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Institute of Nutrition of Central America And
Panama (INCAP/PAHO)

Department of Pediatrics
Hospital General de Occidente
San Juan de Dios

Guidelines for the Management of Principal Neonatal Emergencies for Regional - Departmental Hospitals



*Quetzaltenango Maternal
and Neonatal Health Project*



MotherCare™

MotherCare Project/John Snow, Inc.

Guatemala, 1993

**INSTITUTE OF NUTRITION OF CENTRAL AMERICA AND PANAMA
(INCAP/PAHO)
Department of Pediatrics
Hospital General de Occidente San Juan de Dios**

**GUIDELINES FOR THE MANAGEMENT OF
PRINCIPAL NEONATAL EMERGENCIES FOR
REGIONAL - DEPARTMENTAL HOSPITALS**

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Guatemala, 1993

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INTRODUCTION

This document is a guide for all those who work in the Neonatology Service of our hospital, which, by being a regional hospital, represents a model for other hospitals of the Southwest region of the country.

When referring to "all those who work", we refer to licensed practical nurses, nurses aides, medical students, interns, nursing students, residents and attending physicians. These personnel, through their efforts contribute to the care of the tiny patients who are our temporary visitors. Each one of us, by properly executing our daily work, is responsible for all of them.

The guidelines in this document were developed to improve the management of the most common neonatal emergencies and illnesses that are treated in this hospital, and to thus contribute to decreasing the rate of neonatal mortality.

As mentioned at the beginning of the introduction, these are models or guides for the management of the NEWBORN in the different areas of the hospital where these little patients are attended. The protocols are not of a permanent character, and are subject to change according to advances in the field of neonatology and our own efforts to improve care.

We would like all personnel who work in this area to:

- Use common sense when making decisions.
- Consult the person immediately superior from the point of view of administration, experience and knowledge.
- Anticipate problems.
- Always act responsibly, with dedication, efficiency, professional honor, the desire for improvement, and respect for personal dignity and human life.

1. STANDARDS FOR SERVICE AREAS

little more than half of neonatal deaths occur in the first 24 hours of life; adequate care based on anticipation of problems such as IDENTIFICATION OF RISK FACTORS, EARLY AND EFFECTIVE RESUSCITATION, TEMPERATURE CONTROL, and FEEDING can help to reduce the number of deaths.

all personnel have to know the contents of this manual in the first 48 hours of their stay in the Neonatal Unit.

standards of care according to different areas where newborns are managed:

- Labor and Delivery

- Neonatal Unit

- Observation Area
- Neonatal intensive care unit
 - infectious section
 - non-infectious section
- Postpartum Service

A. LABOR AND DELIVERY

- Familiarize yourself with the standards of care for normal and sick newborns.
- Arrive punctually and appropriately dressed to the assigned area. SMOKING AND EATING ARE FORBIDDEN in all areas where newborns are cared for. They are allowed only in designated areas.
- Upon starting a shift, the pediatric INTERN or physician in charge is responsible for:
 - Obtaining information on all high-risk women in the labor ward. Receiving the resuscitation kit and ensuring that the resuscitation equipment is complete and in good working condition.
 - Supervising the resuscitation area and maintaining it clean and neat.

- Remember that an early and effective resuscitation will improve the survival and quality of life of the patient. This should always be done in a team (resident, intern or physician in charge and nurses).
- All normal newborns must be examined and measured (weight, length and head circumference) in these areas as long as the newborn's thermoregulation is not compromised (do not subject the newborn to hypothermia).
- The neonatal physical examination form must be completely filled out. In the case of seriously ill patients, the information will be completed in the Newborn Service. Follow the same procedure for newborns in the operating room, newborns admitted from the emergency room, and those whose critical state cannot wait the bureaucracy of an admission.
- Avoiding hypothermia is basic to the management of all newborns. Their temperature must be maintained regardless of gestational age or weight. There is no reason why patients should wait in the delivery room before being transferred to the transition area.
- NO NEWBORN SHOULD LEAVE THE DELIVERY ROOM WITHOUT:
 - Having been held or at least seen by the mother.
 - An identification bracelet.
- For all births , stimulate early mother-baby contact (skin to skin contact), ideally through the early initiation of breast-feeding in the delivery room.
- The adequate completion of the PERINATAL CLINICAL HISTORY forms will facilitate quality medical care.
- All personnel charged with caring for newborns must wash their hands and arms up to the elbows for three minutes upon entering the service, and their hands before and after handling any newborn. This should be done conscientiously for all procedures, feeding, diaper changes, physical examinations. blood drawing etc. Hand washing constitutes the most effective means of infection control within hospital services. A low infection rate is one of the most sensitive indicators of the excellence of the work performed in the Neonatology areas.
- All orders must be written; the nurses will not carry out verbal or telephone orders except in emergencies.

