National Action Plan for Containment of Antimicrobial Resistance: Myanmar

2017-2022

(Draft)

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Abbreviations and Acronyms

AGISAR	:	Advisory Group on Integrated Surveillance of Antimicrobial Resistance
AGPs	:	Antimicrobial Growth Promoters
AMA	:	Antimicrobial Agent
AMP	:	Antimicrobial Management Programme
AMR	:	Antimicrobial Resistance
AMSP	:	Antimicrobial Stewardship Programme
AMU	:	Antimicrobial Use
APAC	:	Asia-Pacific Countries
APIs	:	Active Pharmaceutical Ingredients
ASCU	:	AMR Surveillance Coordination Unit
AUSC	:	AMU Surveillance Coordination Committee
CEU	:	Central Epidemiology Unit
CME	:	Continuing Medical Education
CODEX	:	Codex Alimentarius Collection Of Food Standards
DG	:	Director General
DMR	:	Department of Medical Research
DoHRH	:	Department of Human Resource for Health
DRA	:	Drug Regulatory Authority
EMLs	:	Essential Medicine Lists
EQAS	:	External Quality Assessment Scheme
FAO	:	Food and Agriculture Organization
GAP	:	Global Action Plan
GASP	:	Gonococcal Antimicrobial Surveillance Programme
GDP	:	Gross Domestic Product
GFATM	:	Global Fund for AIDS, TB and Malaria
GFN	:	Global Foodborne Infections Network
GP	:	General Practitioner
HAI	:	Hospital Acquired Infection
HCF	:	Health Care Facilities

HICC	:	Hospital Infection Control Committee
HPAI	:	Highly Pathogenic Avian Influenza
ICC	:	Infection Control Comittee
IHR	:	International Health Regulation
IPC	:	Infection Prevention and Control
KAP	:	Knowledge Attitude and Practice
LVBD	:	Livestock, Breeding and Veterinary Department
M&E	:	Monitoring and Evaluation
MDR	:	Multidrug Resistant
MMA	:	Myanmar Medical Association
MMC	:	Myanmar Medical Council
MNA	:	Myanmar Nursing Association
MoALI	:	Ministry of Agriculture, Livestock & Irrigation
MoE		Ministry of Education
MoHS	:	Ministry of Health & Sports
MS	:	Member States
NACC	:	National AMR Coordinating Centre
NAP	:	National Action Plan
NDRA	:	National Drug Regulatory Authority
NFP	:	National Focal Point
NHL	:	National Health Laboratory
NMSC	:	National Multi-Sectoral Steering Committee
NRA	:	National Regulatory Authority
NRL	:	National Referral Laboratory
OIE	:	World Organisation for Animal Health, Organisation mondiale de la santé animale
OTC	:	Over the Counter
PCU	:	Population Correction Unit
PHL	:	Public Health Laboratory
R & D	:	Research & Development
STG	:	Standard Treatment Guideline
TWG	:	Technical Working Group

UNAIDS	:	The Joint United Nations Programme on HIV/AIDS
UNCEF	:	United Nations Children's Emergency Fund
UNFPA	:	United Nations Population Fund
UNGA	:	United Nations General Assembly
VDL		Veterinary Diagnostic Laboratory
VDRL	:	Venereal Disease Research Laboratory
WaSH	:	Water, Saniation and Hygiene
WHA	:	World Health Assembly
WHO CC	:	WHO Collaborating Centre
WHO SEARO	:	World Health Organization Southeast Asia Regional Office
ZELS	:	Zoonoses and Emerging Livestock systems

Executive Summary

Myanmar, as a country going through rapid socio-political transition and institutional development also suffers with a high burden of infectious disease. An ongoing challenge has been to effectively reach its 51 million population, most of whom battle tuberculosis, acute respiratory infections, diarrhoea and malaria including amongst under-five children.

Limited research data on the occurrence of resistant organisms in the nation have, makes it hard to estimate the exact antimicrobial resistance (AMR) scenario. Limited peer reviewed evidence indicates significant divergence from the average resistance trends in APAC region. Nevertheless, several key steps by Government of Myanmar have been instrumental in paving the way for the country to join other nations in the South East Asia Region to speed up its plan on addressing the AMR crisis. Combating antimicrobial resistance would, however, require highest political commitment, multi-sectoral coordination, sustained investment and technical assistance.

A situation analysis was undertaken in September 2016 using a tool developed by WHO SEARO based on discussions between national multisectoral steering committee members, senior technical leaders of the national health authorities and veterinary sector and WHO team. It identified opportunities, challenges and implementation gaps to improve implementation of NAP AMR in ways that could meet the 68th World Health Assembly (WHA) resolution on AMR.

The indicators in the situation analysis protocol were grouped under the heads of National AMR Action Plan in line with GAP-AMR; National AMR surveillance system; Antimicrobial Stewardship and Surveillance of antimicrobial use; Infection Prevention Control in healthcare settings; Awareness raising; Research & innovation and One-Health engagement. Each of these focus areas were consistent with the five strategic objectives of the WHO GAP-AMR, namely the phases of exploration and adoption; programme installation; initial implementation; full operation and sustainable operation.

The situation analysis revealed commitment among political and technical leadership, supporting AMR containment efforts as is reflected in the formation of a National Multi-Sectoral Steering Committee (NMSC). Several existing strengths and initiatives have been mapped as building blocks of an effective NAP AMR. These include a strong laboratory network, existing Infection control and biosecurity programs in human and animal health sectors and a National One Health Strategy which identifies AMR as a priority. A fully functional national drug regulatory authority to oversee regulation and licensing, pharmacovigilance and market authorisation is

another strong element to leverage. Next, initiatives are being taken to develop national standards and guidelines such as the national drug policies were updated essential medicines lists and standard treatment guidelines including for antibiotic prescription are being drafted. Public health system strengthening is an ongoing process while formal campaigns are consolidated or launched focusing on vaccination, sanitation and hygiene at community level.

The National Action Plan on AMR for the period 2017 – 2022 takes these efforts further, reinforcing the government's commitment to make universal healthcare and animal welfare, food security a reality. Based on implementation of the five strategic objectives, each of which has its specific objectives, strategic interventions and key activities, the NAP AMR charts a new phase in Myanmar's journey towards achieving goals related to AMR compliance.

To implement strategic objective 1 related to bridging knowledge and awareness gaps, NAP AMR will establish an evidence-based public communications programme on a national scale to improve awareness of AMR amongst general public and professionals. By 2022, the country would have carried out nationwide evidence based awareness campaigns with regular Monitoring and Evaluation (M&E).Necessary revision and pilot scale implementation of curricular revisions would also have been undertaken by 2022.

To implement strategic objective 2 related to surveillance of AMR, steps would be taken to understand how resistance develops and spreads. This will be done by building on existing strengths of functional national hospital and public health laboratory network in human and animal health sectors, having a nationwide AMR surveillance system in place along with a national early warning system to identify early the emergence of resistance in priority pathogens and to critical antimicrobials by 2022.

To implement strategic objective 3 related to strengthening of hygiene, infection prevention and control, a national infection prevention and control programme would be implemented in compliance with IPC guidelines within healthcare settings, animal husbandry systems and food production systems. Also, actions to decrease Hospital Acquired Infection (HAI) and associated AMR through facility based HAI surveillance programme (Human Health) would be conducted. Hygiene and sanitation related campaigns in community settings will be conducted through systematic health promotion activities.

To implement strategic objective 4 related to optimising use of antimicrobial medicines, a national AMR containment policy would be announced along with a series of measures on Antimicrobial Stewardship Programmes (AMSP) and Standard Treatment Guidelines (STG) at the national scale for prudent use of antimicrobials. Moreover, mechanisms would be established to monitor antimicrobial

usage on a national scale to inform interventions to reduce overuse and promote prudent use of antimicrobial substances. Regulatory structures will be strengthened and newer structures established, especially in veterinary sector.

To implement strategic objective 5 related to building a case for sustainable investments for new medicines, diagnostic tools/vaccines/aids that help bring down use of AMR, it is being mooted to build institutional capacity in the context of research on AMR. A strategic research agenda that is relevant to the Myanmar context will be developed and implemented. This will be done in large part, through leveraging existing capacity, build additional capacity as well as through international collaborations.

Most of these activities will be implemented by the key actors as outlined in the proposed strategic plan that covers the period 2017-22. Following submission of the final report to the World Health Assembly, the Government of Myanmar will continue with its deliberations and planning process under the leadership of National Multi-Sectoral Steering Committee (NMSC).

Background

Setting the Context: From Global to National Action Plans

Antimicrobial resistance (AMR) has emerged as one of the biggest public health threats of the modern epoch. At the 68th World Health Assembly (WHA) in May 2015, a global action plan on AMR (GAP AMR) was adopted in response to the acknowledgement of this emerging crisis (1). The GAP AMR has been developed at the request of the Health Assembly in keeping with resolution WHA67.25 of May 2014, which was reflective of the global consensus that AMR was a major threat to human health.

The GAP AMR has advocated for the One Health approach to form the basis for the global response to AMR, especially in case of developing countries, which are expected to contribute to the increasing trends of antimicrobial agent (AMA) consumption and therefore, likely to be at a higher risk of emerging resistant microbes (2–4). The need for this was further stressed at the 2015 WHA through resolution WHA68.7.[1]

Consolidating the position of the GAP AMR, the global political will come together to further commit to the cause of containment of AMR at the United Nations General Assembly (UNGA) at the high level meeting on AMR on 21 September, 2016, in New York (5). At this meeting, global leaders committed to "taking a broad, coordinated approach to address the root causes of AMR across multiple sectors, especially in human health, animal health and agriculture" (5).

One of the overarching requirements outlined by the GAP AMR was that all Member States (MS) should develop their own, tailor made National Action Plans on AMR (NAP AMR), duly aligned with the principles and approaches espoused by the GAP AMR by May 2017.[2]

The process of framing a contextually-driven NAP AMR will provide a baseline understanding of the local AMR situation, along with highlighting gaps and available capacities. This will serve as valuable information, allowing different countries to customise their NAP AMR as per their local realities.

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[1]Recognising that the main impact of antimicrobial resistance is on human health, but that both the contributing factors and the consequences, including economic and others, go beyond health, and that there is a need for a coherent, comprehensive and integrated approach at global, regional and national levels, in a "One Health" approach and beyond, involving different actors and sectors such as human and veterinary medicine, agriculture, finance, environment and consumers.

[2] (3)to have in place, by the Seventieth World Health Assembly, national action plans on antimicrobial resistance that are aligned with the global action plan on antimicrobial resistance and with standards and guidelines established by relevant intergovernmental bodies;

The process of framing a NAP AMR for Myanmar was initiated through a situation analysis, which provided details of the existing AMR situation, gaps and capacity in the local context.

Situation Analysis and Assessment

Located in Southeast Asia, with total area of 676,600 square km and population of 51 million, Myanmar is surrounded by India and Bangladesh on the west and China, Laos and Thailand on the South East(6). In 2011, the country installed its first civilian government. Ever since, the country has been going through rapid and significant socio-political changes and institution building.

