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Implementing Antimicrobial Stewardship Programs in Asian Hospitals: How to Deal With Challenging Situations

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As outlined in the **Guide to Implementing Antimicrobial Stewardship (AMS) Programs in Asian Hospitals**, AMS programs in acute-care settings require several core components, including hospital administration support, an AMS team, AMS interventions, a structured reporting system, adequate hospital infrastructure, and education and practical training.[1-3] Implementation of hospital AMS programs is inconsistent across Asian countries and regions, and programs often lack one or more of these core components.[4-6] Here, we list some of the most common challenges that can hinder the implementation of AMS programs in Asian hospitals, and suggest some potential solutions.

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Challenge #1: Lack of administrative support/awareness and funding/resources

To secure adequate funding and resources for success, AMS programs require the support of hospital administration.[1-3] However, obtaining a formal statement of support and securing budgeted funding for AMS programs, including dedicated time for AMS activities and appropriate remuneration for core AMS team members, can be difficult to obtain because of competition for resources.[1,4,5] Lack of administrative and budgeted financial support may therefore pose enormous challenges for the implementation of hospital AMS programs.[1,4,5]

How can we overcome this challenge?

It is important to provide hospital administrators with a credible **business case** to persuade them that funding an AMS program is beneficial to the hospital.[1,4] To this end, it is vital to identify an AMS champion/AMS program **team leader** who has the communication skills, expertise and influence to effectively negotiate with hospital administrators and effect change.[7,8] The ideal candidate for this role is a committed and influential infectious disease (ID) specialist physician.[1]

Effective hospital AMS programs are essential to reducing the emergence of antimicrobial resistance, and can offset or reduce costs while improving patient outcomes.[9-15]

Some ideas for developing the business case:

- Highlight the threat of antimicrobial resistance (AMR) and the immediate need to act before it is too late.[16]
- Describe the purpose, proven benefits, and cost-effectiveness of AMS programs.[2,9-15]
- Point out any national policies regarding implementation of AMS programs (eg, the Vietnam Ministry of Health guidelines recently provided a framework for hospitals to implement AMS activities),[17] and statements on the importance/core elements of AMS programs from organizations recognized by hospital administration, such as the US Centers for Disease Control and Prevention.[2,3]
- Share baseline **key performance indicator** (KPI) data showing antibiotic and AMR problem areas within the hospital (eg, excessive carbapenem use, poor intravenous-to-oral conversion, high rates of multidrug-resistant Gram-negative bacteria), or from local/regional hospitals if there is no hospital-specific data.[1,8]
- Use the literature to describe successful AMS programs at similar hospitals in the region (these may range from unit-specific to hospital-wide approaches).[11,13,17]
- Suggest that the AMS program starts small and build capacity over time, gradually introducing AMS interventions by hospital unit or ward, if success is demonstrated.[1]

Outstanding example of a cost-saving AMS program in an Asian hospital

Many studies have shown that AMS programs will lead to savings in both antibiotic expenditures and indirect costs, including studies conducted at hospitals in Asian countries.[11,13]

Vietnam is an example of an Asian country with a high prevalence of AMR, and slow uptake of AMS initiatives.[17,18] However, Vietnamese hospitals that have implemented AMS programs are beginning to report evidence of cost-savings that can be used to encourage other hospitals to commit to funding AMS programs.[18,19] One outstanding example of this is Cho Ray hospital (a 2,600-bed tertiary hospital), the first hospital in Vietnam to implement a comprehensive AMS program.[18] A multidisciplinary AMS team met monthly to review overall inpatient antibiotic usage, and to discuss with junior physicians on the appropriateness of antimicrobial decisions and microbiology result interpretation. After introducing the program in 2015 (6 pilot departments) and 2016 (all clinical departments), Cho Ray hospital has reported a significant increase in compliance rates to hospital antibiotic guidelines, and considerable antibiotic cost savings: US$2.1 million in 2015 versus 2014, and an additional US$1 million in 2016 (Table 1).[18] Treatment response rates remained the same and hospital infections did not increase in comparison with previous years. The AMS program at Cho Ray hospital, which relies on printed guidelines for rational prescribing and mandatory stratification of infection risk before procedures are performed, requires minimal outlay, and could be applied in other hospitals with limited resources. Greater hospital commitment from physician to management level, team communication, involvement of clinical pharmacists, and coordination at the institutional level led to these positive results.[18]