INTENSIVE NEONATAL CARE UNIT

This unit is divided into two sections:

- Non Infectious Neonatal Section
- Infectious Neonatal Section

General standards to prevent infection:

- All personnel working in this service must remove rings, watches, bracelets, earrings, etc. (potential vectors of infection).
- Keep arms uncovered to above the elbows.
- Immediately after entering the service wash hands and arms up to the elbows, even if there are no plans to touch a newborn.
- ALWAYS wash hands before touching any patient, and ALWAYS between patients.
- Use appropriate clothing: surgical greens or gown of the service and cap. Mask in special situations.
- Bringing any type of food into the service is absolutely forbidden.
- Strict antisepsis and asepsis in relation to invasive procedures.
- Disposable equipment should be used wherever possible with each baby having its own items.
- High standards of hygiene and proper facilities for disposal of equipment must exist.
- Visitors should observe good hand washing techniques.

POSTPARTUM SERVICE

In this service, babies stay in the same beds as their mothers. Sharing a bed is considered better than separate beds in our hospital as it prevents hypothermia and promotes exclusive breastfeeding.

The main objectives of bed sharing (mother-baby) are:

- Allow the mother and the baby to experience a natural relationship as soon as the mother is able to assume care of her baby.
- Encourage breastfeeding without a schedule (on demand) and as the only feeding method (exclusive breastfeeding).
- Teach the mothers about child care.

These babies should be examined daily. Problem cases should be presented to the resident or chief of service according to the complexity of the case.

The intern, medical student or physician in charge must make rounds at least twice during his or her shift on call, observing each newborn. The suggested hours are between 16:00 and 18:00 and between 23:00 and 24:00. **THIS IS OBLIGATORY FOR ALL CALL SHIFTS.**

Any situation considered an emergency by the obstetrician, anesthesiologist or perinatal nurse:

- Fetal malposition.
- Previous management by traditional birth attendant.
- Umbilical cord anomalies (Ex: cord prolapse,etc.).

If necessary, begin resuscitation following the scheme included in this manual, by monitoring:

- RESPIRATION
- HEART RATE
- COLOR

Record Apgar score at one and five minutes. If the newborn remains asphyxiated after 5 minutes of life, record the Apgar score every 5 minutes until it is greater than or equal to seven.

Fill out the physical examination in the clinical chart of the baby.

It is important to do everything possible to maintain the infant's body temperature during procedures, regardless of gestational age or degree of asphyxia. Hypothermia makes the resuscitation process significantly more difficult.

Once the resuscitation of an asphyxiated newborn or the reception of a normal newborn is completed, the newborn is transferred to the appropriate service, taking care to avoid hypothermia and maintain adequate oxygenation.

- Sterile syringes (ideally disposable), 1 cc, 2.5 cc, 5 cc. and 10 cc.
- White adhesive tape (micropore or transpore).
- Benzoin solution.
- Sterile gloves.
- Pediatric stethoscope.
- Endotracheal tubes # 2.0, 2.5, 3.0, and 3.5 (three of each is ideal).
- Bulb suction (check functional condition and cleanliness frequently).

MEDICATIONS:

- Adrenaline, 1:10,000 or 1:1,000 (see dilution for administration procedures in table that follows).
- Physiologic intravenous solution.
- Ringer's lactate.
- Albumin 25 %, or fresh plasma.
- Sodium bicarbonate solution 7.5 % (approximately 1 mEq/ml solution) (concentrations vary according to country).
- Glucose solutions 5 % and 10 %.
- Naloxone (Narcan): 0.4 mg/ml.
- Oxygen cylinder.

MINIMUM NUMBER OF PERSONS NECESSARY FOR CARDIOPULMONARY RESUSCITATION IS THREE.