Myanmar is known to be surrounded by porous borders with neighbouring countries. This has not only socio-political implications but implications for movement of diseases and pathogens alongside humans and animals including drug resistance pathogens. Porous borders have also been implicated in illegal movement of drugs and pharmaceuticals for both humans and animals that may or may not be of optimum quality (7).

Compared to other countries in Southeast Asia, Myanmar lags behind on key health indicators(8). The country suffers from a high Infectious diseases burden which contribute to result in greatest proportion of the number of years of life lost, HIV prevalence and malaria incidence nearly double the respective regional averages (8). High infectious disease burden and its complexity is also represented by high TB incidence and MDR TB, the latter being among highest in the region at double the regional average(9).

High MDR TB rate could also be considered an indicator of the problem of antimicrobial resistance(AMR) in general, among common pathogens in both hospital and ambulatory settings. Given multifactorial origin of AMR as a result of antimicrobial use (AMU) in human, animal and food production sectors, it is important to understand the nature and extent of problem and its drivers including socio-cultural, system and policy drivers. This understanding is necessary to inform interventions for effective containment of AMR. However, with the exception of malaria, there is extremely limited peer reviewed evidence or grey literature on existing situation of AMR in common bacteria in Myanmar in hospital as well as community settings in both human and animal sectors.

Antimicrobial resistance and use in human health sector

In the scenario of limited local production, antimicrobials such as β-lactams, tetracycline, fluoroquinolones, aminoglycosides, macrolides and sulphonamides and most are imported from Asian and European countries (personal communication

from Director General(DG) (Department of Food & Drug Administration). However, limited evidence exists on AMR burden, AMU and their trends in Myanmar.

Documented evidence doesn't allow comparison with regional averages. For example, in a study on hospitalised patients during 2009 to 2013 in Myanmar, resistance to *Enterococcus* spp, to ampicillin was reported as 30.8% and 68.8% to erythromycin (10). This is much lower than the APAC regional average of 68.5% resistant to ampicillin in *Enterococcus* reported in 2011 (11). Some evidence on AMR in Myanmar has been reported from studies conducted in border areas,as these areas have been more accessible to patients and samples in the past. In a study on non-pregnant adults on the Thailand–Myanmar border in 2013-2014, resistance percentage in *E.coli* was reported as: ampicillin 70.1%, ceftriaxone 20.9%, co-amoxiclav 7.5%, cotrimoxazole 62.7%, Ciprofloxacin 20.9%, gentamicin 20.9%, nitrofurantoin & meropenem 0%. These rates are again significantly different from APAC averages: 44.6% to co-amoxiclav, cotrimoxazole 64.4%, ceftriaxone 59.4%, gentamicin 42.6%, meropenem 3.3% (12). Similar unexpectedly low resistance was reported to common bacterial isolates in blood cultures from paediatric patients in Yangon Children Hospital (13).

The rising problem of AMR in Myanmar has however, been demonstrated by Lestari et al. in their review of literature of peer reviewed publication between January 1, 1995 and January 1, 2007(14). In 1984 and 1985, no resistance to trimethoprim-sulfamethoxazole was observed among *Shigella* spp in Myanmar, in 1989 it was 48% and in 1993, 63% of isolates were resistant. In Myanmar, tetracycline resistance among *Shigella* spp increased over the years from 0% in 1980, 41% in 1984, 63% in 1985, 90% in 1991 to 91% in 1993. For chloramphenicol, there has been a steady increase in resistance rates over the years in Myanmar: from 0% in 1980, 41% in 1984, 63% in 1985, 75% in 1989, 90% in 1990 to 91% in 1993(14).

Antimicrobial resistance and use in animal health, aquaculture and food production sectors

Agriculture is the backbone of the Myanmar economy: the sector contributes to 37.8% of Gross Domestic Product (GDP), accounts for 25 to 30 % of total export earnings and employs 70 % of the labour force (15). Livestock and fisheries account for 20% of agricultural GDP of Myanmar (16). Livestock and fisheries sector is proposed to expand to achieve food security and self-sufficiency. National livestock policy has laid large emphasis on poultry production as well as dairy cattle while retaining a rural focus and strengthening small holder animal farms (15).

While both marine and inland fisheries are responsible for majority of production, increased emphasis to harness the potential of aquaculture is reflected in special plans of Government of Myanmar. Special livestock and fisheries development committees and task forces have been set up in the past to work on a multi-year

plans for extended breeding and production of fish and shrimp including technical support from global knowledge institutes (17,18).

Alongside the growth of incomes and population, the demand for livestock products is expected rise sharply: for poultry meat the market is expected to grow annually with 15%. The market growth for dairy products is expected to be even higher: 30 – 100% in the upcoming 10 years (17). Rapid increase in production of livestock and aquaculture are known to involve intensive approaches that make animals prone to infections and therefore lead to greater need for AMAs which is reflected in the recent projections. Based on livestock intensification patterns, China, Brazil and India are current hotspots, and future hotspots are Myanmar, Indonesia, Nigeria, Peru and Vietnam (19). Currently in SEA, Indonesia, Vietnam, and Myanmar are the three leading consumers of antimicrobials for farm use on a total per-country basis. Among the 50 countries with the largest amounts of antimicrobials used in livestock in 2010, the five countries with the greatest projected percentage increases in antimicrobial consumption by 2030 are likely to be Myanmar (205%), Indonesia (202%), Nigeria (163%), Peru (160%), and Vietnam (157%) (20). Similarly, aquaculture sector is known to be a major consumer of antibiotics in SEA andaquatic environments of the region have been found to contain antibiotics and AMR genes(21,22). However, no evidence exists on the extent of use of AMAs in this sector in Myanmar.

National policy on the sale or use of antimicrobials in animals and animal feed is not well established in Myanmar. Most of antimicrobials used in livestock production are imported; major classes of antimicrobials, used in livestock production in Myanmar are beta-lactams, tetracycline, fluoroquinolone, aminoglycoside, macrolides and sulphonamides. Studies indicate that up to 10% of poultry meats from retail market have been found to be positive for residue of antibiotics such as fluoroquinolones (23).

Myanmar has a major existing problem of inappropriate use of antimicrobials, and most farmers use antimicrobials without any consultation by veterinarians (23). It is expected therefore that AMR is significant problem in the livestock and food production sectors.

Similar to human clinical isolates, among ASEAN countries, data on AMR and foodborne pathogens are limited in Myanmar and therefore doesn't allow a meaningful comparison with regional trends(24). Data based on a student thesis reveals that*Salmonella* strains in raw food products in retail markets in Yangon, Myanmar were all resistant to tetracycline (24). In a study on poultry meat,*Escherichia coli* isolates were reported to be resistant to ampicillin, chloramphenicol, oxytetracycline, and neomycin (69.23% to 61.53%). Moderate resistance to antibiotics was observed with ciprofloxacin (46.15%). Gentamycin showed the lowest resistance (7.6%). On the other hand, resistance of *E. coli* O157

isolates from fresh beef samples of retail market ranged from ciprofloxacin (25%) and gentamycin (87.5%), to sulfamethoxazole/ trimethoprim (12.5%). Antibiotic resistance of *E. coli* isolated from rectal swab samples of piglets showed 100% resistance to ampicillin and oxytetracycline and resistance to chloramphenicol, ciprofloxacin, gentamycin and sulfamethoxazole/ trimethoprim reported as 75%, 75%, 83.3% and 91.6%, respectively(23).

Situation analysis of AMR containment efforts in Myanmar

A situation analysis was undertaken in Myanmar in September 2016 using a tool developed by WHO SEARO. The specific objectives of the situation analysis were:

- To conduct the situation analysis prior to strengthening and developing the National Action Plan, aligning with Global Action Plan to determine the baseline regarding implementation and functionality in terms of sufficient qualified human resources, funding and functional structures of command and coordination of AMR program in the country;
- To identify opportunity, challenges and implementation gaps in order to improve the overall NAP implementation;
- Assist Myanmar to identify vulnerabilities, opportunities and needs to meet the 68th WHA resolution on AMR and prioritise the activities for AMR containment as per NAP;
- To facilitate WHO in fulfilling its commitment to report on the development, implementation, monitoring and evaluation of the NAP-AMR and to identify priority areas for WHO to support.

The situation analysis process comprised of guided discussions between the National AMR Multisectoral Steering Committee members, senior technical leaders of national health authorities and veterinary sector, and WHO team. The situation analysis looked at how well developed the AMR programme was in terms of governance, policy and systems and its review focused on broad system wide analysis rather than assessing quality of policies and documents.

The indicators in situation analysis protocol were grouped into seven focus areas: 1. National AMR Action Plan in line with GAP-AMR; 2. National AMR surveillance system; 3. Antimicrobial Stewardship and Surveillance of antimicrobial use; 4. Infection Prevention Control in healthcare settings; 5. Awareness raising; 6. Research & innovation; and 7. One-Health engagement. These focus areas were consistent with the five strategic objectives of the WHO GAP-AMR.

Each of the focus areas was comprised of a list of sub-focus areas. Each sub-focus area was graded on five levels to show the incremental extent of AMP programme implementation. These five levels of phases are stated as follows: Phase 1: Phase of exploration and adoption; Phase 2: Phase of programme installation; Phase 3:

Phase of initial implementation; Phase 4: Phase of full operation; Phase 5: Phase of sustainable operation (14).

A thematic situation analysis was conducted based on the phases in which each of the indicators were placed in. The phases reflect phases of the installation and implementation of the AMR containment program in terms of governance, policy and system. Phases 1 and 2 relate to policy development and planning but no implementation; Phases 3 to 5 are related to different levels of implementation including initial implementation; phase of full operation; and phase of sustainable operation. These phases from 3 to 5 are the strengths of the system. Sustainable operation is considered best practice and defined here as an operation that incorporate an M&E system.

Figure 1 shows the status of implementation of AMR containment programme in Myanmar. Green colour indicates complete implementation, yellow indicates partial implementation and red implies no implementation. Following were the findings from the Government of Myanmar-WHO Situational Analysis:

National AMR Action Plan in line with GAP-AMR

Myanmar has not started developing a National Action Plan for AMR containment. A national multisectoral steering committee has been announced with the Deputy Director General of National Health Laboratory (NHL) identified as the National Focal Point. Further governance mechanisms to implement plans under different strategic objectives and interventions will be developed as part of the NAP AMR.

Awareness raising

Awareness efforts in different target groups have been limited and ad hoc and have ranged from Continuous Medical Educations(CMEs) for professionals (general practitioners) by public hospitals and professional societies (by Myanmar Medical Association and General Practitioners' Society) (25)to modular (NOT curricular) teaching in professional courses. These efforts have been organized in the last 1-2 years. Limited or no efforts have been made to understand and address awareness needs of wider target groups base.

National AMR surveillance system

An AMR surveillance system that captures standardized epidemiological, clinical and laboratory data on AMR has not been set up in Myanmar. Myanmar has a strong culture of diagnostic microbiology laboratory network. The NHL is the apex lab and coordinating centre for nearly 1123 hospital laboratories across the country at different levels. The NHL provides referral and advisory services to other verticals in MoHS such as DG FDA and Disease Control Programmes under DG Public Health. Data mostly in paper based form flows from hospital laboratories at different level to

the NHL and is comprised of isolates and their AST results without any epidemiological information. Data is converted to electronic form (excel data) at the level of NHL followed by limited analysis which is not real time. A long standing QA program run nationwide as a national EQAS by NHL is another strength of the laboratory network.

