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CASE MANAGEMENT OF
ACUTE RESPIRATORY INFECTIONS IN CHILDREN
IN DEVELOPING COUNTRIES

Report of a Working Group Meeting
Geneva, 3-6 April 1984

Second Revision

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*The meeting could not decide on several questions that required consultation of specialized experts. An Ad Hoc Committee (Dr S. Berman, Dr Felicity Savage King, Dr F.A. Shann, and the Chairman, Dr B.N.S. Walia) reviewed the recommendations of these experts and revised the report at a meeting in Geneva, 18-20 September 1984.

**This revision became necessary because of the development of ideas about "Case Management of Acute Respiratory Infections in children" during the production and field testing of training material. The revisions were made with Dr Felicity Savage King's assistance reflect the collected advice of experienced paediatricians and other health workers who participated in the testing of the training material in Colombo (Sri Lanka), Chandigarh (India) and Bridgetown (Barbados) during 1985.

1. Introduction and purposes

The production of training material on case management has been a priority activity of WHO's programme on acute respiratory infections in children, as recommended by the WHO Technical Advisory Group on Acute Respiratory Infections (Geneva, March 1983).

In October 1983, CDC's Center for Professional Development and Training collaborated with WHO in analysing the training needs of the programme. The analysis included a specification of the tasks to be performed at various levels of the health system and of the types of personnel performing the tasks at the primary health care and supervisory levels.

Upon this analysis, WHO has contracted the services of CDC to develop training material for mid-level supervisors with the purpose of enabling them to:

- (i) Plan and implement training of health workers to prepare them to manage cases of acute respiratory infections (ARI) according to a standard method, and to educate the community (mothers and other family members) in ARI.
- (ii) Monitor the performance of health workers and modify it to ensure that each health worker can accurately identify and appropriately manage cases of serious respiratory distress, and can provide health education to mothers and other family members.

The purposes of the meeting of the Working Group were to appraise clinical experience and to evaluate the scientific evidence on the diagnosis and treatment of ARI in children, to identify the most appropriate components of case management that can be applied by health workers and the families of children in rural areas of developing countries and to make recommendations on the technical content of the training material.

A List of the Participants is attached in Annex 1.

2. Rationale for the standardization of case management

The available information suggests that there are differences between developed and developing countries in the epidemiology of acute respiratory infections in children. Bacterial pulmonary infections are common in developing countries and this may, at least in part, explain the high mortality reported there. Without question more research is needed, particularly in relation to the clinical and microbiological description of ARI, the susceptibility of bacterial pathogens to antimicrobials, the groups with high mortality and morbidity rates, and the factors determining the incidence and severity of the diseases. While this research is of great value for the future development of the programme, current knowledge of respiratory infections in developing countries should be utilized to formulate guidelines for clinical management of ARI at various levels of primary health care. The widespread application of what is already known is likely to result in a substantial reduction in ARI related mortality.

The importance of bacteria in causing death from acute lower respiratory infections in developing countries, and the established effectiveness of antimicrobial and supportive treatment in averting such death make a strong case for the initiation of an ARI control programme. The strategy of choice is the improvement and upgrading of clinical management provided by primary health care workers in rural areas. These workers need to be trained to use appropriate clinical criteria to decide which children should receive antimicrobial drugs and which children should be referred. They should be trained to administer antimicrobials and to give advice on supportive measures.

The guidelines on case management of ARI are also intended to rationalize the use of antimicrobials, so that children who may benefit receive them sooner, and so that there is less overprescribing of antimicrobials for children who do not need them.

The guidelines address different levels of care - family, community health worker, first health care facility and first referral facility. The family and the community health worker should be taught to perform the most basic activities of the ARI programme. At the most peripheral health care level two signs, namely "fast breathing" and "chest indrawing", should be considered as the basic criteria for immediate action i.e. administration of antimicrobial drugs or referral. These signs can be observed by watching the child breathe, and the use of a stethoscope is unnecessary. Management based on these criteria is expected to save the lives of many children who would otherwise die from pneumonia. The management offered at higher health care levels, and particularly at the first referral level, will depend on what skills and resources are available.

3. Requirements for the technical content of the instructional material

An effective plan for case management of ARI should comprise the following components:

1. Discrimination of cases according to the degree of severity and the action to be taken.
2. Indications for referral.
3. Selection of antimicrobial treatment at each health care level.
4. Supportive measures to be taken by primary health care workers and families.