- PLACE NEWBORN BENEATH HEAT SOURCE
- DRY NEWBORN COMPLETELY
- REPLACE WET TOWEL WITH DRY ONE
- POSITION-REVERSE TRENLENBURG 458
WITH HEAD IN NEUTRAL POSITION
- SUCTION NOSE AND MOUTH. IF MECONIUM IS PRESENT,
VISUALIZE AND SUCTION TRACHEA
- TACTILE STIMULATION



F. THERMOREGULATION

NEONATAL CARE

- To prevent evaporative heat loss, dry the baby immediately with pre-warmed towels. If a heat source is not available the entire room should be pre-warmed to 32.5°C.
- When it is no longer necessary to observe the sick newborn in the incubator for respiratory assessment, abdominal distension, meningocele etc., it should be clothed inside the incubator. This will keep variations in the environmental temperature to a minimum.
- The term infant and larger premature infant should be with the mother, in the same bed and clothed with four layers of clothing.
- Do not bathe the newborn after birth, so as not to remove the vernix. Clean the baby in special situations, and only with medical authorization. This will help to avoid hypothermia.
- Gradually warm severely hypothermic newborns, ideally by 1°C every 30 minutes in the incubator.

ENVIRONMENTAL ADJUSTMENTS

- The temperature in the newborn's room should always be kept above 25°C as a minimum.
- The room temperature should be checked twice a day, recording the hour and the name of the person checking it.
- Infants requiring incubators must have the incubator temperature maintained.
- Place a heat box over the baby's body. use cellophane, or wrap the newborn in aluminum foil.

2. MANAGEMENT OF FREQUENT NEONATAL COMPLICATIONS

A. ASPHYXIA

DEFINITION:

- Perinatal asphyxia is fetal or neonatal trauma due to a lack of oxygen or poor perfusion of diverse organs. An Apgar score of less than 6 at 5 minutes is considered asphyxia.

RISK FACTORS:

- Antepartum:
 - Maternal diabetes
 - Pregnancy induced hypertension
 - Rh isoimmunization
 - Previous stillbirths
 - Second and third trimester bleeding
 - Maternal infection
 - Abnormal amniotic fluid volume (oligo- or polyhydramnios)
 - Post term pregnancy
 - Multiple gestation
 - Medications (Reserpine, magnesium sulfate)
 - Maternal drug abuse
- Intrapartum:
 - Elective or emergency cesarean section
 - Malpresentation
 - Premature labor
 - Prelabor rupture of membranes (more than 24 hours)
 - Foul smelling amniotic fluid
 - Very short labor or prolonged labor
 - Abnormal fetal heart rate
 - Maternal general anesthesia
 - Uterine tetany

- Patients who present with mild symptoms such as:
 - Respiratory irregularity, shallow respirations
 - Moderate muscular hypotonia
 - Hyporeflexia
 - Somnolence, apathy, weak cry

The persistence of these symptoms beyond the immediate postnatal period of 2 hours must be considered pathological, and the newborn should then be included in the treatment group.

TREATMENT:

- Supply supplemental oxygen in a headbox (OXI-HOOD), FiO_2 0.3 -0.4.
- Intubate and ventilate if there is irregular or inadequate respiratory effort or apnea.
- Insert CATHETER and monitor blood pressure.
- Obtain:
 - Hematocrit
 - Blood glucose
 - Calcium
- Correct hypotension with:
 - Blood: Packed red blood cells 10 ml/kg over 1 hour if Hct. is less than 40% (if there is acute blood loss).
 - Albumin: 1 gm/kg or plasma 20 ml/kg over 1 hour.
 - Physiologic intravenous solutions: 20 ml/kg over 1 hour.
 - Bicarbonate: if $\text{PCO}_2 > 40$ mm Hg or there is a base deficit above 12mg.
- Fluid and Electrolyte Maintenance:
 - 1st day: 10% Glucose solution - 60 ml/kg + 500 mg/kg/day calcium gluconate.
 - 2nd day: 10% Glucose solution - 80 ml/kg + 500 mg/kg/day calcium gluconate.
Adjust sodium. chloride, potassium according to lab electrolyte results.
 - 3rd day: 100 ml/kg/day (83% if glucose solution at 10% and 17% of saline).
 - 4th day 120 ml/kg/day (83% if glucose solution at 10% and 17% of saline).