A national referral laboratory for AMR surveillance is yet to be identified. However, the recently approved and published Myanmar National Policy on Health Laboratories identifies a central and apex role for NHL(26).

In the absence of systematic data collection and analysis of AMR trends, an early warning system for emerging trends drug resistance trends is not operational in Myanmar. Situation analysis revealed some anecdotal evidence of hospital level analysis on a case-to-case basis following identification of unusual resistance patterns.

Antimicrobial Stewardship and Surveillance of antimicrobial use

An overwhelming majority of the AMAs used in Myanmar are imported. Import data provides an opportunity to monitor their use through sales data. Similarly, surveillance for use in hospital and ambulatory care settings has not been operationalised.

AMSP as an important strategy for monitoring and improving the use of AMAs in different health care settings is yet to be introduced in Myanmar's health sector. Notably, a National Standard Treatment Guidelines, the treatment guidelines including for use of AMAs is guided by guidelines issued by professional societies and adapted by local physicians and surgeons in the hospitals. Local STGs are seldom guided by local AMR surveillance data.

The institution of DG FDA is the fully functional national drug regulatory authority and well established as a national network. However, challenges in effective drug control include, majorly imported medicines, limited human resources for regulatory enforcement, limited oversight of veterinary drugs and pharmaceutical even though regulated by DG FDA, lack of awareness on AMR and AMU among stakeholder across the board and a significant problem of OTC sales of AMAs in both human and animal sectors. While, the WHO prequalified anti-tuberculosis drugs ensure optimum quality in national TB program, AMAs for common infections including malaria suffer from issues of quality, counterfeit drugs and illegal imports from across international borders.

Infection Prevention Control in healthcare settings

Infection control and patient safety policy was introduced in health care settings by MoHS some years ago. Infection Control Committees (ICC) and teams are in place

under the policy with infection control guidelines. However, except for limited activities related to education and training in hand hygiene, standard precautions and additional (transmission related) precautions, there is limited activity of ICCs. Quality of microbiology laboratory testing is assured by virtue of being part of the NHL quality assured network. However, there is limited to no analysis of hospital associated infections data, AMR surveillance and AMU data to prevent infections and improve of AMAs. Resource constraints including human resource constraints and lack of standards and guidelines were often cited as the reasons for IPC programmes not being implemented to their fullest potential.

Research & innovation

In spite of modest institutional capacity, AMR research has not caught the attention of the research community as is reflected in limited peer reviewed publication base from Myanmar. Opportunistic research is carried out in clinical settings to fulfil mandatory academic requirements. A strategic research agenda and priorities for Myanmar are yet to be identified. A recent publication has highlighted the acute need for research in program planning and resource allocation but also the need for health systems, policy and burden research on AMR in tuberculosis control and MDR TB[27]. International collaborations have been established recently by the NHL with global centres of excellence such as Pasteur Institute, Cambodia, National Centre for Global Health and Medicine, Japan and Niigata University, Japan.

One-Health engagement

Avian influenza outbreaks have brought together the human and animal health sectors in the form of coordination mechanisms. As a further step, a One Health Strategy has recently formulated with a One Health Secretariat being proposed and led by Central Epidemiology Unit at MoHS. One Health platform will undertake joint surveillance and response on six priority diseases (avian influenza, rabies, anthrax, tuberculosis, Japanese encephalitis, food borne zoonoses) and AMR.

Animal health sector in general lags further behind in AMR containment efforts. AMR containment policy, AMR surveillance, AMSP and awareness programs have not been initiated. The zoning related interventions following HPAI outbreaks in poultry are examples of biosecurity and hygiene related interventions that could be expanded to other settings. Recently The Myanmar Pig Partnership, under the aegis of Zoonoses and Emerging Livestock Systems (ZELS) project was launched in Myanmar. The Project is an interdisciplinary research project exploring the disease risk thought to be accompanying changing pig production and consumption patterns in Myanmar. It has helped set up basic bacterial culture and antibiotic susceptibility testing facility at the Veterinary Diagnostic Laboratory (Yangon). AMR surveillance on a pilot scale is carried out from different sites in and around Yangon area with the help of local Veterinary Officers. Clinical samples and samples from piggeries,

poultry farms, slaughterhouses and feed samples are collected on a monthly basis and tested for presence of bacterial pathogens and screened for AMR. Few private farms have started submitting samples for culture and sensitivity to the VDL (Yangon).Similarly, limited capacity for drug and residue testing is available at Veterinary Assay Laboratory which is responsible for testing for drug quality before registering a veterinary drug for import and use in Myanmar. However, this has not been organized into a systematic surveillance system.

One of the major constraint in controlling AMU in veterinary sector has been the absence of regulatory control of veterinary sector on licensing, regulating and controlling AMAs. Veterinary sector is only mandated to recommend and register AMAs requisitioned by animal production units. The regulatory control by DG FDA at MoHS lacks effectiveness at the field level.

Overall, AMR containment efforts in Myanmar are in the phase of exploration and adoption in different focus areas with initial implementation in awareness and hygiene/sanitation and laboratory surveillance; drug regulation is in process of achieving full operation (Figure 1).

Figure 1: Status of implementation of AMR containment programme/initiatives in Myanmar, by phase of implementation

Focus area	Strategic activity	Exploration and Adoption	Programme Installation	Initial Implemention	Full Operation	Sustainable Operation
Developing or strengthening the NAP	NAP AMR developed in alignment with GAP AMR	🟩	🟥	🟥	🟥	🟥
AMR Awareness raising	Awareness campaigns for the public	🟩	🟩	🟥	🟥	🟥
	Education and training strategies for professionals	🟩	🟥	🟥	🟥	🟥
AMR surveillance	National AMR surveillance in humans	🟩	🟥	🟥	🟥	🟥
	National laboratory network strengthening	🟩	🟩	🟩	🟥	🟥
	Early warning system	🟩	🟥	🟥	🟥	🟥
Rational use of antimicrobials and surveillance of antimicrobial use and sale	A national AMR containment policy for control of human use of antimicrobials; AMR stewardship in the community	🟩	🟥	🟥	🟥	🟥
	National Regulatory Authority (NRA) or Drug Regulatory Authority (DRA)	🟩	🟩	🟩	🟨	🟥
	Surveillance of antimicrobial use and sales in humans in the community	🟩	🟥	🟥	🟥	🟥
	Regulation of finished antibiotic products and active pharmaceutical ingredients (APIs)	🟩	🟩	🟩	🟥	🟥
	Regulation of pharmacies on over the counter (OTC) sales and inappropriate sale of antibiotics	🟩	🟩	🟩	🟥	🟥
Infection Prevention and Control and AMR stewardship programme in healthcare settings	AMR stewardship programmes in healthcare settings	🟩	🟥	🟥	🟥	🟥
	Infection Prevention and Control programme in healthcare settings	🟩	🟩	🟥	🟥	🟥
	National Hospital Acquired Infection and related AMR surveillance	🟩	🟥	🟥	🟥	🟥
	Sanitation & hygiene and vaccination	🟩	🟩	🟥	🟥	🟥
Research and Innovation	Research funding; National Policy to promote and foster innovation	🟩	🟥	🟥	🟥	🟥
One Health Engagement	A national AMR containment policy and regulatory framework or control of animal use and their registration for use	🟩	🟥	🟥	🟥	🟥
	National surveillance of AMR and the use and sale of antimicrobials at national levels in the veterinary sector	🟩	🟥	🟥	🟥	🟥
	Infection Prevention and Control programme in the animal sector	🟩	🟩	🟨	🟥	🟥
	AMR awareness generation and education in the animal sector	🟩	🟥	🟥	🟥	🟥

National Action Plan on AMR (2017 – 2022)

Goal, Objectives and Guiding Principles

The goal of the GAP AMR is: "to ensure, for as long as possible, continuity of successful treatment and prevention of infectious diseases with effective and safe medicines that are quality-assured, used in a responsible way, and accessible to all who need them."

To achieve this, the GAP-AMR has laid down five strategic objectives which form the basis for developing public health response to AMR globally. These strategic objectives are:

Objective 1: Improve awareness and understanding of antimicrobial resistance through effective communication, education and training

Objective 2: Strengthen the knowledge and evidence base through surveillance and research

Objective 3: Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures

Objective 4: Optimize the use of antimicrobial medicines in human and animal health

Objective 5: Develop the economic case for sustainable investment that takes account of the needs of all countries, and increase investment in new medicines, diagnostic tools, vaccines and other interventions

Additionally, the NAP AMR is expected to reflect the five principles based on which the GAP AMR strategies have been enunciated. These include:**Whole-of-society engagement including a One Health approach, Prevention first, Access, Sustainability, and Incremental targets for implementation(GAP).**

NAP Development Process

The development of NAP has followed the guidelines enshrined in WHO's "Antimicrobial resistance: A manual for developing national action plans" (World Health Organization 2016). The approach is structured around the five strategic objectives and five principles which are embodied by the GAP AMR (World Health Organization 2015).

Within the five strategic objectives of the GAP AMR, 12 specific objectives have been included. Each of these specific objectives has been described in terms of a Strategic Intervention, with a defined set of key activities to be carried out successfully to execute the strategic intervention and eventually to fulfil the strategic objective. Key Monitoring & Evaluation (M&E) indicators have been listed for activities under each of the strategic interventions with the operational plan comprising of broad planning by activity. Detailed planning along with the budget allotted for the respective activities will be done in due course by national stakeholders.
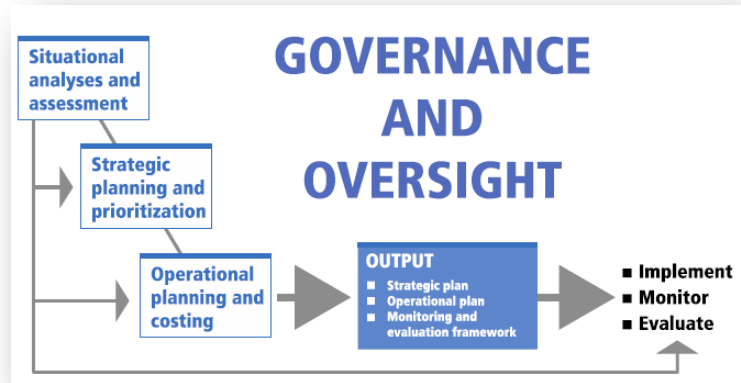
The NAP thus consists of the Situation Analysis and Assessment, a Strategic Plan, an Operational Plan as described in the WHO guidance manual and a Sample template (28,29).

The Situation Analysis by WHO SEARO focused on how well developed the AMR programme is in terms of governance, policy and system formed the basis for identifying gaps and strategic priorities (World Health OrganizationSEARO, 2016). The situation analysis was further supported by literature review including grey literature provided by country level stakeholders.