Health education of the families about the management of ARI is an integral part of the plan.

4. Action-oriented classification of ARI

ARI comprises a complex group of clinical conditions of different etiology and severity. In the past the ARI syndromes have been classified on the basis of anatomical location, for instance, pneumonia, bronchopneumonia, bronchiolitis and bronchospasm. This classification is of limited practical value, because it is difficult even for physicians to make a reliable diagnosis of the different syndromes. In addition, each syndrome includes a wide range of manifestations for which different courses of action are required. The main decisions of a health worker confronted with a child with ARI should depend not on the diagnosis of pneumonia or bronchiolitis, but on discriminating the degree of severity of the illness. It is more pertinent to his work to adopt a classification based on easily identified signs which are relevant to the two major management decisions: whether or not to prescribe antimicrobials, and whether to treat at home or to refer to a higher level health facility.

The smallest possible number of criteria should be selected for each category of the classification. There is no need to consider all possible clinical findings, many of which have relatively low significance for management decisions.

A classification of ARI into three categories is proposed for all levels of outpatient services and community health workers:

- cases that require hospitalization (severe forms);
- cases that can be managed as outpatients, but for whom treatment with antimicrobials is indicated (moderate forms);
- cases for whom only supportive measures without antimicrobial treatment are indicated (mild forms).

In areas where wheeze is common, a separate category for children with wheeze may be necessary.

Taking into account the different capabilities of health workers and the different facilities available at the various levels of the health system, three plans of increasing complexity are proposed:

- (i) for the community health worker (CHW) who normally has less than six months of formal training;
- (ii) for the first level health facility staffed with workers with six months to two years of formal training;
- (iii) for first referral health facilities usually staffed with technical personnel formally trained for three to six years (including general medical practitioners).

(i) Community health workers

In rural areas of developing countries, health facilities may be minimal or sparse. It may only be possible to substantially reduce child deaths from respiratory infections by making antimicrobial drugs available nearer to people's homes, and round the clock. To expand the ARI programme, community health workers need to be trained to recognise serious infections and manage them appropriately. They also must learn appropriate management and health education for respiratory infections which are not serious.

A manual for community health workers is needed in each country which describes step by step how to examine and manage sick children for each common mode of presentation.

Step 1. Recognition of ARI:

A child with ARI is likely to present with one or more of the following symptoms: blocked or runny nose, sore throat, earache or ear discharge, cough, noisy breathing, or difficult breathing. These symptoms are often accompanied by fever, which may be of particular concern to the child's parents.

Step 2. Severe ARI: Need for referral

Look for signs of severe ARI which would necessitate immediate referral to a higher level of health care (where accessible).

The key signs are:

Cough and chest indrawing.
Cough and not able to drink.

Decision: Give one dose of antimicrobials and send the child to hospital.

If transport to the referral facility is delayed or unavailable, the community health worker should give antimicrobial therapy.

Other signs and symptoms, which indicate severe illness requiring immediate referral, and which are sometimes associated with ARI, include convulsions, dehydration and altered consciousness, and stridor at rest.

Children whose cough persists for more than 30 days should also be referred to the first level health facility for assessment.

Step 3. Moderate ARI: Antimicrobial therapy at home

Decide whether the child has any symptoms for which antimicrobials are indicated, but which are not serious enough to require admission to hospital.

The key sign is:

Cough and Fast breathing (more than 50 per minute) but no chest indrawing.

Decision: Give antimicrobial therapy and supportive measures at home.

Other signs for which antimicrobial therapy and home care are appropriate are: ear pain, ear discharge for less than 2 weeks, sore throat with enlarged, tender neck glands. However, community health workers, may be required to refer these cases to the first level health facility for further assessment and antimicrobial therapy.

Step 4. Mild ARI: Supportive therapy at home

If the child is breathing normally, and if none of the signs which indicate the need for referral or antimicrobial therapy are found, supportive treatment at home is all that is necessary.

The harshness of a cough, and the presence of fever are NOT signs which indicate a need for antimicrobial treatment.

NOTE: A very hot child who does NOT have a respiratory infection may have another serious illness such as malaria. It is important to look for the probable cause and treat or refer as necessary.

Symptoms and signs which community health workers should not treat with antimicrobials include:

Cough, with or without fever, but without fast breathing or chest indrawing.

