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WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTE

WHO/RSD/85.18

ENGLISH ONLY

PROGRAMME OF ACUTE RESPIRATORY INFECTIONS

WHO TECHNICAL ADVISORY GROUP ON
ACUTE RESPIRATORY INFECTIONS

Report of the Second Meeting
Geneva, 25-29 March 1985

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1. Introduction

The meeting was opened by the Director General, Dr Halidan Mahler, who emphasized the similarities between the problems facing tuberculosis control 25 years ago in developing countries and those facing ARI control now. These included the need for appropriate technologies for diagnosis and clinical management, the need for universal access to these technologies, the need for integration into the general health care system and the need to convince a sceptical scientific world that these simplified approaches will indeed be effective.

Dr Mahler acknowledged the interdependency of primary health care (PHC) programmes and ARI control and the need to proceed urgently to application of our current knowledge, even if incomplete, to the prevention of child deaths. While vaccination approaches to primary prevention must be vigorously pursued the centrepiece of ARI control must, for now, remain case finding and case management. National health care planners must be provided with the best available information about the programme to enable them to make the necessary difficult choices in the use of limited resources; this includes validation of the approaches which earlier working groups have recommended. Dr Mahler's opening address is attached as Annex 1.

The task for the present meeting was to evaluate what has been achieved in the past two years and to recommend the next steps, bearing in mind that implementation of the programme must be the responsibility of countries themselves, which have limited resources. The group should identify those activities that are crucial to the solution of often shifting problems and explain how and why they should be undertaken. The List of Participants is attached as Annex 2.

2. Review of the state of the WHO ARI Programme

2.1 Global ARI Programme

The first meeting of the Technical Advisory Group on ARI, in March 1983, endorsed WHO's strategy for reducing mortality due to ARI in children under 5 years of age (1).

A global medium term programme on ARI for 1984-89 was formulated in 1983 with the collaboration of the six WHO Regional Offices (2). A working group then met in April 1984 to develop a simplified case management strategy that could be applied by village health workers in the primary health care setting (3). Children with chest indrawing or inability to drink are referred for inpatient therapy with antimicrobial agents, children with a respiratory rate over 50 per minute without the above signs are treated with antimicrobials in the community setting, while children without any of these findings are given supportive therapy and close monitoring at home. Special instructions are given for children with wheeze, or stridor or upper respiratory infections. A training course for supervisors of primary health care workers using these guidelines is being field tested at this time. A manual on case management for use in a first referral facility is under preparation. Studies are planned to validate the use of pathognomonic signs and symptoms in the diagnosis of moderate and severe cases of ARI.

The impact of the ARI control programme on mortality will be evaluated in special prototype projects which are underway in 10 areas. These projects will also study operational aspects of the case management strategy. A group of project managers and epidemiologists met in Geneva in November 1984 to review the study designs; the need for obtaining adequate control data whenever feasible was stressed (4). Five of the 10 projects have already started programme implementation.

A study of etiological agents in ARI was initiated in Islamabad, Pakistan, in December 1984. A protocol for monitoring antimicrobial resistance has been drafted, so that programme managers can verify that the appropriate antibiotics are used in case management.

WHO Geneva has been working on approaches to morbidity and mortality surveillance to assist WHO Regional Offices and countries. Questions on ARI have been added to the CDD survey instrument to be used for surveillance; this approach will be field tested in 1985. In addition, WHO has initiated a review of the classification for ARI in the Tenth Revision of the International Classification of Diseases.

Prevention of ARI by vaccination is being promoted by the WHO Division of Communicable Diseases with programmes for development of new viral (Respiratory Syncytial Virus, and parainfluenzae type 3) and bacterial vaccines. The programme on encapsulated bacteria currently emphasizes meningococcal vaccine; an increased emphasis on pneumococcus and H. influenzae vaccines is expected in the coming years.

Dissemination of technical information on the programme has been a high priority. This has included technical documents, bibliography on respiratory infections, training materials, and an ARI newsletter, the first issue of which has just been published by the Appropriate Health Resources and Technologies Action Group Ltd.

Funds committed to the WHO ARI programme for the 1984-85 budget are \$2 114 000, a 250% increase compared to the 1982-83 budget. There has been a particularly notable increase in funds committed from sources outside the regular budget.

2.2 Regional ARI Programmes

2.2.1 African Region

In the Regional Office the Communicable Diseases officer is responsible for the ARI programme. Control activities are delegated to the sub-regions through inter-country epidemiological surveillance and disease control projects in Niger (sub-region I); Kenya (sub-region II) and Zimbabwe (sub-region III), and to the countries through WHO epidemiologists assigned to projects there.

Some countries in the Region have set up an ARI steering committee at central level (Burkina Faso, Ivory Coast, Kenya, Tanzania, Nigeria and Senegal). A regular budget line is available to support ARI activities at the inter-country level. Regional training courses in epidemiology and diseases control for senior-level personnel (in Bamako for French-speaking and in Nairobi for English-speaking countries) included information on the ARI programme.

The ARI control programme meets a major immediate need of the Region. The validity of the simple strategies and their technical feasibility and cost effectiveness will need to be assessed. Logistic feasibility will probably be the major problem in programme implementation. In some countries, there is an almost total lack of access to any health service, especially in low density rural areas such as the Sahel. With the lack of a health infrastructure, and mobile operations being prohibitively expensive, the need for integration of ARI operations with EPI, CDD and malaria control is indicated, especially as the target group is the same and managerial processes are similar.

2.2.2 Region of the Americas

In the American Region of WHO, ARI is a component of the programme of Maternal and Child Health, together with Diarrhoeal Diseases, Immunization and Growth, Development and Reproduction. Other programmes such as Research, Epidemiology, Viral Diseases and Laboratory Services have contributed substantially to the ARI programme. Active advocacy, dissemination of information and technical advice have stimulated implementation of case management of ARI in children within Primary Health Care. This started in the State of Para, Brazil, in 1982 and was extended to six more States in Brazil and two other countries - Panama in 1984 and Guatemala in 1985. Eight more countries (Argentina, Bolivia, Colombia, Ecuador, El Salvador, Honduras, Paraguay and Peru) have achieved most of the preparatory

steps: formulation of national norms and plans of work, nomination of responsible officers, training and procurement of drugs. Most of these countries will implement improved case management activities during 1985.

Technical and financial support of UNICEF, in a joint programme for child survival, facilitated programme development, in particular in Central America.

The Region is testing the WHO training modules in Spanish, for inclusion in the mid-level supervisors' courses on diarrhoeal diseases. Some materials for family and community education have been produced in Guatemala. The basis and technical contents of ARI control have been introduced in the regional courses on maternal and child health and on control of tuberculosis and respiratory infections.

Until recently, priority in research was given to etiological studies. Technical and financial support was provided for studies in Argentina, Brazil, Costa Rica, Panama, Peru and Uruguay. The participation of other organizations - such as BOSTID, National Academy of Sciences, USA - in support of etiological studies has reinforced this field of research. Most projects are in progress or are being analysed. Results from Panama and Costa Rica are in press. In support of etiological studies, regional workshops on rapid technique in virology and bacteriology are held annually, since 1983, in different countries.

Operational research is the main priority at present. Protocols are in preparation primarily to analyse current medical practices on ARI in children, knowledge and practices in the community, and prevalence of antimicrobial resistance among the common bacterial pathogens.

2.2.3 Eastern Mediterranean Region

The specific objectives of the ARI programme are to promote and support the development of national programmes for the prevention and control of ARI in children, based on provision of effective case management techniques and facilities through the primary health care system; to provide for experienced national manpower at various levels, and to support applied research projects in priority areas for national ARI programmes.

Two operational research projects are being implemented, one in Pakistan and one in Somalia. They will assess the feasibility and impact of the proposed interventions on mortality from ARI in children under 5 years of age. They also will serve as prototype programmes for the management of ARI. The two programmes will emphasize training of supervisory staff, local health workers and families in appropriately recognizing and managing mild, moderate and severe forms of ARI.

A Regional Scientific Working Group Meeting on ARI took place in Lahore, Pakistan, in May 1984 (5). Twenty participants including epidemiologists, paediatricians, and microbiologists from seven countries attended. The meeting reviewed the present situation of ARI in the region and discussed the case management approach with emphasis on possible implementation through the existing health services. The Group has outlined the steps to be taken in the development of a national plan for control of ARI and the main research needed to support control programmes. The participants formulated a draft national plan of operation for ARI control.