Based on the extent of implementation, each of the strategic interventions was graded on an incremental scale consisting of five phases adapted from the Indicator Standards Assessment Tool developed by UNAIDS(30). The first phase, that of exploration and adoption, indicates that the process of designing an AMR containment programme has been initiated. Once the decision to implement the programme has been made, systems progress to the second phase, that of programme installation. The third phase, of initial implementation, is one of the most challenging phases for programmes in developing countries. Once the early implementation barrier is overcome and the programme is scaled up, the fourth stage – full operation – is achieved. Once the programme starts to function at the highest grade of operational efficiency, the fifth and final stage, that of sustainable operation, is attained.

Findings from the Situation Analysis helped situate the current state of NAP in the country along the incremental scale. To enable the country to make the most progress towards implementing NAP, GAP principle of "Incremental targets for

implementation" was followed with the ultimate aim of achieving phase 5 of sustained operations. Flexibility was built into the planning process including monitoring and reporting arrangements, in order to allow the country to determine priority actions that it needs to take in order to attain the five strategic objectives and implement actions in a step-wise manner that meets both local needs and global priorities.

NAP development involved the process of participative dialogue with important stakeholders and informants. Further expansion into a detailed operational by sub activities and validation will be done by country team and stakeholders. Technical support was provided by WHO Country office, WHO SEARO and the Consultant.

Country Response

Governance

A national multi-sectoral governance mechanism is the pivot around which AMR-related activities can be effectively coordinated in all the relevant sectors. This will ensure a systematic and comprehensive approach. However, the scope should be broad enough to address all five strategic objectives of the global action plan, prioritising activities in a step-wise approach.

The governance mechanism for Myanmar will comprise of a High Level National Multi-sectoral Steering Committee (NMSC), for antimicrobial resistance. NMSC will be supported by a National AMR Coordinating Centre and multi-sectoralTechnical Working Groups who will address the strategic objectives of GAP through specialised Task Forces on related to the five strategic objectives of GAP. Each of these will be formed and will function as per the following criteria.

National Multisectoral Steering Committee (NMSC) for Antibiotic Resistance

The NMSC will provide the necessary political commitment and support for national AMR containment efforts in Myanmar and to the international global health community. Given the ultimate goal of AMR containment efforts that are geared to improve human health outcomes, the NMSC will be formed under the leadership of MoHS with MoHS as the Chairperson.

Composition of NMSC:

The NMSC will be chaired by Minister for Health & Sports and Co-Chaired by Minister for Agriculture Livestock& Irrigation. Its membership will be as follows:
- Minister of Health and Sports (Chairman)
- Permanent Secretary of Ministry of Health and Sports (Co-chair)
- Members - 22

National AMR Coordinating Centre (NACC)

The NACC will be the implementation agency for NAP AMR and will draw its powers and mandate from Ministerial Decree while NMSC will provide strategic vision to AMR control efforts. The NACC will provide the platform for programme planning and implementation through a supporting structure comprising of technical working groups for individual strategic objectives.

The NACC is envisioned as a multi-sectoral group of senior programme managers from different ministries with adequate representation of non-governmental agencies, cooperatives, civil society representatives, media, international agencies (WHO/FAO/OIE). By way of its multi-sectoral composition, it will ensure adequate integration of AMR containment efforts into the existing health system, public health and disease-specific programmes, animal health and production food sector and other environmental initiatives.

It will be chaired by Deputy Director General (Labs) and its Secretariat will be located in NHL, Yangon. Its membership will be drawn from the:

- Ministry of Health and Sports
- Ministry of Agriculture,Livestock and Irrigation
- Ministry of Education
- Ministry of Commerce
- Ministry of Home Affairs
- Ministry of Defence

Logistics of the NACC

The NACC will meet every six months. The NACC Secretariat will be located in NHL, Yangon.

Roles and responsibilities of NACC:

Roles and responsibilities of the NACC have been mentioned in the Strategic Plan. Broadly, it will be responsible for:
- Planning, implementation and monitoring & evaluation of different strategic interventions and activities of NAP AMR
- Monitoring and evaluation on implementation different strategic interventions and activities of NAP AMR
- Reporting implementation status to NMSC, national agencies and international partners
- Constitute technical working groups and commission task forces for tasks that include providing technical input for program support and decision-making
- Facilitating collaborations with internal and external agencies and organizations, is essential for many countries especially in the field of surveillance and innovations
- Advocate for prevention and containment of AMR

Appointing a National Focal Point

Deputy Director General (Labs) will be the National AMR focal point responsible for coordinating AMR activities and tasks in the health, animal, aquaculture, food production and environment sectors. The responsibilities of NFP will be to:

- Build sustained partnerships and work nationally and internationally on containment of AMR;
- Identify stakeholders and facilitate formation of an inclusive NACC;
- Lead and coordinate drafting of a national action plan for containment of AMR;
- Facilitate and oversee implementation, M&E of the plan through the NACC;
- Ensure regular data collection and information sharing by instituting effective communication and coordination among all stakeholders, the members of NACC and their constituencies, sectors and disciplines;
- Coordinate national activities for establishment of AMR surveillance systems
- Report on prevalence of and trends in AMR to the Global AMR Surveillance System (GLASS)

Forming Technical Working Groups

Technical working group (TWG) will form an integral part of the governance mechanism in Myanmar. These will be multi-sectoral in composition and will report to the NACC. They will be formed *a priory* and will be mandated with specific tasks such as providing technical input, conducting situational analyses, drafting NAPs, planning and budgeting, commissioning specialised task forces and overseeing implementation of strategic interventions and corresponding key activities under the five strategic objectives.

The proposed thematic TWGs that will be formed include:

1. Awareness
2. Surveillance
3. Infection Prevention and Control and Hygiene
4. Optimizing Antimicrobial Use
5. Research and Innovation

Each of the TWGs will be responsible for programme planning and budgeting referring to NAP on AMR while focusing on One Health and for coordinating between the different agencies and secretariats. They will assume charge for monitoring and evaluation and based on their interactions and review mechanisms come up with a set of workable recommendations.

The 5 TWGs will be mandated by the NACC and will report to their Chairpersons and to the National Focal Point of the NACC. The organisational structure, composition,

locus of coordination centre and general terms of reference are listed below. Specific jobs of individual TWGs have been detailed in the Strategic Plan Document.

General Terms of References of Technical Working Groups

Technical working group (TWG) will be multi-sectoral in composition and will report to the NACC. In their respective strategic objective, the TWG will:

- Provide strategic direction by identifying intervention and key activities
- Conduct situational analyses
- Draft detailed sub activity level NAP
- Plan and budget for different activities
- Monitor and evaluate implementation of strategic interventions and corresponding key activities
- Provide technical input
- Commission specialised task forces

Specific terms of references of individual Technical Working Groups and their structure is detailed in Annexure 2. A Coordinating Unit will support the functioning of each of the TWGs.

Constituting Specialised Task forces

Specialised task forces will be commissioned by the TWGs for delivering on specific tasks in the respective strategic areas. They will work under the technical guidance and supervision of respective TWG and will comprise of in-country as well as international experts, including those from WHO/FAO/OIE. The Task forces will be tasked with functions such as evaluation of existing policies, frameworks, interventions, guidelines and the development of guidelines and standards. They will be envisioned for the implementation of the Myanmar National Action Plan as mentioned in the Strategic Plan Document.
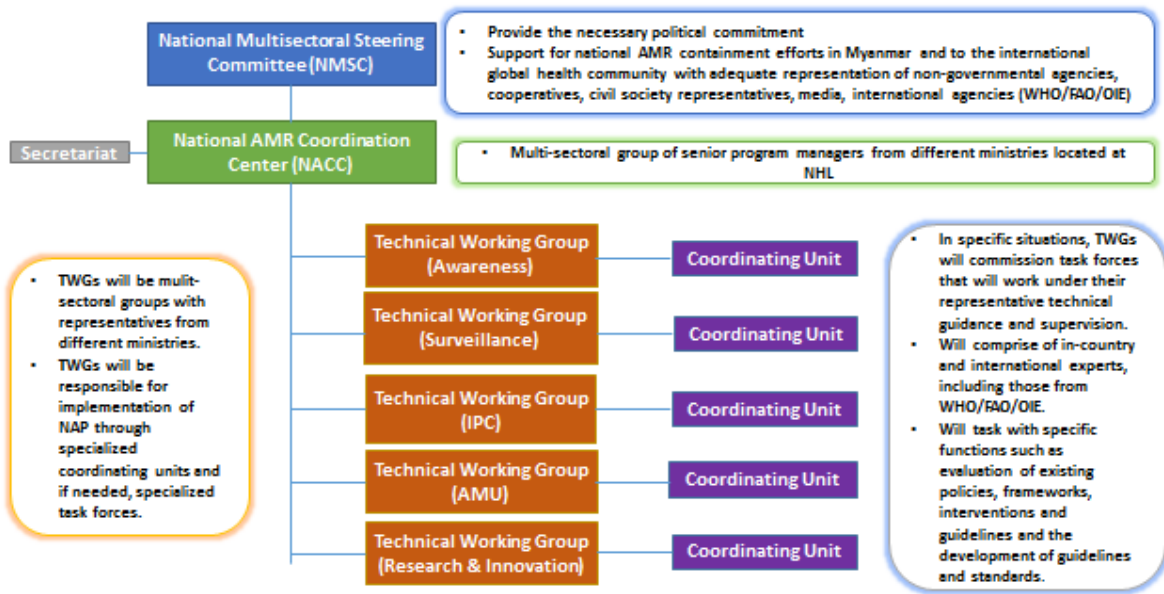
Figures 2:NAP Governance Structure in Myanmar, 2017-2022

Strategic Plan

The strategic plan for Myanmar's NAP AMR is based on implementation of five strategic objectives, each of which has its objectives, strategic interventions and key activities

Strategic Objective 1: AWARENESS

The GAP AMR has identified the need to raise awareness of AMR and promote behavioural change through public communication programmes that target different audiences in human health, animal health and agricultural practices as well as a wide range of consumers related to these sectors. The GAP AMR has also focused on making AMR a core component of the professional education training, certification, continuing education and development in the health and veterinary sectors and agricultural practice. This approach is expected to foster proper understanding and awareness amongst professionals.

The Situation Analysis revealed that awareness program on AMR in different sectors is yet to be formalised. Limited and ad hoc CMEs and trainings have been conducted by tertiary care hospitals, professional societies and veterinary universities. Awareness for general public and other relevant stakeholders such as livestock farmers have not been conducted.