Table 1

Antibiotic costs savings (versus the previous year) across all departments of Cho Ray Hospital, Vietnam, after the implementation of an AMS program in 2015/16.[18]

Year	2013	2014	2015	2016
Antibiotic cost (% pharmacy budget)	21.3%	20.4%	18.5%	17.2%
Cost savings (US$)	N/A	N/A	2.1 million	1.0 million

N/A: not applicable

Challenge #2: Lack of manpower

Ideally, **AMS teams** should include an ID specialist, clinical pharmacist (with ID training, if possible), a clinical microbiologist, an infection control specialist, and an information technology (IT) expert as core team members.[1] In this AMS team scenario, the ID specialist leads the team, and is responsible for implementation and evaluation of the AMS program, and the clinical pharmacist/pharmacologist performs many daily AMS program tasks and supports the team leader.[1] However, many hospitals may not have adequate personnel to build such a multidisciplinary AMS team and perform AMS activities, particularly in low- and middle-income countries.[1,5,6,16,20-22]

How can we overcome this challenge?

Training more ID physicians and pharmacists would bolster the ability of hospitals to implement effective AMS programs, but if this is not feasible, hospitals should use their available resources to create the most effective AMS team possible.[1,21,22] For example, if no ID specialists are available, the team leader could be an interested clinician from another specialty or a pharmacist with an interest in infectious diseases.[1,21] In resource-limited settings, the minimum personnel for an effective AMS team should include an interested clinician, a pharmacist, and a collaborating microbiologist (or microbiology laboratory technician).[1] In this instance, it may be possible to obtain external ID specialist advice and AMS training from a more well-resourced hospital to support the AMS team.[1,21]

There is growing recognition of the importance of engaging nurses in AMS teams.[3,23,24] Bedside nurses can, for example, initiate:

- Intravenous-to-oral transition: Nurses are most aware of when patients are able to tolerate oral medications and can initiate discussions on switching to oral antibiotics.[3]
- Antibiotic reviews: Nurses often know how long a patient has been receiving an antibiotic and when laboratory results become available, and can play a key role in prompting re-evaluation of therapy at specified times (ie, after 2 days of treatment and/or when culture results are available).[3]

Example of an effective multidisciplinary AMS team in an Asian hospital with limited manpower

In the absence of an available ID physician during the first year of an AMS program at Hospital Enche, a government-funded district hospital in Malaysia, a medical specialist was assigned to lead the AMS team, and an ID physician at a separate tertiary hospital served as an off-site consultant to the AMS program when additional AMS advice was required.[21] Personnel restrictions also meant that there was no full-time pharmacist with ID training available for the AMS team. The pharmacists who were involved in the team rotated among themselves to accommodate AMS program duties in addition to their routine daily tasks. AMS core team members were provided with practical AMS training through attachment to AMS rounds with ID physicians at other teaching institutions. A clinical microbiologist was an AMS team core member, and constructive support from the microbiology department played an important role in the success of the AMS program at this district hospital.