Stridor which stops when the child is at rest, i.e. is not crying or upset

Sore throat (with or without exudate) with NO enlarged, tender, glands

Ear discharge for more than 2 weeks

Clear or purulent nasal discharge

Blocked nose

Decision: Give supportive treatment. Do NOT give antimicrobial therapy.

The health worker should discuss with the parents how they can give supportive treatment at home.

Health workers should explain to mothers that a cough with normal breathing will get better by itself in one to two weeks. The mother should give the child food and drinks, and bring him back if he becomes worse - for example, if he develops difficult breathing. At the level of the community health worker, it is not necessary to learn to distinguish children with wheeze from other children with ARI.

Table 1 presents a summary of the classification of ARI to be applied by the community health worker.

(ii) First level health facility

The staff of the first level health facility have usually received training for six months to two years. Their functions in the ARI programme will not be exclusively limited to the basic activities of the community health workers, which are aimed at preventing deaths, but will include actions for the reduction of suffering and sequelae. They may learn to recognise and treat wheeze. A child with even mild wheeze may have chest indrawing, but chest indrawing in the presence of wheeze is NOT an indication for treatment in hospital. Most children with wheeze do NOT need antimicrobial treatment. Children with wheeze who are one year old or more should be treated with bronchodilators (such as salbutamol). Children with wheeze who have fast breathing (more than 50 per minute) may

also have pneumonia, and some may need oxygen. They should be referred to hospital. Staff at the first level health facility may also learn to assess children whose cough persists for more than 30 days. Many of these children have asthma. Some have whooping cough, a few may have tuberculosis.

Staff at this level may also be trained to examine the throat and to recognize signs of diphtheria (in areas where this infection is common). They may also be taught to recognize otitis media and to treat it with antimicrobials.

Table 2 presents the classification of ARI to be applied at this level.

(iii) First referral health facility

The first referral health facility has beds for hospitalization and is staffed by a general practitioner or other health worker with three or more years of formal training. The facility should be provided with second line antimicrobials such as benzyl penicillin and chloramphenicol, with diphtheria antitoxin, and with oxygen, for the treatment of very severe cases of ARI.

The intramuscular route will be the method of choice for the administration of antimicrobials, including chloramphenicol. Intravenous administration should be avoided because of the high risk of overhydration, and of sepsis caused by poorly sterilized equipment.

It should be possible to diagnose and treat tuberculosis in a child who is referred because of a cough which continues for more than 30 days, or in a child who does not respond to the antimicrobial therapy within two weeks.

The first referral health facility will have alternative bronchodilators (such as adrenaline) in addition to salbutamol, for the treatment of wheeze.

Referral to a higher health care level is not considered in these guidelines, because the decision should be based on the level of expertise and resources available at the first referral health facility. Professionals will make these decisions on an individual basis.

Table 1

CLASSIFICATION OF ARI TO BE
APPLIED BY THE COMMUNITY HEALTH WORKER
(Less than 6 months' training)

Severe: Referral + antimicrobials

Cough and chest indrawing
Cough and not able to drink.

Also refer if a child: - has convulsions or fits
- sometimes stops breathing
- is difficult to wake up
- has severe dehydration
- has stridor at rest.

Also refer for assessment if a child's cough continues for more than 30 days.

Moderate: Antimicrobials at home (plus supportive measures)

Cough and Fast breathing (more than 50/min), but no chest indrawing

Mild: No antimicrobials, supportive measures only

Cough, with no fast breathing and no chest indrawing
Sore throat
Ear discharge
Blocked or runny nose

Table 2

CLASSIFICATION OF ARI TO BE
APPLIED AT THE FIRST LEVEL HEALTH FACILITY
(six months to two years' training)

Severe: Referral + antimicrobials

Cough and chest indrawing (with no wheeze)
Cough and not able to drink.
Cough and wheeze and fast breathing (more than 50/minute)

Also refer if a child: - has convulsions or fits
- sometimes stops breathing
- is difficult to wake up
- has severe dehydration
- has stridor at rest
- has a grey membrane in the throat
(in areas where diphtheria is common).