By 2022, Myanmar will carry out nationwide evidence based awareness campaigns with regular M&E. The aim is also to revise curricula in undergraduate medical and veterinary, food industry and agriculture teaching and Continuous Professional Development courses. Revised curricula will be implemented on a limited scale but with regular audits. The Strategic Plan is as follows:

Objective 1.1: To improve awareness of AMR amongst the general public and professionals

Strategic intervention 1.1 Establish an evidence-based public communications programme targeting audiences in policy making, human and animal health practice, the general public and professional on prudent use of antimicrobials

KEY ACTIVITIES

Under the technical guidance of TWG (Awareness):

2017   1. A task force will conduct Knowledge, Attitute and Practice(KAP).Studies on a national scale on AMR, AMU,environmental relationships to assess awareness levels and gaps in knowledge in different target groups. Priority target groups will include farmers, pharmacists, pharmacies, druggists, traditional medicine practitioners, primary and secondary school curriculum, general public and media

2018   2. MoHS and MoALI,in collaboration with MoE, will design evidence based communication campaigns using evidence generated that will include accurate and relevant messages targeting priority groups. Awareness campaigns conducted recently by Myanmar Medical Association(MMA) andGeneral Practitioner(GP) society on AMR and AMU will be reviewed for suitability for inclusion in overall communication strategy

2017-18   3. MoHS and MoALI will identify pilot sites to implement communication campaign for antibiotic awareness improvement. Limited scale roll out will be done with support from WHO, FAO and relevant NGOs

2019   4. Pilot campaigns will be evaluated in 2018. This will be followed by nationwide scale up and scale out of awareness campaigns in 2019 with regular monitoring and evaluation

Responsible Agency

    MoHS, MoALI, MoE, Ministry of Information

Partners and Stakeholders

    WHO, FAO, OIE, NGOs & INGOs, MMA, MNA, MMC, GP Society, Livestock Producers' Associations, Pharmacists' Associations, Private Hospital's Association

- Awareness levels by target groups
- Evidence based communication campaigns tailored for specific target groups
- Reports on the impact of communication program

Objective 1.2: Improve knowledge of AMR and related topics in professionals through professional education and training deployed at the national scale

Strategic intervention 1.2 Include AMR and related topics such as Infection Prevention Control as a core component of professional education, training, certification and Development for health care providers and veterinarians

KEY ACTIVITIES

Under the overall supervision of TWG (Awareness):

2017-18   1. Task Force commissioned in 1.1 will conduct KAP Studies on a national scale to assess awareness levels and gaps in knowledge in professional groups on AMR, hygiene & IPC, environmental relationships. Priority professional groups will include:specialist physicians/surgeons, general practitioners, veterinarians, para-veterinarian, paramedics, nursing staff, environmental health specialists, agriculture/production experts, ministry officials of relevant departments and policymakers.

2019-20   2. DG , Department of Human Resource for Health (DoHRH)and MoALI counterpart, under technical guidance of Ministry of Education, and in collaboration with Medical and Veterinary Councils will undertake revision for professional development courses (human and animal health, the food industry and agriculture). Proposals submitted by Directorate of Medical Services and ongoing module for undergraduate veterinary curriculum will be reviewed for their suitability for new curricular strategies. Roll out of courses will be done on a limited scale along with concurrent regular audits followed by nationwide scale up.

2020-22   3. AMR and related topics will be incorporated in undergraduate and postgraduate curricula in human and animal health, the food industry and agriculture. Limited scale testing of revised curriculum along with regular audit of courses will be conducted before planning a nationwide scale up in next phase of NAP

Responsible Agency

MoHS, MoALI, MoE

Partners and Stakeholders

WHO, FAO, OIE, NGOs & INGOs, MMA, MNA

Illustrative Indicators

- Awareness levels by professional groups
- Number of revised curricula for target professional groups
- Audit reports of professional courses

Strategic Objective 2: SURVEILLANCE OF AMR

The GAP AMR identifies the need to establish an evidence based surveillance for AMR in the nation and identifies the following critical information/evidence gaps:

- Descriptive epidemiology of resistant organisms as they emerge
- Understanding how resistance develops and spreads
- The ability to rapidly characterise the emergent resistant organisms
- Understanding social sciences, behavioural and other research needed for holistic fulfilment of all five strategic objectives
- Treatment and prevention of infections, especially in the low resource settings
- Basic and translational research to support the development of new treatments, diagnostic tools, vaccines and other interventions
- Alternatives to non-therapeutic uses of antimicrobial agents in the context of agriculture, aquaculture and their use in crop protection
- Economic research

The situation analysis revealed that several elements of systematic AMR surveillance are not in place in different sectors such as surveillance standards/guidelines, systematic data collection and analysis including electronic reporting and recording and linkage with HAI surveillance. Human health sector is ahead with a strong quality assured network of laboratories performing AMR testing. Disease Control Programs, especially TB, also have an advanced system of AMR testing. However, animal health sector has only a very recent pilot initiative in place.

By 2022, Myanmar will consolidate its strengths in AMR surveillance and develop a high quality AMR surveillance system on a limited scale that will integrate AMR surveillance in laboratories, hospitals, AMU and surveillance in animal sectors. By 2022, a national early warning system will be in place to identify early the emergence of resistance in priority pathogens and to critical antimicrobials.Nationwide expansion will be planned at the end of this phase of NAP in 2022. The Plan will be rolled out as below:

Objective 2.1: Set up a national surveillance system for antimicrobial resistance under the leadership of a National Coordinating Centre.

Strategic intervention 2.1 Establish a national coordination structure for surveillance of AMR

KEY ACTIVITIES

2017   1. The TWG (Surveillance), TWG (IPC) and TWG (AMU) will jointly identify an AMR Surveillance Coordination Unit(ASCU), define its mandates and terms of reference and designate a Focal Point followed by notification by ministerial decree. The ASCU will be located in the National Health Laboratory,Yangon and will comprise of members from NHL, CEU, Veterinary Diagnostic Lab, Veterinary Assay Lab and Directorate of Epidemiology (LVBD)

2017-18   **2.** The ASCU,with technical support from WHO, OIE and FAO, will develop guidelines for AMR Surveillance including guidelines for data sharing (indicators, triggers, analysis plan, response plan), incorporating the critical components as outlined in guidance documents (WHO sample templates, GLASS implementation guide, AGISAR technical recommendations, OIE, Codex Alimentarius, etc).

2017-18   3. The ASCU will identify priority pathogens, sample sites and pathogen-antimicrobials combinations in humans and animals, based on the country's AMR situation

4. ASCU will develop a One Health AMR surveillance plan in humans, animal and food (sample selection, number of samples, sample processing, logistics)

5. ASCU will assess and inventory resources for monitoring, surveillance and testing sentinel environmental sites (hospitals, animal production units, slaughterhouses, pharmaceutical manufacturing units etc.) for antimicrobial resistant organisms and antimicrobial agents

6. ASCU will be responsible for training of surveillance staff and clinical staff in AMR surveillance and lab techniques according to GLASS standards

7. Under the technical guidance of ASCU, Central Epidemiology Unit (CEU) will develop an integrated human and animal IT platform for AMR surveillance reporting. Linkages of information systems will be established to ensure interoperability between Lab AMR surveillance of NHL and hospital infection surveillance in different HCFs. WHONET platform will be implemented for epidemiological and laboratory AMR surveillance data entry, storage and transmission in human and animal sector labs.

2019-22
8. ASCU will implement a national AMR surveillance program that is representative but with limited number of operational sites. Central Hospitals and their labs, and central veterinary diagnostic labs (Yangon and Mandalay) and regional veterinary diagnostic laboratories will be targeted in the pilot phase. Regular data of AMR along with resistance profiles of priority pathogens for human, animal and food will be made available to ASCU from these limited number of sites. Integrated information system will be integral to the AMR surveillance pilot

9. Under the technical guidance of ASCU, NHL in collaboration CEU will conduct studies to map antibiotic resistant organisms in representative environments (hospitals, animal production units, slaughterhouses, pharmaceutical manufacturing units etc.), with varying degrees of exposure to antibiotics.

10. Data will be reported, exchanged and queried through the integrated AMR surveillance IT platform; WHONET platform implemented by ASCU will be utilised

2021-22
11. The ASCU will establish formal linkages between national AMR surveillance programme and WHO GLASS. Reporting to GLASS will commence after formal assessment of national AMR surveillance program pilots

12. TWG (Surveillance) will conduct a formal assessment of National AMR surveillance followed by recommendations of nationwide scale up

Responsible Agency

MoHS (NHL, PHL, CEU, FDA), MoALI (Veterinary Diagnostic Lab, Veterinary Assay Lab and Directorate of Epidemiology of MoALI)

Partners and Stakeholders

     WHO, FAO,OIE

Illustrative Indicators

- Presence of ASCU with focal point
- AMR surveillance standards and guidelines incorporating GLASS standards and other intergovernmental standards
- List of priority pathogens, specimens, pathogen-antimicrobial combinations to be included in surveillance system
- Number of AMR surveillance sites fulfilling requirements of programme
- Data reports from surveillance sites
- Timeliness and completeness of surveillance reports
- Assessment reports of performance of National AMR surveillance programme

Objective 2.2: Build laboratory capacity under the leadership of a National Referral Laboratory (NRL) to produce high-quality microbiological data for patient and food-safety management and support surveillance activities.

Strategic intervention 2.2 Establish a quality assured national laboratory surveillance network (for AMR surveillance and action)

KEY ACTIVITIES

Under the overall technical guidance of TWG (Surveillance):

2017
1. The National Health Laboratory will be identified as National Reference Laboratory (NRL) for AMR Surveillance in Myanmar. NHL will cater to human clinical and water samples. Veterinary Diagnostic Laboratories will cater to samples animal, animal feed and food samples and link AMR surveillance with NRL. The NHL will develop expertise in methods for confirming and characterising specific pathogens, performing susceptibility testing, organising quality assurance and participating in external quality assurance schemes (EQAS). NHL will subscribe to Thailand EQAS network for a regular EQAS

participation in addition to existing project based NCGM Collaboration. The NHL will coordinate a national network of surveillance laboratories to monitor AMR in human clinical, animal and food samples. Further, environmental surveillance for AMR will be carried out as per 2.1 (8)in human/animal health surveillance labs.

2. Laboratories linked with AMR surveillance sites in 2.1 will be identified by the NHL. These surveillance laboratories will be capable of identifying target pathogens and perform susceptibility testing as per standard operating procedures (SOP) laid down by the NHL.

3. The NHL, in partnership with Veterinary Diagnostic Laboratories will develop and share AMR surveillance standards and guidelines, including SOPs, incorporating other intergovernmental standards (OIE/WHO GLASS and AGISAR/Codex) with surveillance labs.

2018

4. NHL will train surveillance staff, clinical staff, and laboratory personnel in AMR surveillance, lab techniques and data management according to international standards (WHO GLASS and AGISAR, OIE, CODEX)

2018-19

5. Lab surveillance network in support of National AMR surveillance network will be rolled out in limited number of sites (Sites identified in 2.1 (8) will be targeted in the pilot phase).

2022

6. TWG (Surveillance) will conduct a formal assessment of National AMR surveillance network followed by recommendations for a nationwide scale up.

7. NHL will expand the network into a nationwide quality assured laboratory AMR surveillance network. NHL will establish linkages with international and global surveillance and internationally relevant initiatives (like GLASS, GFN). Reporting to GLASS will commence from surveillance sites recruited and operationalised in initial phase.

Responsible Agency

MoHS (NHL, PHL, CEU), MoALI (Veterinary Diagnostic Lab, Veterinary Assay Lab and Directorate of Epidemiology of MoALI)

Partners and Stakeholders

WHO, FAO, OIE

Illustrative Indicators

- National Reference Laboratory (NRL) that has expertise in methods for confirming and characterizing specific pathogens, organising quality assurance and participates in an external quality assurance scheme (EQAS)
- Number of quality assured laboratories supporting AMR surveillance sites
- AMR surveillance standards and guidelines incorporating GLASS standards and other intergovernmental standards
- Surveillance staff, clinical staff, and laboratory personnel trained in AMR surveillance and lab techniques according to GLASS standards
- National AMR testing external quality assurance system
- Performance reports of NRL and national laboratory network

Objective 2.3: Develop a multi-centric surveillance system on the national scale to provide early warning of emerging resistance and monitoring of secular trends at national and sub-national levels.