Two countries have formulated national projects for ARI control. Tunisia, in collaboration with WHO, has developed a plan to be implemented in a phased manner; it is expected to be extended to the whole country in a period of 5 years. Egypt is including an ARI component in a child survival programme, which will be supported by UNICEF, WHO and USAID.

2.2.4 European Region

According to official reports about 20 000 000 people suffer from ARI in European countries every year, though this is clearly an underestimate in view of the inadequacy of the current reporting systems. More accurate data obtained from a survey on ARI in the United Kingdom showed that about 30% of the population experienced ARI every year. In Europe the economic loss due to absenteeism from work because of ARI exceeds 600 000 000 working days per year, or more than 3 billion dollars. During epidemics of influenza this figure may be much higher.

At the present time there are no formal WHO programmes given the special characteristics of the countries in the region. However, some Member States are being approached with a proposal to initiate programmes on ARI, e.g. the German Democratic Republic, Greece, Morocco, Portugal, Romania, Spain, Turkey, and the USSR.

2.2.5 South-East Asia Region

Acute respiratory infections alone or in combination with acute diarrhoeal diseases and with malnutrition have been recognized as a leading cause of morbidity and mortality during childhood in most of the countries of SEAR. Following resolution SEA/RC36/R6 of the South-East Asia Regional Committee, in 1983, and the recommendation of the South-East Asia Advisory Committee on Medical Research, activities were initiated in the Region on research and control of acute respiratory infections. In 1983 an Inter-country Scientific Working Group on Acute Respiratory Infections was held in New Delhi which recommended guidelines for this programme (6).

Although the activities on ARI have been initiated quite recently, significant progress has been made during the last two years:

- (1) At the Regional Office an ARI unit has been established with a medical officer in charge;
- (2) National task forces have been established in 7 countries (Burma, India, Indonesia, Mongolia, Nepal, Sri Lanka, Thailand). Burma has included an ARI control programme in the 1986-90 Disease Control Programme. Formulation and management of national ARI programmes are under consideration in most of the other countries.
- (3) Several countries have prepared operation manuals and health education material;
- (4) Intervention studies on a pilot scale have been initiated in India, Nepal, and Sri Lanka. Many research institutes in the Region have taken an interest in ARI;
- (5) Liaison has been established between WHO and UNICEF on coordination of activities on ARI at country level.

2.2.6 Western Pacific Region

The development of the ARI programme in the Region initially was focused on gaining an understanding of the nature and extent of the ARI problem in the various countries. The activities undertaken included research on the etiology and the epidemiological and clinical features.

Five countries have undertaken or planned studies on etiological or operational aspects of ARI (China, Malaysia, Papua New Guinea, Philippines, Vietnam).

The approaches for programme implementation include establishment of agreed terminology and criteria for diagnosis of acute respiratory infections and implementation of a prototype programme integrated at the primary health care level. The programme covers immunization, health education and standard case management. Monitoring of bacterial resistance is undertaken for possible adjustment of the standard antimicrobial treatment.

A South-East Asia and Pacific Research-for-Development Workshop on Control and Morbidity of acute respiratory infections in childhood was held in Sydney in August 1984.

As part of its efforts to develop common research methodologies and standard procedures, the Regional Office for the Western Pacific has produced guidelines for ARI research and programme development (7). The guidelines also have been most useful in the initiation of ARI projects. A manual on laboratory techniques for bacterial acute respiratory infections will be published soon. Training materials on the management of ARI at the peripheral level are being developed and tested in the field.

A regional workshop on laboratory techniques for the diagnosis of ARI was held in Manila in November, 1983. Consultants in data management and in design of training manuals were provided to countries in the region.

3. Comments on the WHO ARI Programme

In discussing progress in the WHO global and regional ARI programmes, the following points were emphasized:

(a) The substantial progress made at the global level in the last 2 years has provided the tools for effective programme implementation at the regional and country levels. Coordination with CDD, EPI, MCH, PHC, UNICEF and donor agencies should facilitate rapid expansion.

(b) The ARI control programme of improved case management must be seen as an essential component of an integrated PHC system. There is a strong justification for adoption of this approach since reduction of infant and childhood mortality is invariably amongst the top priorities in the health programme of developing countries. Infant mortality has been selected as one of the 12 WHO indicators to monitor the progress towards Health for All by the year 2000. Mortality related to ARI is often due to the existence of risk factors like malnutrition, low birth weight, diarrhoeal disease, malaria and measles. An integrated programme to attack these problems through a PHC approach is most likely to be successful in reducing mortality. The adoption of an integrated approach will also save on the costs of training and evaluation, and provide the basic framework for delivery of services. Further development of PHC infrastructure capable of implementing the recommended measures is of utmost importance.

(c) The growth of an ARI control programme and its adoption as a national programme by the Member States will require substantial promotional efforts to develop the national political will and financial support. These will include (i) the involvement of professionals in the solution of technical, managerial and operational problems, (ii) the circulation of reports and recommendations, research papers and ARI Newsletter, (iii) seminars and meetings in which ARI is discussed, (iv) incorporation of the improved case management in undergraduate teaching, (v) the use of ARI manuals and modules in the training of supervisors and PHC workers. Support of the community must be obtained by improving awareness and understanding through the use of mass and folk media. Special materials will be needed for this task.

(d) National programmes rely heavily on the recommendations and technical support from WHO and UNICEF. Documents issued by these organizations are often used for enlisting financial support and political commitment.

(e) Significant progress was made by the regional programmes in the past two years, in particular in AMR, EMR and SEAR. The earlier leading role of WPR in research was acknowledged, but it was felt that this tradition should continue by applying the research findings in programme implementation. Activities in AFR have been hampered by logistic difficulties; increased emphasis on implementing the ARI programme in this region is particularly important as a means to reducing the high infant mortality.

(f) Although formal WHO programme activities are not envisaged in the more highly developed countries, it is clear that these countries all share a massive morbidity problem and that ARI mortality in the elderly is an area of considerable interest to them. The need to enlist the support of scientists in these countries for the development of an improved ARI technology was discussed at length. Involvement of the scientific community in all countries is important in solving the complex technological problems.

(g) The first TAG meeting, while recognizing the deficiencies in knowledge on which ARI control must be based, had emphatically declared that enough was known to begin a programme (1). The present group reaffirmed its commitment to the evolving programme and commended the secretariat on the progress made with the limited resources at its disposal.

4. National implementation of ARI Control

National strategies must be based on a sound combination of internationally known facts, the specific characteristics of ARI and the circumstances in each country and indeed in different parts of the country.

It must be stressed that the development and implementation of a programme is a national responsibility and that its effectiveness will depend on the local epidemiological situation, the availability, skill and enthusiasm of the health personnel, and the resources allocated to the programme. International cooperation will no doubt be most beneficial at the outset but should be directed towards setting up the facilities needed to overcome obstacles to programme development and implementation. The running of the final programme must be a national affair and should not depend on other than national inputs.

Although it must not be a vertical programme, there must be a central directing unit with authority to initiate and implement the measures deemed necessary. The unit should be in a position to coordinate, supervise and evaluate the various planned activities which will generally be introduced in a phased manner so that before the programme is expanded, the feasibility and efficiency have been tested. The distribution of specific defined tasks to identified individuals is the best way to secure success in this kind of complex endeavour.

Simple tools for epidemiological surveillance, programme monitoring and evaluation should form an integral part of a national ARI control programme from its very inception, and should allow for regular periodic assessment of progress in achieving the programme objectives and targets.

The success of a national programme depends heavily on the impact of family education efforts, the adequacy of drug supplies, the supervision and training of PHC workers and upon vaccination coverage. Therefore all these should be monitored. Knowing the extent to which the programme has been implemented and is being utilized by the population is necessary to interpret measurements of its impact.

Methods of surveillance used for other communicable diseases have limited value for ARI largely because of the difficulties in identifying the etiology of pneumonia. In developing countries ARI are a leading cause of primary care consultations, of hospitalization and of death. Although this is a widely acknowledged fact, in most countries there is still a lack of adequate epidemiological and clinical information. A routine information system may be used to collect surveillance data on mortality, morbidity and hospitalization of ARI, if such

a system already exists for the surveillance of other diseases. If this is not the case, surveillance should be developed on district, provincial and national levels to monitor mortality and morbidity attributable to ARI, and data on hospitalization; a sentinel surveillance system may be appropriate.