Labor-saving AMS strategies for Asian hospitals with limited manpower

It is recommended that all AMS programs include formulary restriction or prospective audit or a combination of these two core **interventions** to curb prescribing behavior that promotes AMR.[1-3] Prospective audit and feedback may be better suited to Asian prescribing culture than restrictive measures, but it is labor-intensive and must be adapted to suit the resources and workflow of the hospital.[1,16] AMS programs in resource-limited Asian hospitals may therefore tend to rely on formulary restriction because of limited manpower.[6] To overcome manpower and time constraints, AMS teams may choose to conduct prospective audit and feedback at reduced frequency (daily audit is not required) and/or selectively audit cases based on clinical syndromes or a single antibiotic agent or class thought to be misused.[1,6,19,25,26] For example, an intervention focused on carbapenems in response to endemic carbapenem-resistant *Acinetobacter baumannii*.[1]

Leveraging digital devices and platforms

The widespread usage of smartphones, secure chat and conferencing platforms, and strong, reliable internet make tele-AMS feasible in hospitals that lack the resources for a fully in-house AMS program.[27] In place of in-person visits and face-to-face feedback with frontline prescribers, members of the AMS team or an off-site consultant can initiate feedback and communications via secure chat systems.[27] Group chats on secure systems can also serve as a discussion platform and an avenue to provide updated information.[27]

Challenge #3. Knowledge gaps on AMS execution/lack of understanding, staff concerns and resistance

Some of the most commonly faced challenges when implementing AMS programs in Asia are related to knowledge gaps and lack of understanding, as well as staff resistance to AMS programs.[5] Further, staff concerns that AMS strategies such as antibiotic restriction may lead to poor patient outcomes can be problematic.[5]

How can we overcome these challenges?

Some ideas for educating and reassuring staff:

- Inform, educate and remind prescribers and other stakeholders about AMS and hospital AMS program activities through avenues such as **posters**, **leaflets**, newsletters, lectures, electronic communication and the hospital intranet.[1,3,8,28,19] Make links to important resources or guidelines easily accessible on the hospital intranet; mobile apps can also serve as a platform for dissemination of guidelines and antibiograms, and are likely to be consulted more frequently due to accessibility.[8,29]
- Provide mandatory training on prudent antimicrobial use for doctors, pharmacists and nurses.[29]
- Provide education and training activities on AMS and the hospital AMS program as part of orientation programs for new staff.[1,28]
- Regularly report AMS performance to prescribers and other stakeholders to help reduce prescriber resistance to AMS, and assuage concerns that AMS strategies could have negative effects on patient outcomes.[1,5,29]

- To avoid misinterpretation of the AMS team as the 'healthcare police', promote the benefits of AMS on patient outcomes and highlight the lack of evidence of harm where appropriate, and consistently convey the message that AMS is about improving prescribing, not about restricting antimicrobials or reducing costs.[29]
- Ideally, for each key department, identify a champion who is respected and trusted by their peers to advocate for AMS. Strong support from senior hospital leadership is essential. In departments with a high volume of antibiotic prescriptions, conduct ward rounds that involve the selected AMS champions and clinicians who manage the patients, provide real-time feedback on prescriptions, and involve everyone in discussions.[8]
- When possible, choose prospective audit and feedback over formulary restriction to provide opportunities for AMS team members to engage with and educate treating physicians, and to maintain a sense of prescriber independence.[1,6,16]

An education program combined with with ongoing feedback as part of the audit/feedback process is an example of an inexpensive and highly effective AMS program that could be easily applied to many hospitals and is well suited to the Asian bedside prescribing culture.[1]

Example of an Asian hospital using education and feedback to excellent effect

An educational and antibiotic-management program implemented as part of an AMS program established at Thammasat University Hospital (Thai tertiary care hospital) in 2004 was associated with a significant alteration of prescribing practices, and reductions in antibiotic use, bacterial resistance and costs.[30] Interventions included monthly education of medical students and residents, and control of specific antibiotic classes. At each educational session, information and feedback relevant to each specialty or clinical practice were given, and the hospital antibiotic guidelines were introduced. Additional training sessions were performed every 4 months for all physicians in the hospital. There were no restrictions on antibiotic-prescribing habits, but physicians were informed about the increased risk of development of bacterial resistance associated with the overuse of third-generation cephalosporins and carbapenems, as well as the potential benefits of replacing such agents with ß-lactam/ß-lactamase inhibitors or fourth-generation cephalosporins. These interventions were well accepted by prescribers.[30]

In another study at the same hospital, surgeons had a tendency to prescribe a wide variety of broad-spectrum antibiotics for abdominal surgery prophylaxis.[31] A. Apisarnthanarak (personal communication, October 2022) shared that after setting up an inter-departmental (ID–surgery) collaboration with continuous monitoring and feedback in relation to antibiotic prophylaxis prescribing practices and local ESBL-producing Enterobacteriaceae patterns, the prescription of carbapenems for surgical prophylaxis, as well as the rate of ESBL-producing Enterobacteriaceae declined.

With the support of a multidisciplinary team (ID specialists, a clinical pharmacist and laboratory technicians), the hospital has also recently overcome barriers to the implementation of a hospital-wide area under the curve (AUC)-based vancomycin dosing protocol. Initial barriers include lack of knowledge about vancomycin therapeutic dose monitoring processes, entrenched prescribing behaviors and poor communication among healthcare personnel.[32] In addition to monitoring adherence to the vancomycin dosing protocol and close communications with the treating physicians, daily discussions on the quality improvement of the vancomycin dosing protocol were made by team members via instant messaging (LINE application). After this multidisciplinary team intervention, adherence to the dosing protocol was significantly improved (90.8% versus 55.0%, $p \leq 0.001$), leading to a reduction in 30-day mortality (8.3% versus 20%, $p=0.015$) and a trend toward reduced acute kidney injury (5.0% versus 10.8%, $p=0.15$).[32]

Challenge #4. Lack of supportive infrastructure (diagnostic services and IT)

Access to a laboratory with the capacity and capability to perform timely and reliable microbiological diagnostics is important for the effective implementation of **diagnostic stewardship**, which is an essential partner to AMS.[33,34] Delayed (≥72 hours) conventional bacterial culture and antimicrobial susceptibility testing results, necessitating initial empiric therapy, are barriers to optimizing antibiotic therapy.[1] Few hospitals in Asia use rapid diagnostic testing (RDT), and some are not even in a position to deliver accurate and reliable conventional pathogen-defining testing.[1,35,36]

Using IT systems to support AMS program processes and guide prescribing decisions can help to improve appropriate antibiotic use in acute-care hospitals.[37] However, IT systems can be costly and time-consuming to implement and maintain. As such, many Asian hospitals do not have IT systems to support AMS programs.[5] Even when implemented, IT systems may not always have the desired effects. For example, prescribing recommendation alerts made through electronic medical records (EMR) may not always be readily accepted.[16]

How can we overcome these challenges?

When developing the business case for AMS, it is important to explain that strengthening laboratory capacity to at least deliver accurate and reliable conventional pathogen-defining testing enhances the ability of AMS programs to de-escalate antibiotic therapy and achieve AMS goals and benefits.[1,29] Work can then begin on developing a business case for increasing access to RDT to reduce empiric antibiotic therapy. Realistically, however, cost is likely to remain prohibitive in many hospitals, particularly in low- and middle-income countries, and a selective approach will be required.[35,36] For RDT to be approved by hospital administration, communication of cost-saving potential (ie, lower costs for antibiotics outweighing increased expense in the laboratory) is likely to be helpful. In the meantime, early AMS review and promotion of the use of monotherapy instead of combination therapy, antibiotic de-escalation, and IV-to-oral switch are strategies that can help reduce antibiotic consumption and optimize empiric antibiotic therapy.[1]

Although they are helpful, extensive databases and sophisticated IT systems and tools are not necessary for successful AMS programs.[1,8,28,29] If a hospital does not currently have the infrastructure and funding to set up IT systems to support an AMS program, a paper-based system and simple manual measurements can be used until sufficient resources are available.[1,8]

As hospitals move toward adopting EMR, there will be increasing opportunities to integrate prescribing recommendations and decision support into IT systems.[1,16] Instead of relying on EMR alerts alone to deliver prescribing recommendations, active dialogue between AMS team members and treating physicians should be encouraged to increase the probability of the acceptance of recommendations delivered electronically.[16]

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