Strategic intervention 2.3 Establish a systematic, standardized process to collect, assess and share data, maps and trends on AMR hazards; develop communication and dissemination systems to ensure coordination and information exchange; and initiate responses to warning triggers

KEY ACTIVITIES

Under the overall technical guidance of TWG (Surveillance) and with technical support from WHO and FAO:

2017-19
1. The ASCU will identify agencies (related to agriculture, human and animal health, drug control, environmental health) to be involved in AMR hazard and risk assessment, and outline their roles and responsibilities
2. The ASCU will frame guidelines and national standards for

systematic collection, sharing, and assessment of AMR hazard events framed in keeping with international standards (IHR/WHO/OIE/FAO); includes surveillance manual, investigation/response guidelines, case management guidelines and lab guidelines.

3. List and definitions of priority events (priority pathogens, specimens, and pathogen-antimicrobial combinations) will be developed in keeping with country AMR situation

4. The ASCU will commission CEU to conduct surveys to establish baseline estimates and trends of AMR to determine risks and establish thresholds for alerts and action systems

2020-21
5. A central library or database will be established at the ASCU to store AMR risk information, and make data available to government agencies, public and international community as appropriate in future

2021-22
6. Data transmission on AMR alerts will start flowing from initial phase AMR surveillance sites identified and recruited in 2.1 (8). Processing of information will be initiated in real time or close to real time. This will be followed by a comprehensive analysis on AMU in the human and veterinary sector and its linkage with the resistance profiles reported in animals and humans by the laboratory based AMR surveillance programme.

Responsible Agency

MoHS(NHL, PHL, CEU), MoALI (Veterinary Diagnostic Lab, Veterinary Assay Lab and Directorate of Epidemiology of MoALI)

Partners and Stakeholders

WHO, FAO, OIE

Illustrative Indicators

- AMR risk assessment policy and guidelines in keeping with international standards (IHR/WHO/OIE/FAO)
- List of priority AMR risk triggers
- Baseline estimates of AMR trends and thresholds for alerts and action systems

- Multi-sectoral Rapid response teams trained response to AMR events
- Central database of AMR pathogens and their risk information
- Timeliness and completeness of surveillance reports
- Assessment reports of performance of national AMR risk Early Warning System

Strategic Objective 3: HYGIENE, INFECTION PREVENTION AND CONTROL (IPC)

Infection prevention and control, especially in the context of hospitals, is an important aspect of a strategic plan to contain AMR since clinical settings represent an ecosystem of high antimicrobial usage. Within this ecosystem, exist patients, who may be immunologically impaired. These patients not only represent the population that is vulnerable to serious, life-threatening infections, at the same time, they promote the emergence of resistance.

On the other hand, better hygiene (WaSH) and Infection prevention control represent methods to cut down on the spread of infections in ambulatory human and animal care facilities, in food production systems and in the community in general. Vaccination in humans and animals and biosecurity in food production systems are specific interventions that if implemented effectively, can result in better health outcomes and reduced risk of emergence of AMR.

The Situation Analysis of measures related to hygiene, infection prevention and control in human, animal and related sectors in Myanmar reveals platforms that have been developed. However, in the absence of standardised guidelines, awareness, training and resources, the quality and scale of implementation has been less than optimal. Infection control and patient safety program in hospitals and biosecurity and good animal husbandry practices capacity developed in partnership with FAO following Highly Pathogenic Avian Influenza(HPAI) outbreaks are platforms that could be capitalised. Other measures such as AMR stewardship programme in healthcare settings or ambulatory settings, in human and animal health and food production sectors and HAI surveillance are yet to be initiated.

The Strategic Plan as outlined below aims to roll out a comprehensive multi-sectoral national IPC programme on a limited scale in healthcare facilities in public and private sector and in selected food chains (farms, slaughterhouses, food processors, aquaculture etc.). Similarly, HAI surveillance will be implemented in few public and private healthcare facilities. In community settings, formal campaigns for sanitation and hygiene including biosecurity and animal husbandry practices and food handling practices on a small scale in animal and food production sites. Human and animal vaccination are well-developed program that will be further consolidated and strengthened.

Objective 3.1: To establish a national infection prevention and control programme through full implementation and compliance with the IPC guidelines within healthcare settings, animal husbandry systems, fisheries and the food chain

Strategic intervention 3.1 Create a formal organizational structure to ensure proper development and use of infection prevention and control policies and strategies in health care settings, animal rearing facilities and in fisheries

KEY ACTIVITIES

2017-18   1. TWG (IPC) in collaboration with TWG (Surveillance) and TWG (AMU) will commission a multi-sectoral task force that will evaluate existing IPC, Hygiene, IPC and Biosecurity components of Animal Husbandry guidelines and IPC Guidelines in food production systems. Existing guidelines and programmes on patient safety in human hospital services will be reviewed for their strengths and weaknesses including resource constraints and technical capacity. Biosecurity guidelines developed and implemented for prevention and control of Avian Influenza/Pandemic Influenza in partnership with FAO will be similarly reviewed. The Task Force will develop a national IPC policy, mandating the creation and harmonization of National IPC Programmes in healthcare facilities, animal health care facilities, and food production systems.

Under the overall technical supervision of TWG (IPC):

2017-18   2. The TaskForce on IPC will develop IPC guidelines with implementation and M&E plans covering infection prevention and control in all health care settings (hospital and ambulatory) in human sector including linking it with hospital accreditation system; IPC/biosecurity in animal health facilities (hospital and ambulatory), vaccination, and biosecurity in the farm to fork chain

in line with international standards set out by OIE/FAO in animal and food production sectors. Existing guidelines and program will be reviewed before integration into national guidelines.

3. The Task Force, in collaboration with WHO, FAO, OIE and ASCU will identify target groups to be trained in IPC from different sectors (human health, animal health, food production/agriculture, environment) and at different levels (policy makers, programme managers, general people, industry leaders, farmers, etc.).

2019-20
4. TWG (IPC) through DG (DoHRH) and Veterinary Counterpart, will coordinate capacity building at healthcare facilities to create dedicated, trained IPC teams at facilities in selected number of sites including large private hospitals. These should also include trained biosecurity teams in veterinary hospitals and select levels to implement and supervise animal farms, slaughterhouses, food processing industries, etc.

5. DG (DoHRH) and MoALI Counterpart, in collaboration with MoE, will review existing curricula of professional courses with respect to content on IPC and develop training modules for incorporation into professional courses.

2020-22
6. TWG (IPC) through MoHS and MoALI will roll out IPC programme on a limited scale, with dedicated, trained teams in place in some public healthcare facilities and private sector and in selected food chains (farms, slaughterhouses, food processors, aquaculture etc.).

TWG will conduct a formal assessment of National IPC Programme in 2022, followed by recommendations of nationwide scale up in all human and animal healthcare facilities across the nation and across all food production systems.

Responsible Agency

MoHS (HICC), MoALI

Partners and Stakeholders

National Private Hospitals' Association, MMA, Livestock Producers' Associations, ASCC, WHO, FAO, OIE, UNFPA, UNICEF, City Development Committee

Illustrative Indicators

- Evidence based IPC guidelines
- Healthcare workers and staff trained in IPC procedures and guidelines
- Number of institutions with IPC programme
- Revision of curricula of target professional groups
- Number of institutions with reports of IPC programme audit
- Performance reports of national IPC programme

Objective 3.2: Decrease Hospital Acquired Infection (HAI) and associated AMR through facility based HAI surveillance programme (Human Health)

Strategic intervention 3.2 Implement a healthcare facility-based HAI surveillance system along with related AMR surveillance (human health).

KEY ACTIVITIES

2017-18   1. The TWG (IPC) will commission a multi-sectoral task force that will, as part of Hospital IPC Guidelines, develop guidelines for HAI surveillance (objectives, standardised case definitions, methods of detecting infections/procedures/exposures and exposed populations, process for analysis of data, evaluation of data quality, reporting/communication lines at local level and from local to national facilities, quality assured microbiology capacity, training programme, financial outlays).

2019-22   2. ASCU will implement on pilot scale a HAI surveillance in select public and private healthcare facilities. HAI surveillance data will be reported centrally from these public and private healthcare facilities.

2022   3. ASCU will carry out a formal assessment of HAI surveillance pilot. Data from HAI surveillance network will be integrated into National AMR surveillance network as outlines in 2.1 (7). Integrated analysis of surveillance data will form the basis for monitoring and response frameworks, including the identification of priority triggers (priority pathogens or pathogen-drug resistance combination) that will be established by ASCU. HAI

surveillance will be implemented on a national wide scale covering central, regional, referral, township, district and rural hospitals in public and sentinel private hospitals/chains of hospitals

Responsible Agency

MoHS (HICC)

Partners and Stakeholders

National Private Hospitals' Association, MMA, WHO, UNFPA, UNICEF

Illustrative Indicators

- National HAI surveillance standards and guidelines
- Number of HAI surveillance sites
- Performance reports of national HAI surveillance programme

Objective 3.3: To limit the development and spread of AMR outside health settings

Strategic intervention 3.3 Promote sanitation and hygiene by social mobilisation and behavioural change activities

KEY ACTIVITIES

2017   1. The TWG (IPC), in collaboration with MoE, will commission a multi-sectoral task force. The Task Force will review and evaluate the existing national campaigns, generate new evidence wherever necessary and modify guidelines suitably to address issue of sanitation and hygiene including, food handling practices and vaccination in humans and animals.

Under the overall technical supervision of TWG:

2018   2. MoHS and MoALI will implement formal campaigns for sanitation and hygiene including biosecurity and animal husbandry

practices, food handling practices and vaccination on a small scale in animal and food production sites.

3. MoALI will strengthen immunization programmes for preventable infections; MoHS and MoALI will evaluate existing vaccination programme for their effectiveness and coverage

2018-19   4. MoHS and MoALIin collaboration with MoE will include sanitation and hygiene including food handling practices in the core curricula in secondary and undergraduate education for school and college students

2019   5. MoHS and MoALI will carry out monitoring and concurrent evaluation of campaigns on sanitation and hygiene to inform nationwide scale-up,

Responsible Agency

MoHS (HICC), MoALI

Partners and Stakeholders

National Private Hospitals' Association, MMA, UNFPA, UNICEF, MoE, Ministry of Information, WHO, FAO, OIE, NGOs, MMA, GP Society, City Development Committee

Illustrative Indicators

- Campaign for sanitation and hygiene
- Number of revised curricula for target groups with sanitation and hygiene and safe food handling in the core curriculum
- Vaccination coverage rates

Strategic Objective 4: OPTIMISE USE OF ANTIMICROBIAL MEDICINES

Use of antimicrobials in any form, even when rational and prudent, can precipitate resistance in target microbes. High antibiotic use may reflect over-prescription, easy access through over-the-counter sales, and more recently sales via the Internet which are widespread in many countries.