Mortality data are clearly of the greatest importance, and efforts should be made to ascertain the contribution of ARI to child deaths. It should be emphasized that collection of statistics on the causes of death within a village or community will help the community to recognize its problems and increase its motivation in tackling them.

Laboratory investigations for identification of etiological agents in ARI are of little help in the clinical management of patients and they are not routinely used by paediatricians in developed countries. It is important, however, to obtain as unbiased a view as possible of the spectrum of organisms invading the lungs, particularly as multiple organisms (virus/bacteria and bacteria/bacteria) may be present. Although the establishment of sophisticated laboratories for the clinical management of ARI alone is not appropriate, some of the existing laboratories should be strengthened and upgraded to monitor antimicrobial susceptibility of bacterial pathogens, and to determine prevalent respiratory pathogens. The latter goal will be facilitated if improved diagnostic methods for pneumonia become available.

4.1 Prototype programmes

Since 1983, the WHO programme has progressed from an exclusively research orientation to a phased control programme implementation in a number of areas. At this stage, the emphasis is still mainly on feasibility and evaluative studies, but, in Brazil, there has been a bold attempt to develop statewide case management programmes and in other Latin American countries, national norms for clinical management of ARI are being established.

A review of 3 of the earliest demonstration projects in Bohol, Philippines, Bagamoyo, Tanzania, and Chandigarh, India, illustrates the benefits of a phased approach to implementation. These programmes, which are built, within the PHC system, around case management and upgrading knowledge, attitudes and child care practices regarding ARI, are also at the same time measuring the impact of the strategy.

4.1.1 The Bohol Project - Republic of The Philippines

An operational study on the implementation of an ARI intervention programme within the context of primary health care was initiated in the island of Bohol in April 1984. It aims at demonstrating the reduction of ARI mortality in children under 5 years of age through the implementation of the improved ARI case management in coordination with health education, the expanded programme on immunization and nutrition.

Deaths are monitored by two complementary methods: periodic household surveys, undertaken semi-annually, and continuous reporting through key informants, which is done fortnightly. The cause of death in children under 5 years is ascertained through verbal autopsy. A standard questionnaire is used to obtain information on symptoms and health conditions of the child prior to death from a responsible household member. Baseline data indicate mortality rates of 67 per thousand in infants and of 7.8 per thousand in children aged 1-4 years, with ARI related to 26.9% and 45% of all deaths in these age groups respectively. The estimated ARI mortality rates are 1800 and 400 per 100 000 population in infants and children 1-4 years respectively and are about the same as in statistics from 1976.

Training manuals based on WHO WPRO ARI training materials have been developed for primary health care workers, at peripheral and referral units, and for course facilitators. The manuals are used to train health care providers in one half of the study area with the other half remaining as a control area. The impact on childhood mortality will be determined one and two years after implementation. Cost benefit analysis will also be undertaken.

4.1.2 The Bagamoyo Project - United Republic of Tanzania

ARI control has been implemented as an integral part of primary health care (PHC) in one district in Tanzania. This district serves as a model for demonstration and evaluation of PHC in the country, particularly of its potential for control of major diseases and reduction of child mortality as part of the goal for Health for All by the year 2000.

Additional training and logistic support for control of ARI has been given to village health workers and other health workers in the district over and above the usual PHC provisions. Bi-monthly home visits to each child under five and mother have been organized. Group health education is provided on home care and on discrimination of ARI symptoms needing treatment at the village health post or at higher levels of care. Information on feeding practices and vaccinations is also provided.

Baseline studies of the first 12 months revealed the following:

- (a) Case fatality ratios for cases treated by medical assistants and doctors in health institutions are 1.4% for all types of ARI, 2.5% for pneumonia, 12.0% for measles and 17.4% for measles in combination with pneumonia.
- (b) Of those who died with pneumonia in the community, only 43% received antibiotic treatment. Most severely ill children had grossly inadequate treatment in the community setting.
- (c) No treatment was reported in 7.4% of families of children with diarrhoea and in 5.4% of children with fevers, compared with 24.5% of children with coughs and 37.6% of children with difficult breathing. This may indicate unawareness of the dangers of cough and difficult breathing, and underlines the importance of health education and community involvement.
- (d) The mortality survey showed that in the community pneumonia contributed 36% of all mortality. 27% of fatal pneumonia cases also had measles. Other major causes were malaria (21%), diarrhoea (20%) and malnutrition (15%).
- (e) Preliminary results of the mortality survey done one year after implementation of the control programme showed an overall reduction of mortality in children under five of 28% in the intervention area as compared to the control area. Reduction in deaths ascribed to pneumonia contributed 46% of the total decrease; the seasonal distribution of deaths showed the greatest difference between intervention and control areas during the rainy season when pneumonia deaths are most common. The reduction in mortality rates between the control and intervention areas was 36% for pneumonia, 37% for malaria, 20% for diarrhoea, and 20% for all other causes.

The Bagamoyo project demonstrates the feasibility of ARI control using the existing PHC system. It is also helping to define operational problems.

4.1.3 The Chandigarh Project, India

Operational studies on ARI control in children with the aim of reduction of mortality have been carried out in a group of villages of Haryana State, India. The initial development efforts for these studies included preparation of training and health education material; working out logistics of supply; testing of simple evaluation instruments and preparation of decision trees. The WHO case management approach for ARI was introduced in a cohort of 199 low birth weight babies in three clusters of 21 villages followed from birth to one year of age. Data on incidence of ARI and mortality in 211 low birth weight babies and 448 normal birth weight babies in neighbouring villages from a separate study were used for comparison. The field investigators responsible for evaluation and training were not

responsible for providing health care. The training and service activities were undertaken within the existing system of health care delivery. Monitoring of case management interventions included a weekly survey for all ARI episodes and recording of all deaths, with information on health services utilized and cause of death based on a verbal autopsy technique.

Although the incidence of ARI in low birth weight babies (4.79 episodes) was comparable to normal birth weight infants (4.7 episodes), the case fatality ratio in moderate-severe ARI was significantly higher in the low birth weight group (24.6% vs 3.2%).

Fatality of moderate and severe ARI was 8.7% in low birth weight infants treated by using the case management approach as compared to 24.6% amongst those not managed by this approach.

In November 1984 an operational project supported by WHO/AGFUND was initiated in 35 villages with 5000 children under 5 years of age to reduce ARI related mortality and ensure better understanding of ARI among the population, particularly amongst the mothers. Cluster sample surveys on 3000 children under 5 years of age carried out by trained village-based enumerators, showed that moderate and severe ARI affected 2.5% of children during July 1984, and 7.5% of children in January 1985. A census on all the households has been completed and all deaths under 5 years of age during the preceding year have been investigated by verbal autopsy. Monthly contacts have been initiated.

ARI control activities have been integrated with other PHC elements like EPI, CDD, Nutrition, Family Planning, which are known to improve child survival, in a district with 1.4 million population. In this health systems project, initiated at present in a population of 400 000, the responsibility of providing care as in other projects belongs to the staff provided by the state. The project strengthens the educational, training and logistics efforts and promotes the use of innovative and simple evaluation tools. This project is addressed towards managerial and operational issues. The feasibility of integration will be investigated and the impact on infant - early childhood mortality will be evaluated.

4.2 The benefits of pilot and feasibility projects

The group emphasized the value of projects such as those testing and strengthening national intervention strategies and assessing their relevance to the national needs and resources. The broad principles surrounding an ARI intervention are quite clear. But it is also clear that there is no fixed and immutable formula. Feasibility projects can identify local customs, attitudes and practices and test national approaches to training, health education and standard management.

5. Current status and prospects for improvement of technologies for ARI diagnosis, therapy, and prevention

The evolving global programme will need to review possible new approaches and to develop methods to evaluate them. These could then be adapted and applied by any group involved in ARI research or the introduction of programmes. Close collaboration and cooperation must be maintained between WHO and the various organizations around the world which undertake research on ARI.

5.1 Field diagnosis of ARI morbidity and mortality

The definition of the pathognomic value of symptoms and signs, individually and collectively, in ARI is complicated by the large numbers of agents and the diversity of their clinical manifestations and of the different responses of individuals to infection with the same agent. Clinical decision trees (flow charts) with treatment end points have been constructed to date without complete knowledge of the predictive values of the symptoms and signs on which they depend.

