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APPROPRIATE TECHNOLOGY FOR MATERNAL AND NEWBORN CARE:

Progress Report on Activities of WHO and
WHO Collaborating Institutions

Maternal and Child Health Unit
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PROGRESS REPORT ON ACTIVITIES OF WHO AND
 WHO COLLABORATING INSTITUTIONS ON
 APPROPRIATE TECHNOLOGY FOR MATERNAL AND NEWBORN CARE*

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* Also known as pregnancy and perinatal care

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1. INTRODUCTION

The Task Force on appropriate technology for maternal and newborn care was formed to enhance the principles of primary health care by the use of appropriate technology in the improvement of the health of mothers and children. Primary health care (PHC), in the context of Health for All by the Year 2000, means the provision of means and ways to PHC workers to improve the health of the communities and families, given their current resources. Appropriate health technologies are essential tools in the approach for achieving health for all.

The specific targets in support of the evolution and adaptation of technologies and approaches aimed at protecting and promoting the health of pregnant women and newborn babies, are outlined in the 7th General Programme of Work 1984-1989¹.

The activities will aim at fostering national and international action so that by 1989: (1) All countries will have strengthened or expanded programmes for care during pregnancy and childbirth with the aim of ensuring that at least two thirds of births are attended by trained health workers, trained traditional birth attendants; (2) WHO will have developed and adapted appropriate health technologies applicable to at least four major world wide health problems specific to maternal and child health, such as complications of childbirth, hypertensive disorders of pregnancy, low birthweight, and perinatal problems related to infection and nutrition. Particular emphasis will be laid on technologies for care in the home and at the immediate referral level.

The approaches to achieve these targets include increased emphasis on collaboration with countries in the assessment, adaptation, development and field testing of appropriate technologies to cope with problems specific to pregnancy, delivery and the neonatal period. Special attention will be given to (1) the prevention and treatment of the complications of pregnancy, especially those that may give rise to high

perinatal mortality and morbidity; (2) the prevention, control and treatment of perinatal infections; (3) prevention of complications during delivery through labour monitoring; (4) prevention of postpartum haemorrhage; (5) reduction of low birthweight rates; (6) care of the neonate by appropriate technology for temperature control and resuscitation of the newborn; (7) promotion of cleanliness of delivery: clean delivery site, clean hands and clean cutting of the umbilical cord.

The appropriate health technologies should be socially acceptable to the community using them, simple to use, efficient, easy to maintain and affordable, incorporating principles of self-reliance, scientific soundness and social relevance.

The Task Force has been established with the aim to help develop, adapt and promote the appropriate technologies for the well-being of the mother during pregnancy and for the birth process concerning both the mother and newborn baby. To do so, it has set up a Steering Committee which comprises of a multi-disciplinary group of experts in obstetrics, gynaecology, midwifery, paediatrics, bio-engineering, anthropology, epidemiology, statistics, sociology, etc., to recommend and advise WHO on the scientific, technical, promotional and managerial aspects of the Task Force. The Task Force also includes eight WHO Collaborating Centres which are active in various research projects, training of personnel, implementation and strengthening of programmes in the area of pregnancy and perinatal care. In addition to the WHO Collaborating Centres and the Steering Committee, the Task Force collaborates with other UN Agencies, Non-governmental Organization and Investigating Institutes working on issues surrounding pregnancy and perinatal care at the PHC level. Working Group meetings are also held for in-depth review and recommendation of necessary actions to be taken in the various priority areas of the Task Force.

The principles which the Task Force uses in the evaluation of appropriate technology involve the following stages in the order shown:

¹ Seventh General Programme of Work covering the period 1984-1989, World Health Organization, Geneva, 1982 ("Health for All" Series, No 8), Section 9.1 on Maternal and Child Health, including Family Planning.

1. Identification
2. Research and Development
3. Synthesis of information
4. Dissemination of information and implementation
5. Iterative re-evaluation process.

1.1 Identification

Technologies could be identified according to the following three major groups: a) technologies which are already in use should be evaluated for their appropriateness. For this type of evaluation, research and development may be required for some technologies whereas for others, only synthesis of available information is required. b) Some technologies need to be modified or adjusted to become appropriate. c) Innovative technologies are new methods and techniques which may be appropriate but may require creative efforts if they were to be introduced without disturbing the social and cultural balance too much.

1.2 Research and development

Research involves the uncovering of new principles and demands a large range of personnel and equipment facilities. Development brings together existing knowledge to make the principles work in practice.

1.3 Synthesis of information

It is important to undertake the synthesis of all information from research and development efforts so as to determine the appropriateness of a technology. The synthesis of the appropriate technologies could then be listed in the form of product specification sheets. They could be useful to health workers, policy makers and programme managers in countries.

1.4 Dissemination of information and implementation

This is essential in ensuring that the correct messages and information reach the communities who can then incorporate this information into their needs.

1.5 Iterative re-evaluation process

This involves the feed-back evaluation following implementation of a technology, so that necessary adjustments could be made for optimal outcomes.

2. PRENATAL CARE

2.1 The use of the gravidogram or symphysis-fundal height measurements for fetal growth monitoring.

Antenatal or pregnancy care for monitoring fetal growth and for surveillance of the health of the pregnant woman is essential in ensuring a safe birth. The gravidogram is a simple system for monitoring fetal growth and maternal health.

The use of the gravidogram or symphysis-fundal height measurements to estimate fetal growth during pregnancy has been proposed as an alternative to the use of ultrasound. This method has been advocated by numerous authors in the medical literature. WHO-supported studies were carried out in Viet Nam and Ethiopia to determine whether country-specific gravidograms should be constructed for individual populations, because of different cultural and socioeconomic characteristics. The study in Addis Ababa, Ethiopia, did not follow the protocol and data from Viet Nam was insufficient for analysis. The gravidogram and accepted standard curve is used in Shanghai and Beijing.

A literature review on the gravidogram is presently being done by the Task Force. Guidelines written for PHC workers interested in constructing a normogram for symphysis-fundal height measurements will be prepared.

It has been suggested that the fundal height and abdominal girth measured during early labour could give an indication of birthweight. WHO is starting a study to obtain such information in order to find the correlation between the fundal height and abdominal girth measurements of women taken during early labour and birthweight in different population groups. The study will also attempt to find out the critical cut-off levels of fundal height and abdominal girth below which the risk of delivering high risk low birthweight neonates increases. If this study shows a good correlation between fundal height abdominal girth measurements during early labour and birthweight, cut-off levels can be determined. The identification of pregnant women likely to deliver low birthweight infants could be done when they are still in the early stage of labour.

They could then be transported to hospitals or health care facilities where intra partum and neonatal care could be given to low birthweight infants. This would certainly contribute to a reduction of perinatal mortality rates, specially in rural areas of developing countries where at present, there are no facilities for the identification of individual women at risk of delivering low birthweight infants.

The cut-off levels will certainly have to be country, region or culture-specific because the difference of maternal height, weight, body build and fat fold thickness due to cultural and ethnic differences, and are likely to result in marked variations in fundal height and abdominal girth.

Only a simple technology will be required for taking the necessary measurements: a colour-coded tape for use by TBAs so that they could recognize the women who are at increased risk of giving birth to a low birthweight infant.

2.2 The use of a simple haemoglobin screening device for the detection of anaemic pregnant women

A method for measuring haemoglobin, inexpensively, simply and accurately has been the topic of discussion in meetings on appropriate technology for pregnancy and perinatal care. Although several methods already exist, some were felt to be inaccurate for practical use (for example, Talqvist), some necessitated solutions and reagents (for example, copper sulfate), and others too expensive for primary health care use (for example, Spencer and Lovibond).

A simple hand-held model requiring no reagent and using undiluted blood, developed by the Caribbean Nutrition and Food Institute (CNFI) of Jamaica, was made known to WHO. While this model was relatively simple to use, its main disadvantages rest with the labour-intensive glass grinding polishing task. In addition, using standard grey filters, observers were not able to satisfactorily distinguish between different blood samples. The model caught the interest of the German Agency for Technical Cooperation (GTZ) who decided to finance the prototype development of a version of the model, much improved by a German company. Incidentally, the physical principles of this model using undiluted blood and different filters is not original and has been registered with U.S. patent office for many

years. What was original and unique was that the CNFI model could be relatively easily made with simple materials. The model improved by the German company would attempt to overcome two obstacles: (1) plastic injection moulding of the blood chamber which would reduce the price of each instrument enormously and overcome the issue of glass-grinding; (2) the use of grey filters which would allow the observer to easily distinguish between 2 grams of haemoglobin. The instrument is under development and progress has been made in the development of a plastic blood chamber; and appropriate filters are presently being tested.

2.3 Hypertensive Disorders of Pregnancy (HDP)

The hypertensive disorders of pregnancy represent a major health problem to pregnant women. Because of the importance of these disorders, the Task Force has conducted an interregional collaborative study on HDP so as to understand better some of the factors contributing to increased maternal and perinatal mortality throughout the world. Analysis of this study is being undertaken and will be completed soon.

A Study Group meeting was also held on this subject in September 1985, and it brought together experts in the field of HDP. A WHO Technical Report Series publication is being finalized and some of the topics covered are:

- definition and classification of HDP;
- incidence of HDP;
- pre-disposing factors of HDP;
- patho-physiological aspects of HDP;
- diagnostic tests;
- complications of HDP;
- fetal and neonatal complications in HDP;
- differential diagnosis of HDP;
- management of HDP : early case detection and primary health care;
- treatment and management of HDP in secondary and tertiary health care centres.

3. POSITION DURING LABOUR AND DELIVERY

3.1 Position and mobility during labour

The question of whether the labouring woman should be allowed to move about freely

during the first stage of labour and whether she should be allowed to assume her method of choice during the expulsion contractions of the second stage of labour was taken up by the Task Force.

Studies have been carried out and have been published in the literature to show the effects of different positions during labour and delivery. In most "traditional societies", the common practice is for women to squat, kneel or stand or be in a semi-inclined position and rarely in the lithotomy position during labour and delivery. There is physiological evidence that freedom of mobility and position other than the lithotomy one during labour and delivery have beneficial effects on the maternal and fetal outcome. However, there are not enough clinical trials to show this. A randomized controlled trial is currently being undertaken in Bristol, United Kingdom, to determine, in terms of maternal and fetal outcome, the better of the two methods, i.e. active versus physiological management of labour. The maternal and fetal outcome will be measured in terms of the amount of blood loss; delivery of the placenta; adverse side effects for the mother; fetomaternal transfusion; breastfeeding status at hospital discharge/or 10 days postpartum; condition of the baby.

The women assigned to the active management of labour (i.e. current practice) are given an intramuscular injection of syntometrine immediately after delivery of the anterior shoulder; clamping of the cord 30 seconds after the delivery of the baby and immediate delivery of the placenta by controlled cord traction.

The women allocated to the attempt of the physiological management of the third stage of labour will be given no prophylactic oxytocic; no cord clamping; cord cut after delivery of the placenta, a few minutes after pulsation has ceased; no controlled cord traction, (after delivery of the baby) women will be encouraged to adopt a position in which the placenta can fall aided by gravity, e.g. standing, kneeling, squatting or on all fours.

3.2 Continuous human support during labour and delivery

Another human resource technology that has proved beneficial to maternal and fetal outcome during labour and delivery is the continuous support of a lay companion to the

labouring woman. Randomized controlled studies in Guatemala on continuous maternal support during labour have demonstrated the striking effects of reducing the length of labour (14 to 8 hours) and incidence of perinatal problems (C-section 17.2% to 6.2%, pitocin 13% to 2%). A similar study has also been undertaken in the United States to investigate the perinatal effects of human support during labour. A few collaborating centres have expressed interest in such a study. A protocol is available for this study.

3.3 The partogram - a chart for monitoring labour

Another useful tool in helping to ensure safe births is a "labour" chart, which is also known as a "partogram". The use of the partogram has been widely accepted in most Western Institutes where births take place. There is some confusion of terminology but in general, a "partogram" is defined as a graph depicting the progress of labour using cervical dilatation on the Y-axis and time on the X-axis. This graph is then compared with a "standard curve" to determine whether labour is progressing normally or not. Opposition to this method comes from some users who find it a mechanistic, impersonal and institutional approach to childbirth. Proponents argue that the partogram could predict adverse pregnancy outcomes timely for appropriate interventions, and a good method for the primary health care level where vaginal examinations are acceptable.

On the other hand, vaginal examinations when performed in unclean conditions may lead to vaginal and cervical infections, increasing fetal and maternal morbidity. A modified version of the partogram for PHC workers still needs to be investigated; one that requires a minimum number of vaginal examinations (for example, with the Bird's method only three vaginal examinations are necessary). Another possibility is to provide primary health care workers with examples of several charts showing the range from normal to abnormal progression of labour and train them to recognize the situation with the curves so that the right option is taken accordingly. One aspect of the partogram involves the measurement of time. Several suggestions have been made to investigate simple time measuring devices including those found in antiquity (sand, water, candle clocks) and the estimates of time by movement of sun, stars, moon.

The whole question of the partogram requires review. Some experts in perinatal medicine suggest that a randomized controlled trial be done to determine the effectiveness of using a partogram versus a less invasive method of following labour. This study may be worth doing in hospitals where vaginal examinations are NOT routinely performed to follow the progress of labour (for example, Saudi Arabia).

4. CARE OF DELIVERING NEWBORN BABIES

The Task Force has determined several areas of priority to achieve the set targets, through the use of appropriate technologies for childbirth at the home and immediate referral level, and support to programmes to ensure safe births conducted by traditional birth attendants.

In the developing countries, more births occur outside than inside health facilities. Deliveries occurring outside health facilities are usually conducted by trained health workers, traditional birth attendants with varying degrees of training, and family members who are rarely trained. The last group of birth attendants may attend only a few deliveries a year or in their whole lifetime, and this group probably constitutes the majority of birth attendants conducting births outside formal health facilities.

For this group of birth attendants (family members) who have neither training nor extensive experience, the Task Force advocates the following goals in order to ensure a safe delivery and promote the health of mothers and infants:

1. Three cleans: clean hands for the birth attendant; clean cutting and care of the umbilical cord; and clean surface for the delivery site.
2. Immediately after birth, the newborn baby should be dried, kept warm and put to the mother's breast. Weighing the baby or taking other anthropometric measurements for identifying "at risk" babies; registration of the newborn and referral for follow-up care to the relevant community-based programme should be promoted.

3. Use of a locally assembled delivery kit to provide the three cleans, warmth to the newborn baby, and a recording system to be distributed to pregnant women by health workers.

In order to implement the three goals, guidelines accompanied with extensive drawings and illustrations, will be provided to programme managers of MCH/FP programmes on "how to" prepare, make and use the essential elements of the locally assembled delivery kit, according to the workload of the birth attendants, and according to local availability of materials. Three levels of birth attendants are categorized: (1) those conducting less than 5 deliveries a year; (2) those conducting 5 to 40 deliveries a year; and (3) those conducting more than 40 deliveries a year. The locally assembled kit will be most relevant to the first category of TBAs.

4.1 Clean hands of the birth attendant

For promoting clean hands of the birth attendant, the guidelines will provide ideas on how water should be stored in a can or jug in places where water is not readily available. A recipe for making soap locally, will be given in the guidelines; suggestions for cutting soap bought from local shops into smaller bars are also included, together with instructions to TBAs to wash their hands every time they examine the pregnant woman. Instructions on how to prepare small pieces of wood sticks for cleaning under the finger nails and how to use them are provided.

4.2 Clean cutting of the umbilical cord

For the clean cutting and care of the umbilical cord, detailed instructions on how to prepare the cotton tapes giving dimensions required; where to tie the tapes on the cord; and how to seal the clean tapes in plastic bags, will be provided in the guidelines. The use of half a razor blade, the various means for cutting a full blade and clear instructions accompanied by drawings on how and when to cut the umbilical cord will be given.

4.3 Clean surface for delivery

For a clean surface of the delivery site, various possibilities of material that can be used for this purpose, are suggested together with instructions for their clean preparation: plastic or meal sacks; old cloth or blanket; rubber sheets, newspapers.

4.4 Drying and warming the newborn baby

Just after the delivery of the newborn baby, it should be dried with an absorbent towel and wrapped in another clean towel which has been previously washed and dried and kept in a clean place. An ordinary hat is recommended for the well baby and a "three-layered" hat made of alternate cotton material and gauze for babies requiring extra warmth (See section 5 on "Thermal control of newborn babies").

4.5 Weighing, measuring, recording and referring the newborn baby

Birthweight is one of the indicators of "at risk" newborns. Bearing in mind that it is not always possible to weigh every single newborn because scales are not always available at homes, or even communities, for cost and transportability reasons, and because they require a minimum amount of training for their use, other methods giving an indication of birthweight have been sought (see section 6 on "Weighing newborn babies - evaluation of scales and other measuring/recording techniques for growth monitoring"). Studies carried out in approximately 23 centres show that mid arm and/or chest circumference of newborn babies could provide one of several indications required to suggest whether the newborn has to be referred. Tapes for measuring mid-arm and chest circumference of newborns have been tested, and final prototypes will be made of plasticized paper, colour-coded showing three situations which will correspond to newborns with: (1) above 2500 grams; (2) 2000-2500 grams; (3) under 2000 grams birthweight. For the two latter situations, the baby should be referred to a higher level of care. Symbols for showing the sex of baby, alive or dead and other vital data on the birth of the baby can be recorded using colours and symbols.

The implementation of these principles can only work if a good supply and supervisory system exists or is built to ensure the upward and downward flow of material, information and support for referral.

5. THERMAL CONTROL OF THE NEWBORN BABY

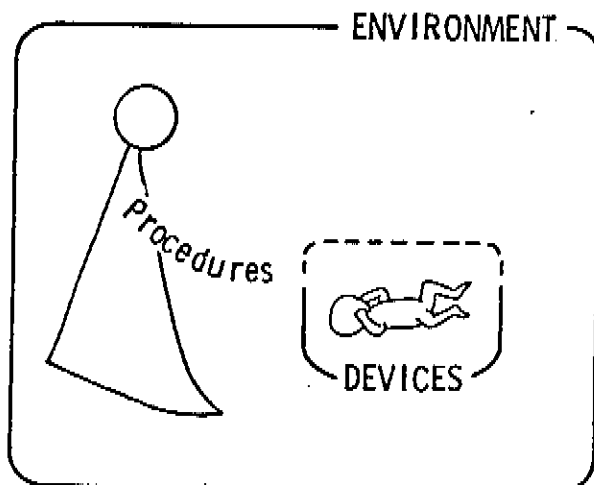
By far, this issue has received both the greatest attention and support by the Task Force on appropriate technology for

pregnancy and perinatal care. In fact, the first meeting on appropriate technology held in Geneva, February 1980 was devoted entirely to this subject.

Thermal control during the neonatal period is considered by some to be an enormous, if not the most important, problem encountered by the infant during the first month of life.

One aspect of the problem deals with the mis-use of incubators in different countries. Since it is felt that this is a real issue, the Task Force recommended that WHO support studies/surveys to evaluate the present status of incubators in different countries (situation analysis). In order to accomplish this task, the Bio-engineering Unit, John Radcliffe Hospital, Oxford, United Kingdom, was given financial support to help with this effort.

The approach being taken by WHO after several deliberations in Working Groups, is a holistic and integrated one. We have understood the importance of the interaction between practices and devices within the environment. This interaction should be investigated. Since the environmental factors vary, the thermal control strategies can be affected accordingly. The Bio-Engineering Unit in Oxford is thus investigating the entire complex of technical, environmental and cultural factors related to the thermal control of the newborn.



Thermal Control of the Newborn Baby

The study itself is being undertaken in two phases. In phase one all the medical literature devoted to thermal control of newborns has been collected and the gathering of information on incubators has started. An instrument package comprising of a data collector computer-assisted data logger (with probes for continuous measurement of temperature, humidity and air velocity) has been assembled by the Bio-Engineering Unit for use in the study. A study protocol has been written for individual country investigations.

The instrumentation package can record data from the room and ambient conditions, and data from the baby and measurements within the incubator.

Variables that can be recorded electronically are:

Environment

- Temperature
- average
- wall
- outside air
- seasonal

Relative humidity
Noise level
Air velocity
Power supply

Baby

- Temperature
- core
- skin

Evaporative water loss?
Water consumption?

Incubator

- Temperature
- operational
- inner wall

Relative humidity
Noise level?
Air velocity
Power supply

Variables that can be observed and recorded by the investigator are:

Environment

- Physical layout
- description
- photographs

Temperature
- seasonal

Baby

- Biological data
- weight
- gestational age
- clinical status
- diagnosis

Procedures/events*
- feeding
- weighing
- changing
- medication
- resuscitation
- and others

Incubator

- Physical layout
- description
- photographs

Temperature
- indicated
- control preset

* the predetermined events to be observed will be electronically coded.

The situational analysis of thermal control devices for newborns will be made possible by the use of the instrumentation package capable of measuring, displaying, storing and printing up to 16 channels of data. Transducers for temperature, humidity and air velocity are available as standard; noise level and transepidermal water loss may be measured with additional transducers and circuitry.

Bench tests of the instrumentation confirmed that precision and accuracy of the system are adequate for the situational analysis studies envisaged. Clinical tests in the Special Care Baby Unit in Oxford demonstrated the clinical applicability of the instrumentation. The system functioned adequately during trials in China, Thailand and Nepal but the mechanical package needs to be made more robust for transport.

The thermal control of newborns study primarily aims at collecting data (situation analysis) on three chief parameters - the environment to which the newborn is subjected (delivery room); any equipment used to keep babies warm (incubators, swaddlers, cot nursed, etc.), the routine practices (nursing, drying, wrapping and personnel practices, etc). The results of this study will then be used to write guidelines (for PHC workers, hospital workers, midwives) on what factors need attention for ensuring a thermal neutral environment. In addition, the guidelines will contain information on the proper use of thermal equipment (incubators, radiant heaters, etc). Initial phase of studies are currently being carried out in Nepal.

Other experimental techniques have been supported by WHO in terms of "seed money" support or technical support. Two of these techniques are most advanced and have undergone bench testings and a few field trials: the water-filled thermal mattress has been developed by Dr R. Tunell of the Huddinge Hospital, Stockholm, Sweden and the transport thermal control device developed by Dr P. Lemburg in Dusseldorf, Germany. Please refer to Document WHO/MCH/86.8 for a more complete report on the thermal control of newborn babies.

6. WEIGHING NEWBORN BABIES AND EVALUATION OF SCALES AND OTHER MEASURING/RECORDING TECHNIQUES FOR GROWTH MONITORING

Birthweight is one of several indicators that help the birth attendants to detect newborn babies that require special care. Existing technologies, i.e. the various existing types of scales, do not always meet programme needs in terms of personnel using them, location of use, load being weighed, and scale manufacturing specifications.

The Task Force has set up a working group to evaluate scales and related techniques for weighing not only newborn babies but also infants for growth monitoring purposes and pregnant women for fetal growth, according to the above-mentioned criteria.

At primary health care centre, community and home levels, (i.e. location) the person who is likely to weigh the newborn infants and pregnant woman (i.e. load)

is the trained or untrained TBA, a family member, community health workers, auxiliary nurse-midwife, nurse-midwife, medical assistant, nurse, midwife or nurse student (i.e. personnel). The combination of location, load and personnel provides a starting point in determining programme scale needs. In addition, costs, potential for local manufacture and frequency of use are other factors to be considered.

Scale specifications also need to be examined closely, so as to determine whether the design, potential for scale error and potential for operator error of any given type of scale are within acceptable ranges.

Characteristics which have to be evaluated in the fundamental design of a scale are (1) fundamental design; (2) potential for scale error and; (3) potential for operator error.

Features that need to be examined in the fundamental design of scales are as follows:

1. Maintenance requirements should take into consideration the poor environmental conditions under which scales are used: extremes of moisture; heat and dust harmful to mechanical equipment; unavailability of spare parts and instructions for repairs.
2. Safety: slings or weighing parts should be adjusted so that the newborn or infant being weighed is no more than 20cm off the floor or table when the scale pointer is at the user's eye level. This will minimize the possibility of injury in case of mechanical or operator failure.
3. Durability/choice of materials: springs used in the scales manufacture need to be produced to very stringent standards to ensure accuracy. The materials used should not affect the accuracy of the scale, for example, wooden balances should be treated so as to seal out moisture that might cause warping and thus affect the accuracy of weighing.
4. Ease of operation: the scale should be easy to set up, to zero, to tare and to read. Some scales have to be manipulated before use while others can be read straightaway.

5. Acceptability: the scale should be acceptable to infants, parents and operators. The infants' acceptability will depend on the container in which they are placed and the length of time the weighing takes. Parents' acceptability is related to safety or cultural aspects. Operator acceptability depends largely on ease of use and portability of the scale.

6. Portability: a scale, if it needs to be transported from home to home, has to be light enough to be carried and easy to be transported, i.e. should not be bulky.

Errors inherent to the scale issuing from design, affect its accuracy, precision, non-linearity/hysteresis, sensitivity, friction, possibility for unobvious damage, possibility for weight damage and fatigue potential. Accuracy and precision are most important when weighing newborn babies and infants for growth monitoring.

Operator error could result from (1) taring - deducting the weight of the load container; (2) parallax - the apparent change in a scale reading caused by changing the line of sight of the viewer; (3) damping allows easy reading of the weight of a moving load. This is useful when weighing newborn infants and small children.

Four main groups of existing scales or techniques are categorized:

1. Hanging scales include beam (hand-held and bar), dial springs, tubular hand-held scales, electronic/strain gauge.
2. Compression scales include table-top single beam, double beam, dial spring, electronic double beam (floor) and floor spring (bathroom)
3. Possible anthropometric replacements for birthweight.
4. Self-recording scales (prototype)

6.1 Anthropometric measurements as surrogates for birthweight

A WHO multi-centred study was carried out to determine whether newborn anthropometric measurements (arm and chest circumference) could be used as substitutes for birthweight.

The use of birthweight as a predictor of an infant's health status, as well as for population trend studies has been accepted by public health workers and is promoted by WHO. Until birthweights are systematically collected and analysed, requiring equipment and training, at all levels of care, a simpler method such as arm and chest circumference has been proposed.

The above-mentioned study was designed to define the exact relationship between birthweight and arm and chest circumference. The study was multi-centred and included a wide variation of ethnic and racial groups. The data, approximately, 8,000 cases, have been received and entered into a micro-computer for analysis.

The analysis will concern itself with defining the exact nature of the association between the variables of concern, determine cross-centre variation and derive useful cut-off values for primary health care workers. It is hoped that with this information, arm and chest circumferences of newborns will be used as substitutes for birthweights in areas where the latter is difficult to obtain.

Please refer to document WHO/MCH/86.5 for a more complete report on the subject.

7. COLLABORATING CENTRES NETWORK

There are eight WHO Collaborating Centres on research, development, training and health service research in perinatal care and maternal/child health.

The WHO Collaborating Centres play a vital role in the implementation of the Task Force for Pregnancy and Perinatal Care (PPC). The network of Collaborating Centres offers an ideal framework for carrying out in-depth comparative studies in such fields as appropriate technology, perinatal care, infectious diseases in pregnancy, traditional practices and birthweight as a health indicator. The network also should serve as a rapid means for disseminating information on a worldwide basis.

To carry out health service research as well as the training of teachers in MCH and institution strengthening at national levels, a network of WHO collaborating

centres for pregnancy and perinatal care has been established.

While efforts are being maintained to further expand the network of collaborating centres, a number of centres have already been designated or are in the process of being designated. These centres have each elected certain areas in which to specialize, and projects are underway in most of them. A principal investigator has been appointed for each centre whose responsibility is to conduct the studies which are used to improve MCH care at a national level and to exchange experiences with other network colleagues.

7.1 The African Centre

WHO Collaborating Centre for Perinatology

The National Centre of Maternal and Child Health
Black Lions Hospital
Addis Ababa
Ethiopia

Principal Investigator:
Dr Nebiat Tafari

The Perinatal Care Unit of the National Centre of Maternal and Child Health has a special institutional arrangement to facilitate research and development in perinatal health care. The components of the Unit are the neonatal care facility at the Ethio-Swedish Pediatric Clinic and the delivery suite and transitional newborn nursery at the Tikur Anbessa Hospital.

The overall objective of this Collaborating Centre is the development of perinatal health care through research and exchange of technical information. Specifically, the Centre aims to:

1. Assist in the formulation and participate in the conduct of relevant perinatal health and health services research.
2. Provide technical cooperation in national capability strengthening in perinatal health care and health services research through training of

relevant cadres of health workers and other technical manpower.

3. Provide technical collaboration for perinatal health care and health services research to WHO member states and to institutions upon request.

7.2 The American Centres

WHO Collaborating Centre for Pediatrics Pathology

Centro de Investigaçao e
Treinamento em Patologia
Pediatria
Rua Oito de Dezembro 717
20550 - Rio de Janeiro - RJ
Brazil

Principal Investigator:
Dr Carlos José Serapiao

The Centro de Investigaçao e Treinamento em Patologia Pediatrica was designated as a WHO Collaborating Centre in 1979. The Centre performs the following functions on behalf of WHO:

1. Promote efforts to improve the quality of the pediatric pathology practice in all the institutions dedicated to child health.
2. Promote a cooperative enterprise with similar centres in the country and continental area.
3. Develop programmes of training in pediatric pathology, including continuing education and specialization.
4. Conduct experimental, statistical and morphological research with emphasis for the regional problems.
5. Maintain a consultation for the diagnosis of pathological tissue.

WHO Collaborating Centre in
Perinatal Care and Health Service
Research in Maternal and Child
Health

Division of Public Health
Georgia Department of Human
Resources
47 Trinity Ave, S.W.
Atlanta, Georgia 30333
United States of America

Emory University Regional Perinatal
Center

Emory University School of
Medicine
1364 Clifton Rd. N.E.
Atlanta, Georgia 30333
United States of America

Centers for Disease Control
Department of Health and Human
Services
Atlanta, Georgia, 30333
United States of America

Principal Investigator:
Dr Al Brann

Latin-American Center of
Perinatology and Human
Development (CLAP)

Centro Latinoamericano de
Perinatología y Desarrollo Humano
Hospital de Clínicas, Piso 16
Montevideo
Uruguay

Principal Investigator:
Dr Ricardo Schwarcz

CLAP can perhaps be considered as the "grandfather" of the Collaborating Centres network, having been designated by PAHO in 1970. With the following objectives, CLAP has developed extensive programmes in research and training over the years.

The tripartisan centre in Atlanta was designated in 1983. The centre has the following terms of reference:

1. To assist in the development and participate in relevant research in perinatal care and health service research in maternal and child health.
2. To provide technical collaboration for perinatal care and health service research in maternal and child health to member states for institutions upon request.
3. To provide technical collaboration and national capability strengthening in perinatal care and health service research in maternal and child health through education and training of health workers
1. To develop appropriate technologies for perinatal and pediatric attention, giving priority to technologies applicable at the primary health care level, promoting and backing-up health services research.
2. To contribute to the promotion of health services regionalization through the development and proposal of norms and procedures for perinatal pediatric attention, according to risk criteria and complexity of references.
3. To contribute to the improvement of health services operational capacity through the study and proposals of norms of rational staffing and assigning of adequate functions to the existing resources for perinatal and pediatric attention.
4. To promote adequate participation of the family and community in perinatal and pediatric attention through appropriate educational technologies about maternity, paternity and family life.
5. To contribute to the development of human resources for perinatal and pediatric attention through workshops and seminars as well as by continuous personnel and community training in pregnancy, delivery and newborn assistance.

7.3 The European CentreWHO Collaborating Centre for
Perinatal Studies in Europe

Institute of Child Health
Athens
Greece

The centre was designated in 1981 and a perinatal surveillance unit was conceived in order to define the problems in terms of time, person, and place by birthweight specific groups and to identify the profile of the woman who is at increased risk of experiencing perinatal death. The following are the terms of reference of the Centre:

1. Assist in the organization of meetings of the perinatal study group and other relevant meetings.
2. Participate in the development of research design for studies done by the perinatal study group, and assist in the conduct of these studies.
3. Serve as a clearinghouse for perinatal health service research studies in the European Region.
4. Assist in the development of a WHO network of perinatal collaborating centres and function as a member of this network.
5. Develop and support a national perinatal surveillance unit in Greece that will:
 - a) collect, tabulate, analyze and disseminate data on the occurrence of perinatal events in Greece;
 - b) define perinatal problems, formulate hypotheses, design intervention strategies and evaluate intervention strategies;
 - c) assist in the development of methodologies in perinatal health service research;
 - d) develop the profile of a woman or child at increased risk of experiencing adverse perinatal outcomes;

e) assist in the identification of appropriate perinatal technology according to the epidemiological studies carried out by the surveillance unit.

f) provide the Government with all the necessary data generated by the perinatal surveillance system so that the Government can, in turn, make rational decisions with regard to the further development of their perinatal surveillance system.

6. Designate a staff member to serve full-time as the focal point in the Institute for the above activities.
7. Provide technical cooperation with developing countries on request with regard to perinatal problems and with regard to the establishment of perinatal surveillance.

7.4 The Western Pacific CentresWHO Collaborating Centre for
Research and Training in Perinatal
Care

Beijing Obstetrics and Gynaecology
Hospital
Beijing Municipal Maternal Health
Institute
17 Qihelou, East District
Beijing
People's Republic of China

Principal Investigator:

Dr Chen Wenzhen

This Centre has the following terms of reference:

1. To collaborate with WHO in developing training programmes in perinatal health care for China and other developing countries.
2. To take an active part in collaborating with WHO in conducting health services research in perinatal care and biomedical research in perinatal medicine.

WHO Collaborating Centre for
Research and Training on Maternal
and Infant Care

Shanghai First Maternal and Infant
Health Institute
536 Chang-Lo Road
Shanghai
People's Republic of China

Principal Investigator:
Dr Jiang Dixian

The Shanghai First Maternal and Infant Health Institute has the following terms of reference:

1. To collaborate with WHO in supporting the national health programme in training the chiefs of MCH centres and MCH institutes with a view to strengthening the national MCH service network.
2. To collaborate with WHO in arranging training programmes in developing countries in the field of maternal and infant care.
3. To take an active part in collaborating with WHO in conducting health research in maternal and infant care.
4. To act as cooperational institute in the southern part of China for the national programme of perinatal surveillance.
5. To collaborate with WHO in developing international epidemiological training activities.

WHO Collaborating Centre for MCH/FP
Service Research and Training

Department of Obstetrics and
Gynaecology
Faculty of Medicine
National University of Singapore
Kandang Kerbau Hospital for Women
Singapore
Republic of Singapore

Principal Investigator:
Professor S.S. Ratnam

This Centre was designated in 1982 and has the following terms of reference:

1. To collaborate with WHO in conducting research in the field of MCH and family planning
2. To collaborate with WHO in arranging training programmes for postgraduate students and other suitably qualified persons from WPRO and other geographic Regional Offices of WHO, for special courses in MCH and family planning.
3. To provide consultants on MCH/FP research and training programmes in the spirit of technical cooperation between developing countries.

8. WHO SECRETARIAT FOR THE TASK FORCE

Members of WHO Secretariat for
the Task Force on Appropriate
Technology for Pregnancy and
Perinatal Care

Dr Mark A. Belsey
Chief Medical Officer

Mrs Cécile L.H.F. Gregory
Technical Officer

Dr Richard J. Guidotti
Scientist

Maternal and Child Health
Geneva
Switzerland

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