The situation analysis reveals that Myanmar has a fully functional National Regulatory Authority that is responsible for regulation and licensing; pharmacovigilance and market authorization. Post licensing inspections including for retail pharmacies and OTC sales are carried out on national scale but with limited effectiveness, given the complex challenges of mostly import based system of procurement and illegal drug movement. The country lacks important instruments and systems such as a National AMR containment policy, AMU surveillance including sales of antimicrobial agents. Animal health sector lags on all of the above fronts and is also constrained by lack of regulatory powers.

Myanmarwill establish a robust system for regulation and surveillance of use of antimicrobial agents for control of use of antimicrobial substances in human, veterinary and food production sectors. Some of the measures taken will include a National AMR Containment and Use Policy and related regulatory frameworks, National Drug Policy, National Drug Regulatory Authority for Veterinary Sector, essential medicines list and standard treatment guidelines with special reference to use of antimicrobial agents, evidence based guidelines for National Antimicrobial Stewardship Programme an AMU monitoring programme in human and animal health care, ambulatory and community settings and food animals including, residues testing in food products. All of the above systems to optimise use of antimicrobials, however, will be implemented on a limited scale during 2017-2022. Formal assessments will be carried out at the end of this period before nationwide scale up. The Strategic Plan to establish the above is as outlined below:

Objective 4.1: Establish a national AMR containment policy, Antimicrobial Stewardship Programmes (AMSP) and Standard Treatment Guidelines (STG) at the national scale for prudent use of antimicrobials

Strategic intervention 4.1 Create a national AMR containment policy for control of use of antimicrobials in humans and animals, and establish a comprehensive evidence-based formal antimicrobial stewardship programmes at the national level

KEY ACTIVITIES

The TWG (AMU) in collaboration with TWG (Surveillance) and TWG (IPC) will commission a task force to develop a National AMR Containment and Use Policy and related regulatory frameworks. Within this policy framework, the task force will:

2017-19

1. Propose a formal organisational structure responsible for implementation of the National AMR containment policy. The Policy will mandate provisions for the five strategic objectives enshrined in GAP and NAP AMR for Myanmar

2. Formulate regulatory framework for control of human and veterinary use of antimicrobial substances, including but not limited to the phasing out of Antimicrobial Growth Promoters (AGPs) and establishment of system for certification of farm products free from antibiotic residue

3. Under supervision of DG FDA and DG Medical Services, develop an essential medicines list with special reference to use of antimicrobial agents. Antimicrobial agents in the EML will be considered for inclusion based on Myanmar's situation of current levels of AMR, availability, supply chains, financial outlays and international guidelines and standard treatment guidelines in human medicine, veterinary medicine, aquaculture and food production (including antimicrobial growth promoters; AGPs).

4. STGs (including antimicrobials) will be developed by the taskforce for training, supervision and supporting critical decision-making in antimicrobial use practices, in human and veterinary healthcare and food production section

5. Conduct baseline surveys to assess the extent, barriers and enablers of AMSP at institutional levels

6. Develop comprehensive, evidence based guidelines for a National Antimicrobial Stewardship Programme (AMSP) with aim of improving and measuring the appropriate use of antimicrobials in human and animal health care, ambulatory and community

settings as well as aquaculture.

Under the overall supervision of TWG (AMU)

2018-22   7. DG Medical Services (MoH) and DG LVBD (MoALI) will implement AMR policy for control of human and veterinary use of antimicrobial substances, including the phasing out of Antimicrobial Growth Promoters (AGPs). Limited scale implementation of the national AMSP in human and animal health care, ambulatory and community settings and food animals will be done. This will be accompanied by monitoring and concurrent evaluation followed by nationwide implementation in the next phase of NAP.

Responsible Agency

MoHS (DG FDA, DG Medical Service) & MoALI (DG LBVD)

Partners and Stakeholders

WHO, FAO, OIE

Illustrative Indicators

- Evidence based national standard treatment guidelines
- National Essential medicines list
- Regulatory framework for control of human use of AMAs
- Comprehensive, evidence based National AMSP guidelines for health care and community settings addressing the core areas
- Performance reports of National AMSP

Objective 4.2: Regulation of post-marketing quality of drugs under the leadership of an NRA/DRA to ensure access to quality antibiotics

Strategic intervention 4.2 Strengthening of a competent National Regulatory Agency (NRA) or Drug Regulatory Agency (DRA) which can enforce quality standards of antimicrobial drugs (veterinary, human, and food production sectors)

KEY ACTIVITIES

Under the overall supervision of TWG (AMU):

2017
1. DG FDAin collaboration with a suitable counterpart in DG LVBD will formulate a National Drug Policy with special reference to AMAs and AMR. The Policy will be applicable to human and animal health, aquaculture and food production sectors. The Policy will be made available in the public domain

2017-19
2. MoHS will further strengthen DG FDAin serving its mandates of drug control, import, manufacture, quality, distribution, pricing, market authorization, advertising, retail sales, and inspection, and to implement the relevant policies. DG FDA will cover drugs used in human health (and support regulation of animal health, aquaculture and food production till the time the Veterinary FDA is fully functional).
3. MoALI will establish a National Drug Regulatory Authority (NDRA) on the lines of and with mandates similar to DG FDA. The MoALI FDA will cover drugs used in animal health, aquaculture and food production.
4. The NDRAs will develop regulations and quality checklists for AMAs, APIs and OTC sales.
5. NDRAs will establish a system for the coordination and collation of data on drug quality (including supply, storage, transportation) from different sources or parts of the nation; tracking and reporting suspected product quality and treatment failure. The system will be implemented by regional FDAs. Special attention will be given to international border areas known for illegal import of drugs

2017-22
6. Within the regulatory frameworks laid down by NDRA, the MoHS, and MoALI will establish an institutional network with the capacity for quality control of antimicrobial agents or APIs. Existing system

of inspection by national and regional FDAs of MoHS will be reviewed for its efficiency. Regional FDAs will be strengthened and set up and will be responsible for carrying out inspections in different types of pharmaceutical establishments; formal registration procedures for drugs; and legal provisions for penal sanctions for non-compliance. Relevant authorities within the regional FDAs will be tasked with their implementation and enforcement of regulatory provisions. Human resources will be adequately provisioned for effective monitoring and enforcement

7. Regional FDAs will also be responsible for strengthening the pharmaceutical supply chain, including the procurement, supply and management system in human health, veterinary and food production sectors

8. TWG (AMU) in collaboration with CEU and veterinary counterpart will conduct independent periodic surveys to estimate the extent of OTC and inappropriate sales of antibiotics and APIs and the drivers for the same and evaluate the effectiveness of OTC regulations done and corrective measures undertaken

2022

9. During first years of NAP, MoALI drug regulation will be enforced in limited areas of Myanmar with special focus on international borders. Nationwide implementation of drug regulatory system will be possible by 2022

Responsible Agency

MoHS (DG FDA, DG Medical Services) & MoALI (DG LBVD)

Partners and Stakeholders

WHO, FAO, OIE

Illustrative Indicators

- National DRAs with appropriate mandate, TORs, membership and leadership
- National Drug Policy
- Regulations for import, export, local production, distribution and use of finished AMAs and APIs and OTC sales
- Guidelines for drug quality management system (manufacturing, registration, supply, storage, transport, inspection and legal provisions for penal sanctions for non-compliance)

- Number of drug quality monitoring sites; Estimates of OTC sale of AMAs and APIs

Objective 4.3: Establish mechanisms to monitor antimicrobial usage on a national scale to inform interventions to reduce overuse and promote prudent use of antimicrobial substances

Strategic intervention 4.3 Monitoring antimicrobial use (AMU) and sales in humans, animals and fisheries; monitor trends of residues of antimicrobials in food chains to inform interventions to promote prudent use of antimicrobials

KEY ACTIVITIES

Under the overall technical guidance of TWG (AMU), TWG (Surveillance) and TWG (IPC)

2017
1. ASCU will establish a subcommittee called Antimicrobial Use Surveillance Committee (AUSC) with appropriate mandate, TORs and Focal Point (FP) that links with ASCU

2018
2. The AUSC will coordinate policies on AMU and monitoring their impact on AMR. ASUC will design an AMU monitoring program in humans and food animals including, residues testing in food products (guidelines and standards for surveillance design, data type, reporting formats, reporting sites, sources of antimicrobial usage/sales data, list of indicators). AUSC will monitor sales data in humans as well as animals (sales quantity per kg of slaughtered animal, sales quantity per PCU etc.). In addition, point prevalence surveys will be conducted in collaboration with CEU and Veterinary counterpart to assess quantity and quality of AMU in different settings. Longitudinal surveillance will be planned in the next phase of NAP.
3. In collaboration with Veterinary Assay Laboratory, AUSC will also develop guidelines to implement residue testing including data sharing

2019-22

4. AUSC will implement AMU surveillance and residue testing. Healthcare facilities, including in ambulatory and community settings (human and animal pharmacies etc.) and parts of animal husbandry chains (e.g. farm level) will be recruited on a limited scale. For residue testing, surveillance sites operationalised for AMR Surveillance in 2.1 (7) will be recruited. AMU surveillance and residue testing will be conducted on limited scale by 2022. Data for the use of antimicrobial substances and sales data in humans, animals, and food production sectors will be available by 2022

5. The AUSC will analyse AMU data in linkage with the resistance profiles reported by the AMR surveillance programme. Actionable recommendations will be made to modify existing local STGs

Responsible Agency

MoHS (HICC, Medical Care, FDA), MoALI (Epidemiology, MoALI FDA, Veterinary Assay Lab)

Partners and Stakeholders

Ministry of Commerce, WHO, FAO, OIE

Illustrative Indicators

- AMU surveillance and monitoring system
- Sales data for AMAs at the national level
- Actionable recommendations on modifying AMU to contain AMR

Strategic Objective 5: (ECONOMIC) CASE FOR SUSTAINABLE INVESTMENTS AND INCREASE INVESTMENTS IN NEW MEDICINES, DIAGNOSTIC TOOLS, VACCINES AND OTHER INTERVENTIONS TO REDUCE ANTIMICROBIAL USE

The GAP AMR posits that the economic case should reflect the need for capacity building and training in low resource settings, while developing evidence based interventions to reduce infections and combat AMR. The 2001 strategy for AMR containment could not achieve its goals; one of the reasons cited for the same is that there was absence of economic assessments, which evaluated the cost of doing nothing versus the cost/benefits of action at the present.

The Situational Analysis in Myanmar indicates that research on AMR has not been a priority for both policy makers and research community. Given the widespread irrational use of AMAs, AMR is expected to be sizable public health threat, as has been demonstrated in MDR-TB rates in the country. This calls for policy and program relevant research to support planning and implementation of public health interventions. The phase of development of the health system provides an opportunity to put in place strategic research agenda for public health research and AMR in particular to inform health system responses.

The Strategic Plan lays down a roadmap for establishing a strategic research agenda, with systematically prioritised research areas and knowledge gaps related to AMR that will feed into a national policy for research and innovation. By 2022, multi-stakeholder platform and research consortia will be established that will generate program and policy relevant evidence on and compare cost effectiveness of AMR control strategies. The strategic plan also envisions collaborations with national and international agencies, for implementation of strategic research agenda. This will be one of the key strategies for Myanmar, given its existing nature of AMR threat and limited institutional capacity.