- **SIGNS OF SEVERE ASPHYXIA:**
 - Periodic respiration, isolated or prolonged apnea
 - Stupor - coma
 - Little or no spontaneous activity, or no response to stimuli
 - Absence of primary reflexes, absent Moro
 - Non-reactive neonatal heart rate reflex
 - Repeated seizures

PROGNOSTIC CLASSIFICATION:

- Mild or moderate signs \leq 7 days - good prognosis
- Severe or moderate signs $>$ 7 days - poor prognosis

B. INFECTION IN THE NEWBORN

DEFINITION:

Neonatal sepsis is a clinical syndrome characterized by systemic signs of infection accompanied by bacteremia.

RISK OF SEPSIS:

A series of perinatal factors place a newborn at risk of developing an infection (which does not always develop).

PRINCIPAL MICROORGANISMS:

The most frequently reported microorganisms in the literature area are *Escherichia coli* (capsular group K1), Group B *Streptococcus*, *Listeria monocytogenes*. The microorganisms vary greatly from one location to another, however, especially nosocomial organisms.

RISK FACTORS AND SCALE OF RISK IN POINTS:

	POINTS
•Maternal infection (diarrhea, urinary infection, pyoderma. bronchopneumonia etc.)	1
•Prolonged labor > 12 hours in primiparas and multiparas	1
•Management by traditional birth attendant (vaginal examinations performed)	2
•Prolonged rupture of the membranes (> 24 hours)	2
•Birth in septic conditions (street, ambulance etc.)	2
•Prematurity or low birthweight	2
•Resuscitation (intubation with septic cannulas)	2
•Intratracheal meconium	2
•Maternal fever (> 38°C.)	3
•Foul smelling amniotic fluid	3

MANAGEMENT:

- Patients with a risk of infection (See scale of points of risk). If greater than 6 points:
 - Penicillin or Ampicillin + Aminoglycoside
 - If cultures negative at 72 hours and patient's clinical condition is stable. suspend treatment.
- Proven sepsis or strong suspicion thereof:
 - Penicillin or Ampicillin + Aminoglycoside
 - Adjust treatment to culture results, antibiotic sensitivity and/or patient's response to initial antibiotic treatment.
- Meningitis:
 - Treat for at least 10 days after a repeat lumbar puncture, performed 72 hours after initiating treatment.
 - Use Cefotaxime or Ceftriaxone, always in combination with an Aminoglycoside.

If these medications are not available, then use Ampicillin and Chloramphenicol.

SPECIAL CONSIDERATIONS:

- For newborns less than 1,500 grams:
 - Give Colostrum, 5 ml every 24 hours until weight is more than 1,500 grams, in addition to calculated feed per day.

- Teratogens such as alcohol medication, street drugs, radiation
- Chronic maternal illness
- Maternal infection
- Any illness that interferes with placental blood flow and oxygenation:
 - cardiopathy
 - lung disease
 - nephropathy
 - collagen vascular disease
 - hypertension
 - diabetes type D,E,F,R
 - smoking
 - pre-eclampsia
- Placental lesions
 - Secondary to maternal cardiac valvular disease
 - Multiple gestation
 - Malformation
 - Tumors
- Fetal factors
 - Chromosomal abnormality
 - Malformations
 - Congenital infection
 - Multiple gestation
 - RH isoimmunization

PRINCIPAL CLINICAL SIGNS:

- Calculate gestational age from last menstrual period
- Capurro score (see page 72).
- Weight (see Appendix G)
- Length
- Head circumference

MANAGEMENT:

- Perform the following during hospitalization:
 - Weight: evaluate daily
 - Length and head circumference: evaluate weekly

A case summary must be included in the patient's chart upon discharge to facilitate follow up.

Except for special indications, all premature or low birthweight infants must be seen in the outpatient clinic two to three weeks following discharge from the hospital.

DIAGNOSTIC LABORATORY INVESTIGATIONS:

- Dextrostix, blood glucose.

MANAGEMENT:

- **NEWBORNS AT RISK BUT WITH NORMAL INITIAL BLOOD GLUCOSE:**

- Dextrostix at birth and before each feeding for the first 24 hours of life.
- First feeding should be within one hour of birth if clinical condition permits. (Ideally with BREASTMILK.)
- If newborn becomes symptomatic or if Dextrostix is less than 45 mg%, obtain blood glucose immediately for confirmation, and initiate the following treatment:

- **ASYMPTOMATIC HYPOGLYCEMIC NEWBORNS:**

- **BLOOD GLUCOSE BETWEEN 30 - 45 Mg%:**

Depending on the patient's clinical condition, initiate BREASTFEEDING and/or infant formula, or 10% Dextrose solution I.V. at 80 ml/kg/day for 24 hours.

- **BLOOD GLUCOSE LESS THAN 30 Mg%:**

10% Dextrose solution at 4 ml/kg/dose I.V. bolus. followed by:

Maintenance solution: 10% Dextrose solution at 80 - 100 ml/kg/day (this solution should be gradually withdrawn as adequate oral feedings are tolerated).

Evaluate glucose levels by Dextrostix every 15 minutes until stable (> 60 mg%).

If no improvement is seen in three consecutive readings (45 minutes), progressively increase concentration of the glucose solution up to 15% peripherally or 50% centrally.

HYPOCALCEMIA

DEFINITION:

Total serum calcium less than 7 mg% (some premature babies will have a total serum calcium less than 7 mg% but with a normal fraction of ionized calcium).

RISK FACTORS:

- Prematurity.
- Small for Gestational Age (SGA).
- Infant of Diabetic Mother (IDM).
- Associated with Hypomagnesemia.
- Diuretic use (furosemide).
- Post Asphyxia.
- Post administration of sodium bicarbonate or other alkali.
- Post exchange transfusion.
- Infants with metabolic or respiratory problems caused by hypoxia or rapid changes in the Ph.
- Infants with immature renal tubular function (infant formulas derived from cow's milk high in phosphorus).
- Transitory hypoparathyroidism in infants of hyperthyroid mothers.

PRINCIPAL CLINICAL SIGNS:

The signs and symptoms of hypocalcemia in the newborn are nonspecific. The most common symptoms are:

- Apnea
- Seizures
- Irritability
- Excitation

DIAGNOSTIC LABORATORY INVESTIGATIONS:

- Serum calcium levels.

E. APNEA

DEFINITION:

- **APNEA:** Cessation of all respiratory movement for a minimum of 20 seconds, frequently accompanied by cyanosis, pallor, hypotonia and bradycardia.
- **OBSTRUCTIVE APNEA:** The absence of airflow in the presence of respiratory movements.
- **PERIODIC RESPIRATIONS:** Frequent sequences of respiratory pauses followed by rapid respirations. No evidence of cyanosis or bradycardia.

Episodes of apnea and periodic respirations decrease with increasing gestational age.

ETIOLOGY OR RISK FACTORS:

- Prematurity
- Thermal instability
- Sepsis
- Metabolic disorders
 - Hypocalcemia
 - Hypoglycemia
 - Hypermagnesemia
 - Hypo-hypermnatremia
 - Inborn errors of metabolism
- Cardiorespiratory disorders
 - Hypoxia
 - Acidosis
 - Patent ductus arteriosus
 - Hypertension
 - Anemia
 - Airway obstruction
 - Pneumonia - aspiration
 - Respiratory distress syndrome
 - Pneumothorax

□ ***TREATMENT:***

- Treat precipitating cause, if one exists (sepsis, reflux, hypoxia, airway obstruction).
- Control temperature (neutral thermal environment).
- Frequent stimulation.
- Eliminate precipitating reflexes (sucking, position).
- Aminophylline:
 - 5 mg/kg loading dose
 - 1.5-2.0 mg/kg dose every 6-8 hours
- Mandatory ventilation with CPAP.

□ **MANAGEMENT:**

Between 40 and 50% of newborns will have some degree of jaundice in the first few days of life. Term infants usually develop their peak bilirubin levels at 4 days of life. Premature infants will reach their maximum bilirubin at 5 or 6 days of life. The etiology of jaundice that occurs prior to 36 hours of life must be carefully investigated.

Neonates must be examined daily for jaundice. Jaundice is clinically visible in an uncovered part of the body when the serum bilirubin is 5 mg%. Mucous membranes become yellow at levels of bilirubin between 8 and 10 mg %. Do not wait until the sclera become icteric to obtain a bilirubin level. All progress notes must include the date and time of the observation, the progress of the jaundice, and when the jaundice was first observed by the nurse or doctor. Examine the newborn for edema, petechiae, hepato-splenomegaly, ecchymoses. Check feeding history (ingestion, weight gain), temperature control, neurologic state.

□ **CAUSES OF JAUNDICE AND MANAGEMENT**

- Isoimmunization:

- Rh incompatibility.

Example: Mother A- and newborn A+. with (+) Coombs Rh incompatibility.

Positive amniocentesis results should be interpreted according to the Lilley curve (only in infants with Rh or minor blood group incompatibility):

Zone I	Infant not affected.
Zone II	Infant with erythroblastosis. indeterminate grade of severity.
Zone III	Severe erythroblastosis: candidate for exchange transfusion immediately after birth.

Minimum Additional Studies:

- Nucleated red blood cell count
- Reticulocyte count
- Red blood cell morphology (peripheral smear)
- Platelet count

- Viral or bacterial infection, proven or suspected in mother and/or infant:
 - Bacterial infection -----► SEE NORM FOR SEPSIS
 - Viral infection:

Minimum Studies - VDRL:

 - TORCH titers (ideally IgG in mother and IgG plus IgM in infant)
 - Total nonspecific IgM
 - Prothrombin and partial thromboplastin times
 - Long bone and cranial X-rays
 - Urine and throat cultures for specific viruses
 - Fundoscopic examination
- Polycythemia -----► SEE NORM FOR POLYCYTHEMIA.
- Trauma: Cephalhematoma, ecchymoses, central nervous system hemorrhage, swallowed blood, fracture.

Minimum Studies:

- Platelet count
- Prothrombin and partial thromboplastin times
- Blood in feces and urine
- Apt test
- X-ray for fractures
- Lumbar puncture if indicated
- Delayed intestinal evacuation: ----► increased entero-hepatic circulation

Minimum Studies and Management:

- Check number and type of bowel movements (meconium, transitional or lactating).
- Order early feedings
- Order prune juice and early breastfeeding
- Other causes:
 - Drugs
 - Metabolic and endocrine causes
 - Genetic causes

- 4 Clinical signs: hepatosplenomegaly, pallor, edema.
- 5 History of previous siblings requiring exchange transfusions.

---> At older ages:

- 1 Indirect bilirubin increasing by more than 0.5 mg/hour.
- 2 Rapid fall of hemoglobin or hematocrit.
- 3 In term newborns, subtract 1 mg from each 20 mg indirect bilirubin for each of the following historical factors:
 - Anoxia
 - Infection
 - Hypoglycemia
 - Hypothermia
 - Hemolysis
 - Hypoalbuminemia
 - Acidosis
 - Respiratory difficulty

This will give us the indirect bilirubin level at which an exchange transfusion should be performed. In premature infants, begin subtracting at 18 mg% for each of the historical factors.

- 4 If factors exist which could increase the risk of brain damage such as those described in #3 above, perform exchange transfusion in term infants when indirect bilirubin levels are as follows:
 - 10 mg % --► 12 hours of life
 - 15 mg % --► 24 hours of life
 - 20 mg % --► at any age

Deterioration in the clinical state of the patient: lethargy, hypotonia, decreased sucking reflex, loss of Moro reflex, opisthotonos, hyperthermia (CONSULT WITH CHIEF OF SERVICE AND/OR CHIEF ON CALL FIRST).

G. POLYCYTHEMIA

□ DEFINITION:

- Polycythemia: Venous hematocrit greater than 65 %.

□ ETIOLOGY OR RISK FACTORS:

- Placental transfusion of erythrocytes
 - Delayed cutting of the cord.
 - "Milking" the cord.
 - Maternal-fetal transfusion.
 - Feto-fetal transfusion.
 - Baby kept below level of mother during delivery.
- Placental insufficiency
 - Low birthweight infant.
 - Infant of pre-eclamptic mother
 - Post mature infant
- Other causes
 - Infant of a diabetic mother
 - Maternal pharmacologic agents (eg. propranolol)
 - Down syndrome
 - Neonatal thyrotoxicosis
 - Trisomy 13 and 18
 - Congenital adrenal hyperplasia

□ PRINCIPAL CLINICAL SIGNS:

- The majority are asymptomatic
- Respiratory difficulty
- Cyanosis
- Cardiac insufficiency
- Lethargy
- Hypoglycemia
- Decreased sucking
- Seizures
- Renal vein thrombosis
- Jaundice
- Cerebral infarcts

$$\text{Exchange volume} = 80 \text{ ml} \times 3 \text{ Kg.} \times \left(\frac{75 - 55}{75} \right)$$

$$\begin{aligned} \text{Exchange volume} &= 240 \times \left(\frac{20}{75} \right) \\ &= 240 \times (0.27) \\ &= 64.8 \text{ ml} \end{aligned}$$

The usual exchange volume is 10-20 ml/kg.