Moderate: Antimicrobials at home (plus supportive therapy)

Cough and Fast breathing (over 50/min.) but no chest indrawing
Acute otitis media (ear pain, or inflamed, bulging drum, or ear discharge for less than 2 weeks)
Sore throat with enlarged, tender, neck glands

Mild: No antimicrobial (give supportive treatment)

Cough, with no fast breathing and no chest indrawing
Cough with wheeze with NO fast breathing (give salbutamol if child more than 1 year old)
Stridor that stops when the child is at rest
Red throat (with or without exudate) with NO enlarged, tender, neck glands
Ear discharge for more than 2 weeks
Blocked or runny nose

Cough for more than 30 days

If the child has lost weight and has a persistent fever consider the diagnosis of tuberculosis, and refer
If the child has symptoms of whooping cough, give supportive treatment
Children without signs of TB or whooping cough, may have asthma (whether or not they wheeze). Treat with salbutamol.

Table 3

CLASSIFICATION OF ARI TO BE
APPLIED AT THE FIRST REFERRAL HEALTH FACILITY
(three to six years' training)

Very Severe: Admit and give chloramphenicol⁽¹⁾

Cough or wheeze with cyanosis or not able to drink
Also give oxygen if the child is cyanosed

Severe: Admit and give benzyl penicillin

Cough and chest indrawing (but no wheeze).
Wheeze and fast breathing (over 50 per minute).
Give oxygen if the child has wheeze and a respiratory rate over 70/minute.

Also admit if a child

- has convulsions or fits
- sometimes stops breathing
- is difficult to wake up
- has severe dehydration
- has stridor at rest (croup, epiglottitis, diphtheria, foreign body)
- has an adherent grey membrane in the throat (diphtheria)

Moderate: Antimicrobials at home (plus supportive therapy)

Cough and fast breathing (over 50/min), with no chest indrawing
Acute otitis media (ear pain, or inflamed, bulging drum or ear discharge for less than 2 weeks)
Purulent pharyngitis with large and tender lymph nodes in the neck

Mild: No antimicrobials (give supportive treatment)

Cough, with no fast breathing and no chest indrawing
Cough with wheeze with NO fast breathing (give bronchodilators if child more than 1 year old)
Stridor that stops when the child is at rest
Red throat (with or without exudate) but with no enlarged, tender, neck glands
Ear discharge for more than 2 weeks
Blocked or runny nose

Cough for more than 30 days

Assess child for TB, whooping cough, and asthma
Treat in hospital or at home according to result of assessment

(1) Ampicillin or amoxycillin and gentamicin if chloramphenicol is not available, or benzyl penicillin and gentamycin if child is less than 2 months old.

5. Supportive therapy

Supportive treatment is required in most cases of respiratory infection. Ineffective supportive therapy must be discouraged, since it may distract people from actions necessary to save the child's life. The most useful simple supportive measures are:

- Fluids (such as oral rehydration solution) should be given orally to children who are dehydrated, thirsty, or who also have diarrhoea. If the child is dehydrated and unwilling or unable to drink, fluids can be given intragastrically. Intravenous fluids should be used only for shock. It is important to avoid giving excessive intragastric or intravenous fluids to children with lung infections. They may secrete more antidiuretic hormone than normal, and they easily become overhydrated, which causes pulmonary oedema and contributes to respiratory failure.
- Breastfeeding should be continued. If the child cannot suck, the mother should express her milk and feed it to the child with a cup and spoon. A child who is already taking food should be encouraged to take small, frequent feeds.
- Neutral environmental temperature should be maintained. The child should not be allowed to become too cold or too hot. He should be protected from chilling, but he should not be over-clothed or tightly wrapped up, as this may increase the fever and add to his respiratory difficulties. An infant with pneumonia should be nursed lightly clothed in a warm room.
- Antipyretic drugs can be given if the fever is high. Paracetamol (10 to 15 mg per kilo of body weight per dose) should be given orally every 6 hours if the axillary temperature is over 38.5°C (101°F). Sponging with cold or tepid water should be discouraged, as it is not very effective and increases oxygen consumption and the risk of respiratory failure in children with pneumonia.
- Clearing the nose and upper respiratory passages, to facilitate breathing and to avoid respiratory distress. A moist cloth or soft tissue twisted into a wick should be used frequently to wipe out the secretions. Aspiration with a 10 ml syringe (without needle) or a 10 FG catheter and suction machine at low pressure (not more than 200 mm Hg) may be used at the referral facility.
- For relief of ear pain, paracetamol may be used in a dose of 10-15 mg/Kg weight every six hours.
- Ear discharge should be cleaned away using absorbent cleaning paper (or cloth) twisted into a thin wick and placed in the ear canal. The paper should be removed after one minute, and a new one inserted. The procedure should be repeated several times until the paper or cloth comes out dry, which usually takes about 10-15 minutes. The ear should be cleaned in this way 4 times a day.
- Warm vapour from boiling water can be used at home to humidify the air and soothe the upper airways in cases of stridor. Great care must be taken not to expose the child to excessive heat. The best method is for the child to sit for 10 minutes in the lap of an adult near the vapour from a kettle of boiling water.

However, in children with pneumonia, humidification has been shown not to influence the duration of hospitalization. Cold mist is harmful in bronchiolitis and asthma and should not be used.

Cough suppressants, expectorants, mucolytics, decongestants and anti-histamines should not be given as they are ineffective in lung infections and they are expensive. Local home cough remedies containing ginger, liquorice, mint or herbal tea may be soothing and are cheap. Cough mixtures without expensive ingredients may be used if it is considered necessary to give a mother something for her child. A cheap cough mixture can be made from: 20 ml of concentrated peppermint water and 5 ml of solution of amaranth or other suitable colouring in 2 litres of 1% ammonium chloride. The dose is one teaspoonful or 5 ml, three times a day.

- Bronchodilators may be used at referral and first level health facilities for the treatment of wheezing. For example, salbutamol at a dose of 1 mg three times a day for children who are old enough to walk, and 2 mg three times a day for children of school age (5 years old or more).
- Oxygen should be administered, where available, to any child who is cyanosed, and to children with wheeze and a respiratory rate over 70/minute. It should be administered by intranasal catheter at 1.0 litres/minute (in infants). Special low-flow meters are helpful to avoid waste and the risk of gastric dilatation. The catheter should be inserted one half of the distance between the tip of the nose and the tip of the ear. Humidification of the oxygen is desirable, but care must be taken that the water is changed frequently, and the container and catheter should be regularly cleaned and dried, to reduce the risk of contamination.

6. Antimicrobial treatment

Lung aspirate studies in untreated children with pneumonia in developing countries have shown that S. pneumoniae and H. influenzae are the most common pathogens. They are also the commonest pathogens in middle ear infections. Staphylococcus aureus causes a significant proportion of cases of pneumonia when the children studied have already had antimicrobial treatment. Antimicrobials used to treat severe and moderate forms of ARI in children under 5 years of age should therefore be active against S. pneumoniae and H. influenzae.

First line treatment

Where intramuscular injections can be given, procaine penicillin is the best choice for the treatment of moderate forms of ARI at any level of primary health care services.

Penicillin serum levels with procaine penicillin administered once a day are effective against S. pneumoniae (even against strains with reduced sensitivity to penicillin, MIC 0.1 mcg/ml) and H. influenzae (MIC usually 0.5 - 1 mcg/ml). Conversely, benzathine penicillin serum levels are so low that they are unlikely to be effective against H. influenzae or against S. pneumoniae with reduced sensitivity to penicillin.

When intramuscular injections cannot be given, an oral antimicrobial must be used. Cotrimoxazole is one suitable drug because it is effective against S. pneumoniae, H. influenzae, and S. aureus: it is cheap; it need only be given twice a day; and it is well tolerated. Cotrimoxazole is also active against chlamydia and pneumocystis, which may be important causes of pneumonia in infants. Side effects are uncommon with Cotrimoxazole, but may be serious (agranulocytosis, Stevens-Johnson syndrome).

Amoxycillin (or ampicillin) is another suitable oral antimicrobial. It is more expensive than cotrimoxazole. It is inactive against S. aureus, and the emergence of resistant strains of H. influenzae is increasing. Amoxycillin is better absorbed than ampicillin and gastrointestinal side effects are less common. Because of the lower daily dose of amoxycillin, the cost of the two drugs is similar.

Oral phenoxymethyl-penicillin (penicillin V) has little effect on H. influenzae and it is not recommended for the ARI programme.

Second Line Antimicrobials

For severe cases of lung infection (intercostal indrawing without cyanosis) benzyl penicillin, given intramuscularly every six hours, is recommended. It is active against both S. pneumoniae and most strains of H. influenzae. Although it is widely thought that H. influenzae is resistant to benzyl penicillin, it is actually almost as sensitive to benzyl penicillin as it is to ampicillin.

For very severe cases (that is, when cyanosis is present or the child is unable to drink), intramuscular chloramphenicol is recommended. It is very cheap and effective against H. influenzae, S. aureus and most strains of S. pneumoniae. Contrary to widely held opinion, chloramphenicol is as effective when given intramuscularly, as it is when given intravenously. Chloramphenicol may cause agranulocytosis, but this is a rare toxic effect and should be considered as an acceptable risk if the drug is used only in very severe cases. Chloramphenicol should not be used for ARI in children below the age of 2 months. For these children, benzyl penicillin plus an aminoglycoside (gentamicin) should be used when they have severe or very severe lung infection (neonatal pneumonia).

If staphylococcal pneumonia is suspected, it should be treated with a penicillinase resistant semisynthetic penicillin (e.g. cloxacillin) in combination with gentamicin.

Annex 2 and Annex 3 present a summary of the efficacy, toxicity, route of administration and dosage of the recommended antimicrobials.

7. Health education in acute respiratory infections

Effective health education can only be provided on the basis of an accurate understanding of prevailing knowledge, beliefs and practices of a community, and these vary widely.

Experienced people in many communities know that "difficult breathing" (fast breathing, chest indrawing, or both) is a sign of serious illness in a child with a cough. The danger of letting a child become too cold is widely recognized; and many communities have soothing and harmless cough remedies. Health workers should appreciate, use, and build upon this knowledge.

Harmful practices are also widespread. For example, food and drink may be withheld from a child with a cough; the child may be dangerously overwrapped to prevent chilling; the nostrils may be lubricated with oil; and treatment may be denied to children with measles, even though they have respiratory complications. Some parents prefer and expect injectable medicines for every cough that their child has - especially if the child has a fever - even though such treatment is not indicated. Other parents delay bringing their child for treatment, even if the illness is serious. Health workers should understand these practices and beliefs, discuss them with people, and try to discourage them.

Health workers should discuss with community leaders the services being offered. They should ask if cough is a problem in the community, and explain how the services may help with this problem. As they get to know the people, health workers can begin to introduce the topics that seem important, for example:

1. Most children with coughs do not need antibiotics.
2. Children with cough and difficult breathing do need treatment from a health worker quickly.
3. Fast breathing and chest indrawing are signs of difficult breathing.
4. A child with a cough should be given food and drink.
5. A child with a cough should be kept warm but not overwrapped.
6. Immunizing children can prevent some serious kinds of cough.

People are most likely to accept an idea when they are threatened by a disease or disability. "Come in to help - stay on to educate", is a good principle for the health educator. Advice against the cherished harmful beliefs of a family should be avoided during the first contact. However, once having established his credentials by being helpful during an illness, the primary health care worker can educate his community more readily. Special campaigns may be mounted just before the times of peak incidence of ARI.

Every health worker should use every encounter for the purpose of health education. Influential members of the community act as multipliers. Community involvement is essential. It starts with awareness by the community; followed by their active participation. People have great faith in modern medicine; this should be utilized for their benefit. Any patient who seeks medical aid at a late stage, or one whose compliance is inadequate, should receive special attention from the health worker. A spirit of service, and adequate supplies, are essential.

The population can be made aware of the risks of special groups. Health education must also attempt to strengthen the ability of practitioners of other systems of medicine to help patients more, or at least to reduce their propensity for harm.

Health education material is needed in which the local cultural flavour is presented in an interesting fashion. All possible media should be explored. Every health education message should be carefully screened for correctness from the scientific angle, acceptability from the cultural viewpoint and practicality.

Flipcharts may be a suitable teaching aid for the primary health care worker. Films, newspapers and TV are powerful media at the national level. A filler-in between two interesting programmes could receive attention, but the message, to be remembered, must be presented in an appealing style. The printed word is highly respected as the "official" version. Practical demonstrations can be arranged for small groups.

8. Monitoring and evaluation

The success of a national ARI programme will be judged by whether it produces a measurable impact on mortality and morbidity from respiratory illness, particularly in rural areas.

All programmes should take account of local needs and circumstances. No programme should be implemented without provision for monitoring and evaluation to detect flaws in the programme design, weaknesses in its implementation and to allow modification of the programme in response to changing circumstances. To do this requires a reliable information system capable of:

- (a) Establishing adequate baseline information on the nature of the local problem and resources available to meet it;
- (b) monitoring the process of control activities, and changes in disease patterns or in resources;
- (c) measuring the outcome of these activities.

The system adopted need not and should not be burdensome if it is incorporated into the basic training of health workers and their supervisors, so that it becomes an integral part of routine activities.

The information required to plan, monitor and evaluate improved case management at primary care and referral levels will include clinical, laboratory and epidemiological data, and routinely collected data on the performance of health workers at all levels.

8.1 Baseline information

In order to devise a standard management plan appropriate to local needs it is necessary to obtain data on:

- (a) ARI mortality and morbidity in children under five, including:
 - estimates of completeness and accuracy of mortality records;
 - the common clinical forms of ARI, particularly those with high lethality;
 - the spectrum of different respiratory pathogens and their antibiotic resistance patterns;
 - the prevalence of high risk groups, such as malnourished children, neonates and low birth weight infants;
- (b) Health service availability and quality:
 - access to primary and secondary levels of care;
 - resources available at each level, e.g. staff, beds, drugs;
 - current management practices and competence of health personnel at each level;
 - the quality of existing data sources;
- (c) Community characteristics, including:
 - current knowledge, attitudes and practices related to the management of a child with ARI within the family;
 - utilization of existing health care services.

Much of this information may already be available, but where it is not, sample studies may need to be undertaken. These need not be on a large scale, but it is essential that the samples studied are carefully selected and properly represent the target populations. For example, information on health status and health services, on the spectrum of bacterial pathogens and their antibiotic resistance patterns should be obtained from rural as well as urban populations, and from primary care facilities as well as hospitals.

8.2 Monitoring the health care process, resources and disease patterns

After the programme is introduced, the process of implementation should be monitored to ensure that it is applied as intended.

It is necessary, therefore, to monitor:

- (a) the knowledge and performance of health workers at all levels, for example their ability to:
 - discriminate accurately between mild, moderate and severe ARI, to recognize wheeze (if appropriate) and to select appropriate management;
 - teach mothers to recognize severe ARI, to use health services appropriately, to provide supportive care and administer prescribed treatments;
 - maintain appropriate records and transmit the required data to the monitoring centre;
- (b) The availability and adequacy of health service resources, for example, provision of: staff, beds, buildings, equipment, location of primary and referral centres;

(c) Disease patterns, and other factors which may influence the specific management recommendations, for example:

- changes in the clinical forms of ARI, such as the emergence of diphtheria, or the occurrence of measles or whooping cough epidemics;
- changes in the species of prevalent organisms and their antibiotic sensitivities by laboratory examination of specimens collected from structured samples of patients with ARI*, taking account of location (urban/rural, hospital/clinic), clinical type of illness (severe/mild), patient characteristics (age, risk group, etc.).

*N.B. This activity should not be equated with a diagnostic microbiological service. Its purpose is epidemiological and, therefore, it need not be continuous but must be structured to be representative and relevant for devising and adjusting management plans.

8.3 Programme evaluation

The most important outcome of an ARI programme should be an early reduction in childhood mortality. It is essential to know whether the programme is proving effective in this respect, and whether it affects morbidity rates. These outcomes, however, should be preceded by intermediate changes.

(a) Intermediate changes include:

- increased knowledge and changes in attitudes and in behaviour related to ARI among the mothers and families of young children;
- more appropriate utilization of health services by the community;
- better compliance with referral recommendations (reasons for non-compliance whether due to rejection by hospital or rejection by mother must be determined).
- more rational use of antimicrobials.

(b) Outcomes

The essential outcomes to be measured are changes in mortality and morbidity rates.

Mortality rates should be recorded for:

- diseases preventable by immunization (measles, whooping cough, diphtheria and TB);
- other forms of ARI by clinical category.

8.4 Information systems

The system to be used will vary between countries depending on many factors, e.g. the organization of health services. It is, therefore, not possible to prescribe a uniform system for general use.

The essential components of a system for any country, however, should include specific instructions relating to:

- Record compilers
- Design of records
- Monitoring the quality and completeness of recording
- Collection, processing and analysis of data
- Interpretation of information and its dissemination to users (central and peripheral)

The core data required for monitoring and evaluation as described above will include data on health service resources and delivery, and the health status of the target population. It is also necessary to specify the means of collection.

Examples are as follows:

Mortality

- (a) Routine registration, (which is often difficult and erroneous in developing countries).
- (b) Sample surveys of defined populations at regular intervals.
- (c) Fatality related to known case denominators (least satisfactory).