Objective 5.1: To promote sustainable investment in new medicines, diagnostic tools, vaccines and other interventions by developing a strategic research agenda and national research policy

Strategic intervention 5.1 Generate cost effectiveness and benefit evidence for reducing AMU & AMR; develop a national strategic research agenda

KEY ACTIVITIES

Under the overall supervision of TWG (Research):

2017-18
1. The Department of Medical Research (DMR) will create an inventory of relevant networks, initiatives, institutions and experts involved in AMR research across human and animal health sectors in Myanmar. The DMR will assess existing research, capacities, future plans and funding sources for research and innovations through a landscape analysis.
2. DMR will develop a Strategic research agenda, with systematically prioritised research areas and knowledge gaps related to research and innovation in the field of AMR, and resource needs that are relevant for Myanmar (in terms of human resources, materials and funding). Priority research will include:
   a. Research to estimate and characterize burden and risk of AMR and AMU in human, animal and food production sectors including prescribing behaviours as well as treatment and care-seeking, barriers and drivers for uptake of prudent antimicrobial use practices. Special focus will be on broader socioeconomic burden of antimicrobial resistance and cost effectiveness and feasibility of interventions to reduce AMR and AMU across different sectors.
   b. Systems and policy research including operational research to understand and improve priority areas such as regulatory frameworks and their enforcement, stakeholder analysis, human resources, supply chains, public private partnerships, interoperability between different elements of AMR control plans and sectors, information management systems, AMR and AMU surveillance and use in health care and ambulatory settings across sectors, laboratory support

2017-18
3. TWG (Research) will develop a national policy for research and

innovation, including research into alternatives for AMU practices, based on the research agenda drawn up by the DMR

2018-19   4. TWG (Research) will establish a multi-stakeholder platform to guide AMR research and innovation. The research platforms will develop research consortia, and establish collaboration with national and international agencies, for implementation of strategic research agenda

2020-22   5. TWG (Research) will make evidence available through research databases, peer reviewed publications, policy briefs, policy advocacy dialogues to inform national and local policies and strategic interventions in different strategic objectives to reduce the need for antimicrobial in several settings (health care, animal husbandry, aquaculture and food production)

Responsible Agency

MoHS (Directorate of Medical Research) & MoALI (Research &Development Unit)

Partners and Stakeholders

WHO, FAO, OIE, National Health Laboratory, TAG of Clinical Domain & Public Health Domain, Universities of Medicine, University of Public Health, CEU, University of Veterinary Sciences

Illustrative Indicators

- Research network and collaborations
- Multi-stakeholder research initiative National Research Policy on AMAs and AMR Research
- Strategic research agenda, with prioritised research areas, and resource needs in the field of AMAs and AMR
- Peer reviewed publications, policy briefs, policy dialogues

Way Forward

The National Action Plan for prevention and control of AMR in Myanmarhas been prepared by stakeholders from different ministries in Myanmar. The Plan is a Strategic Plan with Operational details. The Plan takes cognizance of the limitations and capitalizes on the strengths and emerges as a comprehensive document that describes the country's vision of AMR prevention and control.

The Plan has built upon some of the critical insights that have emerged from the Situation Analysis and a host of interviews, guided discussions and participative dialogues that have been undertaken with multiple stakeholders. The NAP AMR of Myanmar in its current form provides a constructive opportunity for the government to fine tune it based on its local realities and sensitivities. Most importantly, it presents an affirmative statement of goals, objectives and strategic interventions that will be deployed to achieve the objectives set out clearly in the document.

The strategic plan envisions collaborations with national and international agencies, for implementation of a strategic research agenda that will serve as a major strategy for the country, given its urgent evidence needs to guide program planning and action. Essential elements of AMR containment which have so far not completely taken off the ground will now see movement as comprehensive awareness programmes are conducted, surveillance of AMR and AMU including laboratory capacity, IPC and AMSP are strengthened and other public health functions are aligned to the new AMR goals.

Following submission of the final report to the World Health Assembly, the Government of Myanmarwill continue with its deliberations and planning process under the leadership of NMSC. Next, the NMSC through its constituent NACC, TWGs and Task Forces will draw up a detailed operational plan in addition to its budget and monitoring and evaluation plan for successful implementation of the activities. Most of these activities will be implemented by the key actors as outlined in the strategic plan that covers the period 2017-22.

The successful implementation of the NAP AMR will bring together all the critical players from the human and animal health and related domains creating greater responsibility, ownership and transparency. Working closely with a more sensitised and aware population, the country will bring down its levels of AMR and going forward institutionalise mechanisms to arrest its spread.

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Annexure 1: Interpretation of phase of AMR prevention and control program implementation

Phase of Programme Implementation	What it means
Phase 1 **Phase of Exploration and Adoption**	There are no programmes implemented in a systematic manner in order to conduct AMR prevention and control in the country. However, the process of designing a program has been initiated, and depending on the progress made (as seen through the indicators), it may be that one or more of the following activities are being undertaken: - Identification of needs, options and resources - Identification of potential barriers to implementation (funding, human resources, system responsiveness, etc.) - Investing in systems to augment their readiness to deploy the programme and overcome the identified barriers in implementation - Identifying structures (both in policy making and implementation frameworks) to aid in the implementation of the programne As the nation gets closer to the end of Phase 1, it is on the verge of implementing (at any scale, even a pilot project) an AMR surveillance programme.
Phase 2 **Phase of Programme Installation**	**The decision toimplement a programme** has been made and the initial set of activities have been undertaken in order to launch the program. These may include: - Capacity building - Resource allocation - Establishment of data transmission, security, and sharing protocols - Development of process indicators, standard operation protocols and other guidelines to be adhered to by institutions participating in the programme

	In course of the second phase, there is more emphasis on development of infrastructure, and allocation of resources in order to implement a programme in a defined context and then scale it up to the national context in the subsequent phases.
Phase 3 **Phase of Initial Implementation**	This is probably the most challenging phase in the stages of early**implementation** of any programme within the context of developing nations. In this phase, there is a need to initiate a change or an intervention, which may have patchy uptake or maybe avoided altogether. - In course of this phase, a functional model of the program is identified - All protocols, SOPs, etc. undergo a real world challenge This is a very crucial phase and most programs are likely to find it difficult to come out of this phase.
Phase 4 **Phase of Full Operation**	This is the process of **scaling up a successful model** of the programme that may have been trialled in the previous phase. - The programme is part of accepted practice - There is a nation-wide (or a large scale) adoption of the programme - The programme is functional by generating outputs and outcomes on a regular basis (seek proof of evidence)
Phase 5 **Phase of Sustainable Operation**	This is the highest grade of **operational efficiency of the programme** and indicates that the programme can have long-term survival. - The programme is resilient to changes in funding volume, partner agency support, etc. external factors which were essential for installation and initial implementation of the programme. - Through a functional M&E mechanism, there is systematic improvement of capacity, especially in human resources and system capacity, to enable the programme to function without extensive need to invest in continued capacity building

Annexure 2: Terms of reference of individual Technical Working Groups and their structure

Technical working group SO1 (Awareness):

Terms of Reference

- Plan, implement, monitor and evaluate strategic interventions for improving awareness and antimicrobial use practices in different target groups, including professionals in human health, animal health and agriculture sectors
- Facilitate designing of and guidelines for evidence based campaigns for awareness generation on AMR and related issues
- Coordinate between different sectors, with educational councils and professional associations on issues related to increasing awareness for AMR and related issues
- Coordinate with different TWGs for smooth implementation of the NAP
- Report to NMSCthrough its Chairperson annually

Structure

- Chairperson/Responsible Dept.:
- Secretariat location:
- Members:

Technical working group SO2 (Surveillance):

Terms of Reference

- Identify a National Coordination Centre (NCC), define its mandates and terms of reference and designate a National Focal Point followed by notification
- Facilitate development of guidelines for national AMR Surveillance program including guidelines for data sharing (indicators, triggers, analysis plan, response plan), incorporating the critical components as outlined in guidance documents
- Plan and implement, strategic interventions under the national program for AMR surveillance in human health, animal health and agriculture sectors including quality assured laboratory network and early warning systems. This will include identifying implementation agencies, partner agencies, scope of activities, budgetary outlays
- Coordinate with TWG (AMU) to facilitate integrated analysis of AMR and AMU surveillance
- Monitor and evaluate national AMR surveillance program
- Facilitate maintenance of AMR and AMR risk data bases
- Provide comprehensive and stratified analyses of trends of AMR and AMU across different sectors, AMAs, commodities, species, settings etc.

- Make recommendations on AMR prevention/control/containment and rational use of AMAs
- Report to NMSCthrough its Chairperson annually or on urgent basis in case of an early warning
- Facilitate surveillance information sharing across sectors and with relevant international agencies/networks

Structure

- Chairperson/Responsible Dept.:
- Secretariat location:
- Members:

Technical working group SO3 (IPC):

Terms of Reference

- Develop a national IPC policy, mandating the creating of a National IPC Programme in healthcare facilities, animal health and food production systems and national HAI surveillance in health care facilities
- Facilitate development of guidelines for National IPC program in human and animal health care and ambulatory facilities, and food production systems
- Plan and implement, strategic interventions for the national IPC program in human health, animal health and agriculture sectors including identifying implementation agencies, partner agencies, scope of activities, budgetary outlays
- Coordinate with TWG (Surveillance) to facilitate integrated analysis of AMR, AMU and HAI surveillance
- Monitor and evaluate national IPC surveillance program
- Make recommendations on AMR prevention/control/containment and rational use of AMAs
- Report to NMSCthrough its Chairperson annually or on urgent basis in case of an early warning

Structure

- Chairperson/Responsible Dept.:
- Secretariat location:
- Members:

Technical working group SO4 (AMU):

Terms of Reference

- Facilitate strengthening of existing systems and establish new regulatory systems for control of AMAs sale and use.

- Facilitate development and implementation of national drug policy and within the policy framework guidelines and standards to improve AMU. The standards and guidelines will include EMLs and STGs
- Plan and implement, strategic interventions for the national AMSP program in human health, animal health and agriculture sectors including identifying implementation agencies, partner agencies, scope of activities, budgetary outlays
- Coordinate with TWG (Surveillance) and TWG (IPC) to facilitate integrated analysis of AMR, AMU and HAI surveillance
- Monitor and evaluate national AMSP program
- Make recommendations on AMR prevention/control/containment and rational use of AMAs
- Report to NMSC through its Chairperson annually or on urgent basis in case of an early warning

Structure

- Chairperson/Responsible Dept.:
- Secretariat location:
- Members:

Technical working group SO5 (Research):

Terms of Reference

- As part of a national policy for research and innovation, facilitate development of strategic research agenda, with systematically prioritised research areas and knowledge gaps to guide research and innovation in the field of AMR
- Facilitate establishment of research platforms, research consortia, research funding opportunities and collaboration with national and international agencies, for to promote research and implement strategic research agenda
- Communicate evidence available through research databases, peer reviewed publications to policy and program community for evidence based policy making and program planning
- Monitor and evaluate research efforts on AMR in Myanmar
- Report to NMSC through its Chairperson annually or on urgent basis in case of an early warning

Structure

- Chairperson/Responsible Dept.:
- Secretariat location:
- Members: