Educ Res* 2002;17:500–11. doi:10.1093/her/17.5.500 PMID:12408195
36. Bandura A. *Self-efficacy: the exercise of control*. New York: Freeman; 1997.
37. World Health Organization. Promoting rational use of medicines: report of the intercountry meeting. *Intercountry Meeting on Promoting the Rational Use of Medicines, New Delhi, 13–15 July 2010*. Available from: www.searo.who.int/LinkFiles/Meetings_SEA-Drugs-161.pdf [accessed 13 September 2012].
38. Laing R. The International Conference on Improving Use of Medicines 2004. *Essential Drug Monitor* 2005;34:4.
39. Holloway KA. Combating inappropriate use of medicines. *Expert Rev Clin Pharmacol* 2011;4:335–48. doi:10.1586/ecp.11.14 PMID:22114780
40. International Network for Rational Use of Drugs. Third International Conference for Improving Use of Medicines: Expanding Partnerships for Progress within a Health Systems Framework. Arlington: INRUD; 2011. Available from: <http://www.inrud.org/icium2011-documents/upload/ICUM2011-Overall-Summary-17APRIL2012.pdf> [accessed 13 September 2012].
41. Gilson L, Schneider H. Managing scaling up: what are the key issues? *Health Policy Plan* 2010;25:97–8. doi:10.1093/heapol/czp067 PMID:20053734
42. Prakongsai P, Limwattananon S, Tangcharoensathien V. The equity impact of the universal coverage policy: lessons from Thailand. In: Dov Chernichovsky, Kara Hanson, editors. *Innovations in health system finance in developing and transitional economies*. London: Emerald Group Publishing Limited; 2009. pp. 57–81.
43. Cars O, Mölstad S, Melander A. Variation in antibiotic use in the European Union. *Lancet* 2001;357:1851–3. doi:10.1016/S0140-6736(00)04972-2 PMID:11410197
44. Wirtz VJ, Dreser A, Gonzales R. Trends in antibiotic utilization in eight Latin American countries, 1997–2007. *Rev Panam Salud Publica* 2010;27:219–25. doi:10.1590/S1020-49892010000300009 PMID:20414511