Morbidity

- (a) Routine recording by primary health care workers of cases seen, cases treated and cases referred, treatments given and outcomes.
- (b) Sample surveys of the target population, based on 7 to 14-day recall.

Specimens for microbiological examination

- (a) Routine samples of clinical cases
- (b) Special surveys (e.g. annual or in epidemics)

Performance of health workers

- (a) Regular checks by supervisors
- (b) Intermittent sample surveys

Services and resources

- (a) Regular accounting of available and utilized resources by supervisors
- (b) Intermittent sample surveys

Evaluation procedures such as these will provide, over a period of time, an increasingly valuable index of the effectiveness of the programme, as well as prompting necessary adjustments to meet changing conditions and circumstances.

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OUTPATIENT ANTIMICROBIALS

<u>SENSITIVITIES</u>	<u>PROCAINE PENICILLIN</u>	<u>AMPICILLIN</u>	<u>COTRIMOXAZOLE</u>
<u>H. influenzae</u>	Good (but 0-25% resistance)	Good (but 0-25% resistance)	Very good
<u>S. pneumoniae</u>	Very good (mild resistance in some countries)	Very good (mild resistance in some countries)	Very good (mild resistance in some countries)
<u>S. aureus</u>	Poor	Poor	Good
<u>Gp A streptococcus</u>	Very good	Very good	Poor
<u>Chlamydia, pneumocystis</u>	Nil	Nil	Good
<u>TOXICITY</u>			
Mild, but common	0.2% acute but self-limiting psychosis, or collapse	Diarrhoea, rash	Nil
Severe, but rare	Fatal anaphylaxis 1/250 000	Fatal anaphylaxis less than 1/250 000	Dose related megaloblastic anaemia. Bone marrow aplasia (may be fatal). Stevens Johnson syndrome (may be fatal).
<u>ADMINISTRATION</u>			
Route	Intramuscular	Oral	Oral
Dose	50 000u/kg once a day	25 mg/kg 6 hourly	TMP 4 mg/kg 12 hourly -
5 days, 10 kg child	US \$0.20	US \$0.40	US \$0.08
<u>COMMENTS</u>	Usually effective, long acting, side effects rare, narrow spectrum (less risk of R factor resistance); but intramuscular administration not always possible.	Usually effective, serious toxicity very rare; but short acting, mild side effects common and moderate spectrum increases risk of R factor resistance. <u>Amoxicillin</u> preferable if cost is similar (with dose 15 mg/kg 8 hourly)	Effective, cheap and fairly long acting; but serious toxicity occurs (rare) and broad spectrum increases risk of R factor resistance.

INPATIENT ANTIMICROBIALS

CLOXACILLIN

CHLORAMPHENICOL

BENZYL PENICILLIN

SENSITIVITIES

	<u>BENZYL PENICILLIN</u>	<u>CHLORAMPHENICOL</u>	<u>CLOXACILLIN</u>
<u>H. influenzae</u>	Good (but 0-25% resistance)	Very good	Poor
<u>S. pneumoniae</u>	Very good (mild resistance in some countries)	Good	Fair
<u>S. aureus</u>	Poor	Fairly good	Good
Gp A streptococcus	Very good	Good	Good
Chlamydia, pneumocystis	Nil	Very poor	Nil

TOXICITY

Mild, but common	Nil	Rash	Rash
Severe, but rare	Fatal anaphylaxis 1/250 000	Reversible: grey syndrome, dose dependent marrow aplasia. Not reversible: fatal marrow aplasia 1/20 000	Fatal anaphylaxis 1/250 000

ADMINISTRATION

	<u>BENZYL PENICILLIN</u>	<u>CHLORAMPHENICOL</u>	<u>CLOXACILLIN</u>
Route	Intramuscular (or intravenous)	Intramuscular (or IV), then oral	Intramuscular (or IV), then oral
Dose	50 000u/kg 6 hourly	25 mg/kg 6 hourly	50 mg/kg 6 hourly
5 days, 10 kg child	US \$ 0.18	US \$1.00	US \$6.00

COMMENTS

	Usually effective, side effects rare, cheap.	Effective. Side effects are rare but 1/20 000 fatal, so should only be used for severe sepsis. Fairly cheap.	Expensive. Only indicated for staphylococcal pneumonia.
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