A WHO Working Group on Case Management of ARI recognized that no single decision tree could satisfy all needs (3). The Group proposed the need for plans of increasing sophistication for use by health personnel with varying degrees of training. In general terms, having recognized the presence of ARI, management action for village health workers is based on recognition of critical features related to severity of illness. Plans for higher levels of care become progressively more elaborate. In constructing these decision trees the critical clinical features used must (a) be easy to observe by mothers and health care workers with little training, (b) require the minimum of special equipment, (c) be reproducible between observers, (d) not be subject to variation between patients, and (e) most importantly, discriminate reliably between the major categories of etiological agents, pathologies and severity of illness.

A protocol has been developed for evaluating the sensitivity and specificity of clinical signs and symptoms of ARI based on comparison with a standardized case definition. It is designed to be used on an unselected population of patients with ARI.

A standardized, objective case definition for bacterial pneumonia is difficult to construct, since diagnostic methods for bacterial pneumonia are unsatisfactory. In many countries, a positive X-ray is used to define a case who should receive antibiotic therapy. For the ARI programme to succeed in reducing mortality, it is most important that the clinical signs to be used by the PHC worker be sensitive, i.e. that a high proportion of cases with a positive X-ray also have a positive sign. At the same time, a reasonable level of specificity should be maintained, to restrict inappropriate use of antibiotics. The protocol can also be used with other standardized case definitions for pneumonia, such as a combination of X-ray and laboratory results, and clinical course.

Determination of mortality due to ARI has been attempted by use of the "verbal autopsy" method. Investigators in Papua New Guinea have used a standard questionnaire administered by the same staff member to relatives as soon after the death as possible. The data are then reviewed with a physician who may request further information prior to assigning a final diagnosis. Studies in which results of verbal autopsies can be compared to subsequent or hospital data autopsy would be useful for evaluation of the technique.

5.2. Etiological diagnosis of ARI

Since the last TAG meeting, at least 11 studies have been designed, funded, and in some cases already initiated, to investigate the bacterial and viral etiological agents of ARI. The studies are located in 11 countries (Argentina, Guatemala, Uruguay, Kenya, Nigeria, Bangladesh, India, Pakistan, Papua New Guinea, Philippines, and Thailand) and include patients drawn from populations with varying mortality rates and a wide range of geographic, cultural and economic backgrounds. In an effort to ensure that results are comparable between studies, the National Research Council of the US National Academy of Sciences has coordinated development of virology and bacteriology manuals, workshops for procedures to be used in the studies, and design of study forms and methods for data management. These studies should answer the question of the importance of viral agents in ARI in a wide variety of settings; the studies are also designed to assess interaction of etiological agents with clinical and epidemiological variables.

Results of studies of ARI etiology in Papua New Guinea since 1979 are derived from hospital- and population-based research carried out by the Goroka ARI Unit and the Tari Research Unit. Both are working in areas of the highlands region where infant mortality is of the order of 70/1000.

The severest forms of ARI and the highest case-fatality ratios are associated with bacterial pneumonia. H. influenzae and S. pneumoniae are the major pathogens. Of the 52 pneumococci isolated from blood cultures or lung aspirates, 71% were included in the 14

valent pneumococcal vaccine formulation and 83% were included in the 23 valent formulation. Of the *H. influenzae* isolated from blood cultures, 44% were type b, 29% were encapsulated strains other than type b, and 27% were non-serotypable. The *H. influenzae* isolated from lung aspirates showed a different profile, with only 16% type b, and 59% non-serotypable.

The ability to define the role of bacteria such as *S. pneumoniae* and *H. influenzae* in etiological studies is limited by the current methodology available. Blood cultures are most useful in defining the role of bacteria, but they must be obtained in patients before antibiotics are administered. Sensitivity of blood cultures can vary by the method used; in the Papua New Guinea study, as many as 30% of patients could be diagnosed with a positive blood culture, using Trypticase Phosphate Broth and screening specimens for antimicrobial substances, compared to the 6% positivity with the initial method. Evaluation of current methods such as latex agglutination and coagglutination for polysaccharide capsular antigen detection in serum and urine, and development of improved methods for antigen detection are a high priority, to ensure that studies can include sensitive and specific diagnosis of bacterial agents. It is also suggested that proper specimen storage and cataloguing be encouraged to evaluate new diagnostic tests as they are developed, and to use validated tests for retrospective testing of specimens.

Finally, etiological studies have been conducted primarily in the hospital setting owing to constraints in obtaining and transporting specimens. However, to obtain an accurate picture of etiological agents in the community, emphasis needs to be placed on development of transport methods and techniques appropriate for field settings, to increase information on etiological agents in moderate cases of ARI.

5.3 Antimicrobial therapy

Antimicrobial susceptibilities of invasive strains of *S. pneumoniae* from ARI cases in Papua New Guinea have been determined; 47% of the 55 strains were fully sensitive to penicillin, 49% were partially resistant (MIC 0.1-1 mcg/ml), and 4% were resistant to penicillin. Treatment of pneumonia due to partially resistant strains with benzathine penicillin may not be successful. Additional studies of serum levels achieved by currently recommended antimicrobial regimens are needed, as well as continued monitoring of antimicrobial resistance.

The challenge for the future is to clarify which patients have bacterial infections. In developed countries, the factors which now guide the clinician in identifying these patients are the anatomical site of the infection [larynx (croup), tracheobronchial tree (tracheobronchitis), bronchioli (bronchiolitis) and alveoli (pneumonia)], suppurative complications, severity of infections and host age. If studies in developing countries show that acute lower respiratory tract infections can be classified similarly, croup, tracheobronchitis and bronchiolitis, which are caused primarily by viruses, would not require antibiotics. Pneumonia and suppurative complications would continue to remain as the troublesome entities.

5.4 Vaccines for prevention of ARI

5.4.1 Bacterial vaccines

Recent developments in immunization against pertussis, pneumococcus and *Haemophilus influenzae* are of immediate relevance to the ARI control programme.

Although they are undoubtedly efficacious, concern at their neurotoxicity has led to decreased acceptability of whole cell pertussis vaccines in some countries and a new generation of acellular vaccines is on the horizon. The first of these is now being used nationally in Japan and plans for evaluation of efficacy in Sweden are well advanced. It now seems that pertussis is a toxin mediated disease and, although some debate continues as to

the critical toxins, as well as to the role of IgA in impairing the attachment of the bacterial cells to the mucous membranes, the next stage in vaccine development will be even purer preparations of toxoid. Further evaluation of toxicity and efficacy in large populations is needed to determine whether the newer preparations are superior to whole cell vaccines which are currently in use in most countries.

Polyvalent pneumococcal polysaccharide vaccines are now widely used in adult populations of developed countries and they have an excellent safety record. Efforts to prevent pneumococcal otitis media in infancy with these preparations have foundered on the fact that the most important paediatric serotypes are relatively non-immunogenic in children under 5 years of age. However, two trials in Papua New Guinea have now demonstrated the efficacy of the vaccine in changing respiratory and total mortality in this age group. While current efforts to improve the immunogenicity of these vaccines in early childhood must continue, the present vaccine decreased ARI mortality by 60% in the Papua New Guinea trial, an area where childhood mortality is high. While it may be some time before the new covalently linked pneumococcal preparations are available for field testing in developing countries, efforts should now begin to evaluate the effects of the present preparations in a number of field settings.

Till now, efforts to develop vaccines against Haemophilus influenzae have concentrated exclusively on type b encapsulated organisms because of their undoubted importance in meningitis. But, for respiratory infections, other serotypes of encapsulated haemophilus and unencapsulated strains are equally if not more important. The type b vaccine suffers the same disadvantage as pneumococcal vaccines - that it is poorly immunogenic in early childhood. Efforts to change this by covalent linkage to various carrier proteins appear at this stage to be successful, and a second generation of these vaccines is currently being evaluated in field trials in Alaska. Assuming this strategy is successful, there is the possibility that type b vaccine could become a routine childhood immunization. But efforts must now begin urgently to explore vaccine approaches to the other serotypes and also to the unencapsulated variants which are very important respiratory tract pathogens.

5.4.2 Virus vaccines

In the last few years there have been great advances in analysing the immunogenicity of viruses at the molecular level and in exploiting this knowledge to produce experimental vaccines. For instance by genetic reassortment it is possible to produce candidate live attenuated vaccines containing 6 genes for "internal" peptides from a cold adapted parent and 2 genes for "external" peptides from an epidemic strain.

The genomes of RSV and parainfluenza viruses are being cloned and sequenced and the protective antigenic sites are being identified with monoclonal antibodies. When these are known it will be possible to develop new antigens, perhaps expressed in E. coli or yeast or oligopeptide analogues of the epitopes which could be used as vaccines. Such oligopeptide antigens have been made with a picornavirus (foot-and-mouth disease virus) and shown to protect animals against infection with the virus. It would be possible to try the same techniques with rhinoviruses, although any vaccines made would be difficult to employ.

The molecular genetics and biochemistry of adenoviruses are being studied in great detail, but no applications to vaccine production have been reported, though it is clear that the ability has greatly increased to manipulate the genome to produce attenuation, and also to define peptides and aminoacid sequences likely to be significant immunogens.

The current influenza vaccines are used for prevention of ARI morbidity and mortality in a number of developed countries. However the lack of data on the importance of influenza in paediatric mortality in developing countries, and the expense of the vaccine, do not warrant recommending its use in the ARI programme at the present time.

The current measles vaccine has an important role in prevention of ARI mortality. Efforts to improve its immunogenicity in younger children are important to increase its effectiveness in reducing ARI mortality.

6. Environmental determinants and respiratory infections

A large segment of the urban (30%) and rural (90%) populations in developing countries utilize so-called biomass fuel, such as wood, leaves, agricultural waste and dried animal dung. The combustion of these fuels is primitive and inefficient, causing both the depletion of the available sources of fuel and very high levels of smoke and gaseous contamination indoors. Women and children particularly are exposed to high concentrations of smoke and potentially toxic gases, such as carbon monoxide and formaldehyde, which are known to have an irritant action and to impair pulmonary defense mechanisms. It would be reasonable to expect under these conditions an exacerbation of respiratory illness caused by certain bacteria and viruses.

It has been shown in several studies that there exists a relationship between the presence of smokers in the home and the increased incidence of persistent wheezing and possibly an excess risk of respiratory infection. Also, cigarette smoke and smoke from biomass fuels are quite similar in their composition and both contain several hundred potentially toxic substances. However, the concentrations of these substances in cigarette smoke are in the order of 10 to 100 times less than has been measured in rural homes in developing countries. The presence of elevated concentrations of smoke stemming from the combustion of biomass fuel is therefore likely to affect the health of rural children in particular.

The extensive use of biomass fuel will continue well into the next century. The following activities need to be undertaken:

- implementation of several epidemiological studies, representing different exposure settings, to determine and evaluate the contribution of environmental factors to the incidence and severity of ARI in children; the methodology of such studies will be complex and may require development of methods for measuring exposure;
- dissemination of information and raising the awareness of authorities concerned with rural development about the risk of increased respiratory disease, particularly among children, as a result of improper utilization of biomass fuels.

7. The shape of the future programme

ARI is probably the most prevalent and one of the most significant causes of illness, disability and economic loss in all age groups in all countries of the world. This burden should be lightened by prevention, where possible, and effective treatment to speed recovery and reduce the risk of permanent damage to health. The general objective of the programme should be, therefore, to stimulate the development of ARI control activities in all Member States. For the immediate future the main emphasis of the ARI programme and the principal commitment of the resources at its disposal - financial and staff - should be on primary health care in developing countries. Within this context measures to reduce infant and early childhood mortality are the top priority.

The risks of fragmentation of effort inherent in promoting isolated planning, training, supervision and evaluation of ARI activities should be avoided from the start. At the same time, ARI must also have a clear identity, as the complex problems of ARI must be clearly articulated in order to be sure that the programme can be evaluated and improved.

Objectives will be achieved only by active administrative and professional collaboration between the various programmes involved in primary health care activities. Vigorous promotion of the priority of the ARI control programme will be necessary in order to obtain

the political and financial commitment and to mobilize professional and public concern and involvement. It will require broad as well as detailed planning, the identification and development of appropriate technologies, and evaluation of the effectiveness and efficiency of interventions.

Three major components to the programme can be identified: the health service component, concerned with application of the present state of the art to the prevention and treatment of ARI in children; the research component directed to strengthening the scientific basis of the programme and solving problems raised in the implementation of services; and the promotional component, which will ensure the necessary commitment of resources - financial, personnel, and equipment - and professional and public support. The programme will grow on firm ground if these three components are pursued with vigour and successfully harmonized.

7.1 Activities in developing countries

The aim should be for all countries in each Region to construct and implement a national plan for ARI control. WHO can assist in this by drawing up agreed prototypes such as that proposed by the Eastern Mediterranean Scientific Working Group, Lahore, 1984, which can be adapted to country needs (5). The programme will be introduced in a phased manner, so that the effectiveness of the various elements can be tested gradually, and then built up at various levels. Initially the programme should be in areas where PHC services are strong, and it can be integrated with EPI and CDD.

Matters related to service implementation requiring particular attention will include:

- the need to establish or strengthen health information systems to assist in the planning and evaluation of services and maintaining surveillance;
- the training of health workers at all levels, including doctors, in the use of standard management plans;
- the preparation or adaptation and translation of technical handbooks and manuals for local use;
- the preparation and translation of training and health educational material;
- the strengthening of technical services (laboratory, radiology, data handling) in resource and referral centres.

The activities of countries can be further strengthened through WHO support by, for example:

- providing technical support by short-term consultants for service planning and evaluation;
- establishing in each Region a Collaborating Centre for ARI Training and Health Systems Research;
- organizing Regional Workshops on programme management or for technical training (e.g. of laboratory workers);
- supporting the development of both operational and etiological research projects in Member States;

- assistance in the setting up of demonstration projects in selected areas which will test the feasibility of plans in a local context;
- advising on recent developments in electronic data handling and on recording of epidemiological data;
- encouraging the incorporation of ARI control theory and practice in medical and other professional education.

7.2 Activities in developed countries

The problem of ARI in developed countries is very different from that in developing countries. ARI remains one of the 10 leading causes of death, mortality in older adults causing substantial numbers of premature deaths. The major problem in younger people is sickness with absence from work and school. The consequent economic loss and industrial and social disruption is considerable. Childhood respiratory infections are not without dangers, cause much misery and impose considerable burdens on families and health services. Vaccination coverage is poor in many countries. Developed countries cannot afford to be complacent about the total cost of ARI to them in both health and economic terms.

The major emphasis of the programme in these countries, therefore, is likely to be:

- ensuring that coverage with the EPI vaccines is complete among their child populations;
- undertaking measures to reduce the non-specific factors which have adverse effects on ARI, such as atmospheric pollution and tobacco smoke;
- using influenza and pneumococcal vaccines where appropriate in vulnerable groups of the population.

These countries can also contribute substantially to the ARI programme in other ways, for example:

- the development and improvement of ARI vaccines
- the development of simple diagnostic techniques for etiological diagnosis;
- the provision of standard reagents;
- providing technical training facilities and contributing to Regional Workshops;
- participating in field research with developing countries and providing expertise to assist programme planning and development.

7.3 Health education and community involvement

Involvement of the community through the use of health educational material and communication strategies is an important component of the programme. The objective is to alter community behaviour, including improvement of utilization of health services and modification of life styles to decrease harmful environmental exposures (tobacco smoke, smoke from wood and other traditional fuels). WHO can assist by the development of prototype educational material which can be adapted to the local cultural context. Similarly, programmes for use with special media (such as video tapes and films) can be effective in enlisting public support for the ARI control programme. In addition, the use of traditional and folk media should be encouraged in areas where there is no access to modern mass media.

Child care practices and life styles which are related to the occurrence and severity of ARI should be evaluated. The programme should establish links with social scientists and experts in this field. Social and behavioural research directed toward increasing community involvement also needs to be initiated.

7.4 Role of governmental and nongovernmental organizations

Effective promotion of the ARI programme has started through collaborative efforts of WHO and UNICEF. A joint WHO-UNICEF statement on the programme has been issued (8), and UNICEF has been instrumental in programme implementation in the Region of the Americas.

Active collaboration and partnership has also developed between WHO, governmental agencies and non-governmental organizations in the areas of research, communication and advocacy of the ARI control programme. Examples of these emerging collaborative efforts include research efforts on etiology and case management of ARI promotional activities, production of the ARI Newsletter, and the availability of technical support are examples of these emerging collaborative efforts. The technical and financial support provided by ADAB, AGFUND, BOSTID, GTZ, IDRC, IUAT, Sasakawa Foundation, SIDA/SAREC and UNICEF, have been instrumental in the progress made over the last two years, and is even more important for further implementation and evolution of the programme. Support in organizing international meetings and workshops will help in building advocacy for the ARI control programme. Development of suitable health education material, technical and consultant support, and help in programme evaluation are possibilities for further joint effort.

8. Funding

To provide adequate funding for the ARI programme, the programme must define clear and achievable objectives, which can be implemented according to the realities of the different countries. The currently proposed case management programme is a rational approach to antibiotic therapy of ARI, as has been demonstrated by the substantial reduction of mortality observed in the Tanzanian project. Such information provides a strong basis for obtaining financial and political support of the ARI programme. Support of programme implementation does not preclude the need for support of operational and epidemiological studies to improve programme activities and develop preventive approaches for the future.

Funding of WHO's ARI programme should be increased gradually according to the progress reported. A balanced combination of health service and applied research activities should be maintained. It is mandatory to obtain extra-budgetary sources of funding, mainly through coordinated efforts with UNICEF and bilateral mechanisms. The experience of the last biennium shows that these extrabudgetary funds have increased from US\$ 172 000 in 1982-83 to US\$ 1 049 000 in 1984-85, with the donations of agencies from seven developed countries. These contributions must continue, and increase if the objectives of the programme are to be achieved. The ARI programme represents a special opportunity to strengthen primary health care delivery because of its potential for providing an obvious treatment service to communities, as well as the expected decrease in paediatric mortality.

The coordination and collaborative activities with EPI, CDD and the essential drug programmes are another way to obtain and efficiently use resources to provide maximum benefits for the health of the community, and to ensure integration of the health programmes.

Finally, the crucial issue is that funds necessary to sustain the ARI programme must come from the national health budget of the Member States involved in the ARI control programme, because it is their decision and responsibility to do so. Member States should show their political will to support and establish the basis for a permanent programme.

9. Conclusions and recommendations

9.1 General

9.1.1 The problem of ARI is global. It is a major cause of morbidity and mortality in all Member States. The primary aim of the ARI programme is the reduction of mortality from ARI in children in developing countries. Improved case management within the context of primary health care is recommended to decrease fatality and disability from ARI. Preventive measures to reduce ARI morbidity should be applied, and new preventive measures developed.

9.1.2 The scope, components, objectives and strategies set for the ARI programme in the first report of the TAG continue to be valid. However, more emphasis should be placed on health education and community involvement activities designed to upgrade knowledge, attitudes, and child care practices among mothers and health workers.

9.1.3 WHO in collaboration with many Member States has made important progress in the ARI programme in the past two years, notably:

- (a) in the successful implementation of programmes for ARI control in some developing countries and the initiation of plans in others;
- (b) in basic and operational research, which justifies optimism that implementation of the programme can significantly reduce mortality in infants and young children;
- (c) in the elaboration of specific material for the programme, including:
 - guidelines on case management and health education
 - training modules on the management of a child with cough, and of children with ear, nose and throat infections, which are scheduled for field testing
 - the outline of a handbook on ARI for doctors at district hospitals
 - collection of data from feasibility projects at the community level on supply needs, health education methods, and other operational aspects of ARI control activities.

9.1.4 It is opportune to proceed vigorously with further implementation and development of the programme. All Member States should be urged to review the problem of ARI and their present activities for ARI control. Based on this review they should formulate plans to initiate or to develop an ARI programme appropriate to their needs. At the start of a national ARI programme it must be ensured:

- (a) that the country has defined the size and nature of the problem in terms of mortality and morbidity in the population;
- (b) that the importance of ARI is recognized and that the programme is accorded appropriate priority within the national health care system;
- (c) that the required financial, manpower, and other resources have been committed to ARI control activities.

9.2 Health Services

9.2.1 Efforts should continue to be concentrated on the promotion of case management and health education as regular activities of the primary health care system.

9.2.2 The specific elements of an ARI programme that each country should devise include:

- (a) the content of case management plans for each level of health care, namely the community health worker, the first health care facility and the first referral level or district hospital. Guidelines on case management should be inserted as chapters in primary health care manuals;
- (b) the content of health education on ARI at the community level and the production of locally relevant material to be used in conveying the essential messages;
- (c) preparation of training modules on case management and health education for inclusion in the courses currently organized for senior and mid-level supervisors in relation to other priority programmes, such as immunization and diarrhoeal diseases;
- (d) adaptation and field testing of simple integrated training modules for PHC workers on activities related to child survival, such as EPI/CDD/ARI. These should be addressed to the PHC worker who has limited education and should be appropriate for short training courses (two-three days' duration);
- (e) estimation of the drugs and clinical examination equipment needed to implement the case management strategy so that the programme of essential drugs and other medical supplies can plan the purchase and distribution;
- (f) definition of the operational information on ARI services which should flow from the point of delivery to the management level as part of the primary health care information system;
- (g) establishment of an effective first level referral system to support and complement the peripheral services and strengthen facilities for the management of severe ARI cases. This includes planning for transport of patients and provision of skilled staff, with appropriate investigation and treatment facilities.

9.2.3 Development of the health service component of the ARI programme at the global level should continue, with emphasis on the preparation of:

- (a) an operational manual for central level managers on the ARI elements to be incorporated in the planning and evaluation of primary health care programmes. This manual should give guidelines on how to:
 - define the ARI problem
 - formulate programme objectives and targets
 - collect basic information for planning ARI control activities
 - train and supervise health care personnel
 - estimate supply needs
 - implement case management plans
 - supervise and evaluate ARI control activities
 - monitor morbidity and mortality
 - provide periodic evaluation of the programme.

- (b) a technical manual on surveillance of bacterial sensitivity to the antimicrobials which are included in the standard plan of case management. Projects to define prevalent respiratory pathogens, including the use of simplified diagnostic methods, should be implemented as the methods become available;
- (c) prototype health education material in various forms (with legends, and language free) for mothers and the general public, to promote acceptance and endorsement of ARI control activities.

9.2.4 Surveillance of morbidity and mortality from ARI at country level is regarded as essential. Where the existing information system is unsuitable or not available, the sample survey method may be used in conjunction with surveillance of EPI target diseases and diarrhoeal diseases. The WHO programmes concerned should coordinate their activities (in countries that wish to conduct combined surveys).

9.2.5 Current systems for the classification of ARI are unsatisfactory; further steps should be taken to develop a standardized classification appropriate both for programme management and research purposes. The classification of ARI should be based on critical symptoms and signs of disease severity related to management decisions in a tiered manner appropriate to different levels of care.

9.2.6 Immediate utilization of ARI training modules in case management of ARI should be encouraged in all countries that have initiated an ARI programme and are planning to conduct supervisory skills courses in EPI and CDD.

9.2.7 Vaccination for EPI diseases such as measles, diphtheria and pertussis is an essential part of the prevention of ARI. Collaboration with EPI in achievement of high levels of vaccine acceptance, should be stressed.

9.2.8 Important non-specific measures to prevent severe disease and mortality from ARI include amelioration of low birth weight and poor nutrition. In this connection the ARI programme should be closely integrated with Maternal and Child Health Nutrition Programmes.

9.2.9 The adverse effects of atmospheric pollution on the susceptibility of infants and young children to ARI are well recognized but not well defined. Health education should be directed to the reduction of exposure to tobacco smoke, and, where feasible, to smoke from fuels used for cooking and heating in the home by the use of improved methods of combustion and smoke ventilation.

9.3 Research

Research remains an essential and high priority part of the ARI programme. Many elements of the programme developed earlier by research are now being implemented but research in several areas is still needed to improve the functioning of the programme and to define methods for progress in the future. The standard plan for case management is based on extensive clinical experience and current scientific information. Methods for monitoring the programme should be incorporated into the national programmes as discussed in the recommendations for programme implementation. However, studies on improving programme operations, evaluation of the techniques and measurements of the programme's impact on mortality should be done in special research projects. Prototype ARI programmes are under way in several developing countries. These research projects provide opportunities to develop new methodologies.

Research activities in ARI involves many disciplines. Coordination of research activities should be emphasized to facilitate rapid progress.

Research should be directed towards the topics listed in the Annex 3.

9.4 Promotion and resources

Promotion of ARI programmes will depend largely on the available information and on the effective use of this information in enlisting the support of those responsible for development, and financing of national programmes. Progress towards control of ARI mortality also requires commitment of financial and technical resources on a regional and global level.

9.4.1 For national programmes, support should be enlisted from:

- (a) government officials responsible for decisions on policy and budget,
- (b) medical and associated health care professional groups,
- (c) managers of the public health system, especially those responsible for primary health care,
- (d) community leaders who need to participate actively in the programme.

All of these groups need to receive appropriate technical and scientific information that provides a sound basis for acceptance.

The programme particularly needs the support of the local public health and medical community. Draft national plans developed in each region should be available to the Member States so that the local political and medical bodies can participate in adapting the plan to specific local needs and circumstances. Professionals should also be involved in the solution of managerial, technical and operational problems. Their constructive involvement in the programme is best achieved through an effective exchange of publications, scientific presentations, seminars and workshops.

ARI control strategies and methods should be included in vocational training and continuing education programmes for doctors, and other health workers caring for children.

Promotion of the programme in the community should utilize all available approaches, including mass media. Public relations and educational techniques should be developed in the field of health. They should not just provide information, but should effectively encourage practices leading to improved child care.

9.4.2 On a regional and global level, promotion of the programme is necessary to provide financial and technical support. The United Nations Agencies, and governmental and nongovernmental agencies can all help to ensure successful implementation of the programme.

These agencies can assist by providing:

- (a) bilateral agreements with individual Member States for training and programme implementation activities, including the support of local and regional seminars and workshops, fellowships, development of manuals and audio-visual aids, and institution strengthening. In some instances the minimal clinical examination equipment and drugs might have to be provided for initially.

Most funding agencies require formal applications for support. The WHO secretariat at Headquarters or Regional Offices can assist in developing these documents;

- (b) institutional strengthening through the establishment of WHO Collaborating Centres with specific reference to epidemiology, behaviour and health education research, clinical research, promotion of training activities, and data management;
- (c) support for progress in control and prevention of ARI morbidity and mortality through epidemiological, etiological and intervention studies.

9.4.3 The publication of the ARI Newsletter is of importance for providing an international exchange of information on the programme. There should be continuous updating of the WHO mailing list.

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Opening Remarks

by

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Monday, 25 March 1985, 10h00, Salle A

Some 25 years ago I was leading a research team that had the task of formulating a tuberculosis control programme for developing countries. Faced with tremendous limitations, in almost every respect, we very quickly realized that it would be impossible to bring tuberculosis services within reach of the entire population if we tried to introduce the complex technology then in use in Europe or North America. Making this technology available to a privileged few, and waiting for a socioeconomic miracle to allow for national expansion, clearly would not have served the purpose of tuberculosis control; it merely would have been a convenient way of evading the limitations.

Obviously making headway meant coming to grips with the limitations - not their evasion. Whatever we were going to propose would have to be available to everyone, anywhere in the country. For BCG vaccination this seemed relatively easy, but the real problem was dealing with the millions of patients, right now and probably for many decades to come. To make this possible, tuberculosis control would have to be integrated into a comprehensive health system.

This meant that we could forget about most of our technological baggage; we had to find a technology attuned to the limited resources. In short, we did not even consider mass X-ray as a technique for case-detection but assigned the first priority to sputum microscopy for people who presented themselves with symptoms suggestive of tuberculosis. Our research work had shown that microscopy, which was the most practical diagnostic technique, was effective in this population. Thus, with this relatively simple technique we were able to take care of a majority of the people who felt they were ill. This we called our social target. The next problem was treatment. Hospitalization of the patients found was totally out of the question. But in a series of controlled trials some inexpensive standardized chemotherapy regimens were identified that could be given at home with no additional risk to the patient or his family.

Now we could propose a case-finding and treatment strategy that was applicable at once almost everywhere and at the same time perfectly amenable to technological improvement, resources permitting. I must admit that we were irked by irreverent scepticism from various quarters, but we appreciated that there were many questions that needed a precise answer. We therefore carried out a series of studies on various technical and practical aspects of the programme. Before the quantified evidence we produced most of the criticism soon dwindled.

You will understand that all this crossed my mind when I reviewed the progress in our programme on Acute Respiratory Infections.

In front of you I need not expand on the importance of ARI in developing countries. Reduction of infant mortality invariably is among the top priorities in the health programmes of developing countries; the infant mortality rate is therefore an indicator for monitoring progress towards Health for All by the Year 2000. As with tuberculosis, the problem is intimately connected with the socioeconomic situation, but, again as with tuberculosis, we cannot sit back and wait for socioeconomic development to take care of the problem. The need for integration in the general health system, or more specifically into primary health care, is even more evident than in the case of tuberculosis: not only would it be impossible to reach the population in another way, but also, considering that ARI account for up to 40% of all diseases for which medical attention is sought for children, it would be unthinkable to have a primary health care programme ignoring ARI. I wish to stress this interdependence of ARI control and primary health care. In fact, it would be difficult to overestimate the importance of their interaction. Because of this, the question is not so much how to add ARI control to primary health care, as how to organize primary health care programmes in such a way that all the elements which are necessary for the community concerned are included - a subtle but vital distinction in our way of thinking about and acting in community health.

A further matter to be considered is that primary health care programmes are being developed now; ARI interventions, therefore, should be proposed now. In view of this I have not had a moment's hesitation in making extra funds available for the preparation of instructional material at a time when some sparring was still going on about technical details.

This brings me to the technical policy. First I must say that I concur fully with the view that, with so many avoidable deaths in children each day, interventions should be started as soon as there is a reasonable technical justification for them - not only after all possible technical matters have been investigated exhaustively.

Vaccination no doubt would be the control method of choice; you are all aware of our efforts made in applying the vaccines that are available already as well as in supporting the development of new vaccines. Still, opting for this single-course approach is clearly unjustifiable as long as there remains an incontrovertible need for case management.

In the absence of appropriate diagnostic techniques it is being proposed to base action on the symptoms for which the sick children are presented as well as on certain easily determined pathognomonic signs. According to a clinical classification standard case management is then applied, which includes antimicrobial treatment appropriate to the prevailing etiological pattern. Primary health care programmes therefore have to ensure that the correct antimicrobials are included among the essential drugs and that health workers know how to use them.

Considering the potentials of primary health care, but also its limitations, it scarcely can be contested that this is a logical strategy, if not the only one feasible. On the other hand it cannot be contested either that the management scheme is the critical element of the programme and therefore should be examined most critically indeed.

As regards case finding the approach for ARI is not so easy because the indicated method is neither very sensitive nor very specific. In ARI, it is furthermore complicated because an etiological diagnosis is not made. Research is needed to find an optimum balance of sensitivity and specificity of the method of classification of ARI cases.

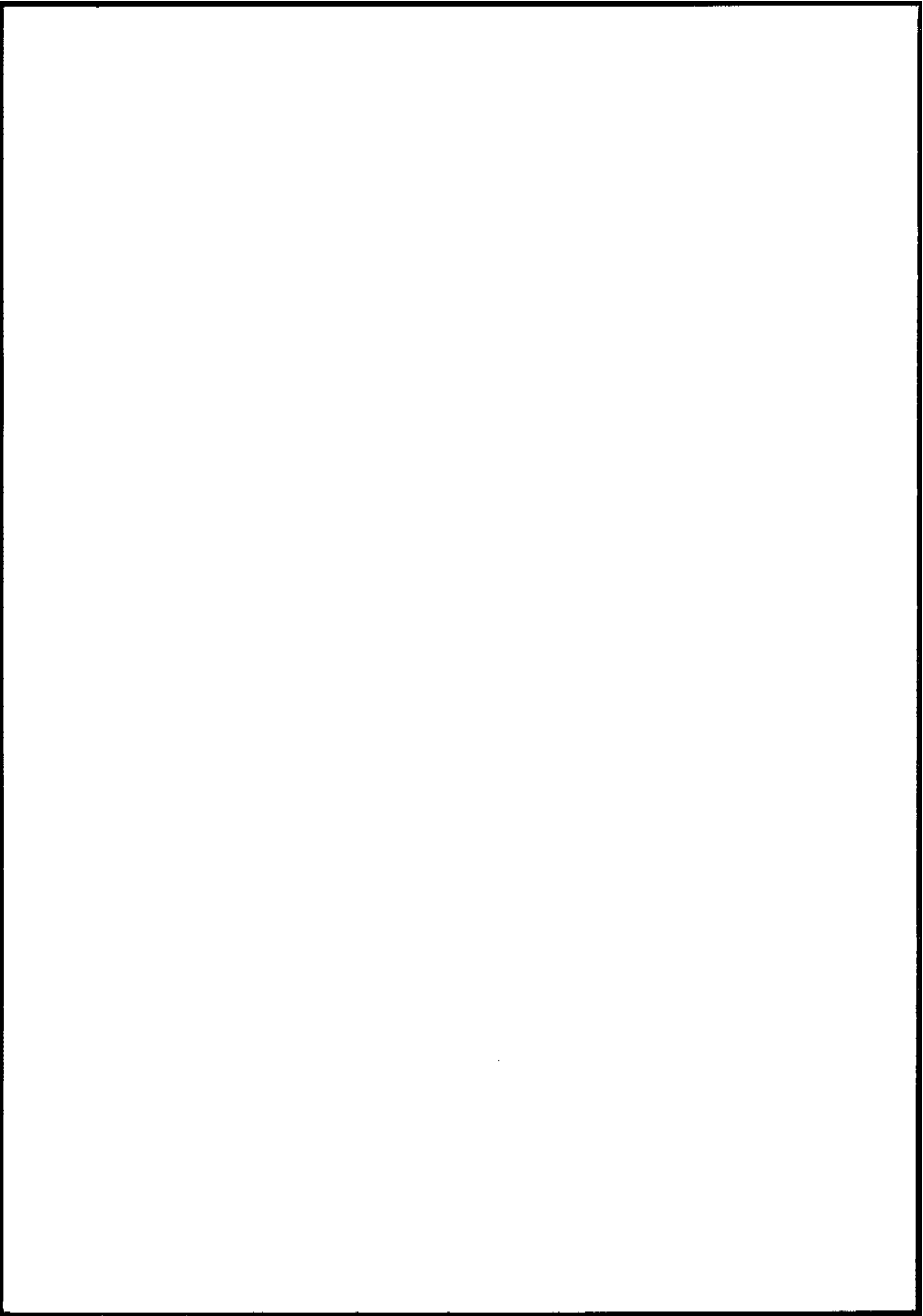
The reason for this is one of principle in implementing primary health care programmes. The national planners should be in a position to arrive at a considered value judgement, taking into account such factors as resources available, and to adapt the programme accordingly. If resources are very limited it still should be possible to implement the programme - not by limiting it geographically, but, for instance, by increasing the specificity of the case-finding method provided this does not lead to another contradiction in respect of its operational applicability and social acceptability.

Guiding principles have been outlined by WHO with respect to discrimination of signs and symptoms of ARI by degree of severity. However, there is no universal solution. Each country should find the best approach.

Rather than adopt the attitude of the Bellman in Lewis Carroll's "The hunting of the snark", who stated "What I say three times is true", we now should obtain validation of the strategy through objective evaluation in the national programme settings. What is still missing is the kind of pertinent research on which we based our tuberculosis programme. In this matter we must be open-minded. Research should not merely provide some elastic figures to prove a single point or preconceived idea; it should be inclusive rather than exclusive and allow for alternatives to be compared.

In your first meeting you made an excellent inventory of what was known and what was to be done. You will now be asked to evaluate what has been done so far, both in qualitative and quantitative terms. Against this realistic background we should like you to formulate your further advice to our programme. In this matter you should try to be selective and specific. As the studies will have to be done by the countries themselves, they really must be a help - not a hindrance - to the programmes. Therefore you should try to identify the activities that are crucial for dealing creatively and efficiently with the often shifting problems, explain clearly why these are essential, and describe how they should be undertaken.

Mr Chairman, WHO and its national constituencies will be most grateful to you and your colleagues here for accepting the ethical and technical challenges inherent in this difficult task. I wish you a constructive week in your WHO. Thank you.



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Annex 3

Specific research priorities in ARI

1. Health systems research

Specific topics for health systems research include:

- (a) Design of data collection and handling systems to facilitate monitoring and data analysis.
- (b) Assessment of the cost effectiveness of the programme, so that data on the expected economic impact of the programme can be generated.
- (c) Design and evaluation of alternative approaches for reducing ARI mortality.
- (d) Evaluation in appropriate populations of the pathognomonic value of signs and symptoms of ARI when used by PHC workers. The strategy proposed by WHO as well as alternative classification schemes should be evaluated. These should be compared with formal case definition including X-ray results, laboratory findings, and clinical course.
- (e) Determination of the accuracy of primary health care workers in identifying these signs, in comparison to the use of these signs by medical workers with longer formal training.
- (f) Evaluation of the accuracy of lay reporting of mortality and the verbal autopsy technique for assessing ARI-related mortality.

2. Research on therapy

- (a) Controlled clinical trials on the efficacy of supportive measures and of alternative antimicrobials for the treatment of acute respiratory infections in different age groups specifying severity and etiology. Supportive measures which are important to evaluate include supplemental oxygen, humidification, fluid intake and nutrition.
- (b) Systematic collection of data on adverse reactions to therapy.
- (c) Investigations on serum antimicrobial levels achieved with recommended and alternative regimens in target populations. Levels should be compared to the results of bacterial susceptibility testing, as recommended under 9.2.3(b) above.

3. Research on diagnosis

The case management approach using antimicrobial therapy will be successful in populations where ALRI is due largely to bacteria. Therefore availability of sensitive and specific diagnostic techniques for bacterial pneumonia is a high priority for research projects, and also to enhance promotion of the programme.

- (a) Evaluation of currently available methods such as latex agglutination and coagglutination for H. influenzae and S. pneumoniae polysaccharide capsular antigen detection in serum and urine for reproducibility, sensitivity, and specificity.
- (b) Development of new methods for diagnosis of bacterial pneumonias.
- (c) Development of simple and rapid diagnostic methods for viral and bacterial agents which can be used in field settings (such as ELISA).
- (d) Evaluation of X-rays as a source of useful diagnostic information in young children.

4. Research on vaccines

- (a) In view of the important role of S. pneumoniae and H. influenzae in ARI morbidity and mortality, currently available vaccines should be evaluated for their impact on ARI. This is particularly relevant in view of the Papua New Guinea finding that use of pneumococcal vaccine reduced ARI mortality in children. Field research projects should consider the feasibility of assessing the impact of pneumococcal vaccines on ARI mortality.
- (b) The impact on ARI mortality of currently available vaccines, such as measles and pertussis, should be assessed. Also, approaches to improve immunogenicity of measles vaccine during infancy should be encouraged.
- (c) The ARI programme should follow closely the progress of the WHO Vaccine Development Programme in respiratory viruses and encapsulated bacteria. In view of the importance of Streptococcus pneumoniae and Haemophilus influenzae as causes of severe pneumonia, research on vaccines against these infections in children should be undertaken by the Scientific Advisory Group of Experts on Vaccine Development in Encapsulated Bacteria.

5. Research on pathogenesis

Although important progress in reducing ARI mortality can be made now by implementation of the case management programme, additional progress requires an understanding of the pathogenesis of ARI, including etiological agents, viral-bacterial interactions and host and environmental risk factors.

- (a) Clinical and etiological studies should continue. The data acquired should also be used to define patterns of mortality and etiological agents which may vary by geographic and demographic groups.
- (b) Epidemiological studies of ARI should be designed to investigate the interaction of the many risk factors potentially involved in ARI pathogenesis. Specifically, factors such as malnutrition, low birth weight, measles, pertussis, malaria, immune deficiency states and child care practices should be evaluated, as well as interaction of risk factors with etiological agents.
- (c) Links of the ARI programme with the Division of Environmental Health should be established to explore the effects of indoor air pollution on the respiratory health of children in urban and rural areas of developing countries. Intervention trials could assess impact on ARI morbidity due to introduction of smoke-free stoves in part of a study population.