Exchange liquid may be :

- fresh plasma
- saline solution

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APPENDIX

APPENDIX A

Indications for Blood Transfusion

The decision to transfuse must take into account the newborn's situation and physiologic needs.

- Newborns with respiratory diseases must have their hematocrit kept above 40%.
- Newborns with Rh incompatibility and Rh isoimmunization who do not receive exchange transfusions can present prolonged hemolysis, and may need transfusions weeks later (4-6 weeks).
- Premature infants with hemoglobin levels of 7 g/100 ml may be in good condition. This hemoglobin level alone does not indicate the need for transfusion.
- Premature newborns in the gaining and growing stage may need transfusions if there is a poor weight gain, apnea, tachypnea or feeding refusals.
- Sick newborns (sepsis, pneumonia, bronchopulmonary dysplasia): if symptomatic, maintain hematocrit above 40%.

APPENDIX B

Blood Products and Transfusion Methods

Packed red blood cells. Calculate quantity as follows:

$$\frac{\text{weight} \times \text{blood volume} \times (\text{Hct desired} - \text{Hct observed})}{\text{Hct of the blood to be administered}}$$

- The hematocrit of packed red blood cells is 60-90 %
- The maximum to be transfused is 10 ml/kg

Give whole blood when there is an acute blood loss (20 ml/kg)

Exchange transfusion with packed red blood cells may be necessary in a severely anemic newborn if the volume of blood necessary to correct the anemia will cause circulatory overload.

ANEMIA PROPHYLAXIS IN THE PREMATURE NEWBORN

Use maternal milk. If artificial infant formula is necessary, use a formula poor in linoleic acid.

Give an iron supplement at eight weeks of age (4 mg/kg/day in reinforced formula or supplemental drops).

APPENDIX C

Breastfeeding

A BREASTFEEDING FRIENDLY HOSPITAL IS ONE THAT PUTS INTO PRACTICE THE "TEN STEPS TO HAPPY BREASTFEEDING" of the joint WHO/UNICEF declaration on the special role that Maternity services play in the protection, promotion and support of breastfeeding (1989).

The statement above should be the goal of our hospitals. We are aspiring to be a Breastfeeding Friendly Hospital, and hope that with this manual we are making the first of the ten steps, which follow below:

- Create written norms for breastfeeding that are systematically transmitted to all healthcare personnel.
- Educate all healthcare personnel who are in positions to effectively put these norms in practice.
- Inform all pregnant women about the benefits of breastfeeding and how to breastfeed.
- Help mothers begin breastfeeding during the first half hour after delivery.
- Show mothers how to breastfeed and how to maintain lactation even if separated from their baby.
- Do not give newborns anything but maternal milk, without any other food or drink unless medically indicated.
- Facilitate 24 hour rooming in (mothers with their babies 24 hours/day).
- Encourage breastfeeding on demand. day and night, without feeding schedules.
- Do not give bottles or pacifiers to breastfeeding babies.
- Encourage the establishment of breastfeeding support groups, and put mothers in touch with them when they are discharged from the hospital.

The following standards of care are important for the effective promotion of breastfeeding:

- During the prenatal period
- During delivery and the postpartum period

- Teach the mother that if she wishes to practice family planning, she must use non-hormonal methods during the period of exclusive breastfeeding (when only maternal milk is given, without water, coffee, gruel or any other liquid or solid).
- Educate the mother about adequate techniques for the initiation and maintenance of breastfeeding, taking into account that:
 - Frequent sucking by the baby and the mother's self-confidence that she can breastfeed assure a good milk supply.
 - The mother must drink a lot of fluids to encourage milk production. She should satisfy her thirst.
- Orient the mother to let the baby nurse on demand, without any daytime or nighttime schedule.
- Teach mothers how to manually extract milk. Make sure milk is extracted and given to the newborn when, for whatever medical reason makes this necessary, the mother and baby are separated.
- Monitor the functioning of human milk banks, applying specific standards.
- Facilitate the formation of breastfeeding support groups, and refer mothers to them.

The following are considered unacceptable with relation to the promotion, protection and support of breastfeeding in the newborn service:

- Publicity within the services of the following products:
 - Infant formulas
 - Dairy or non-dairy products presented as nursing supplements
 - Cereals
 - Juices or other drinks
 - Prepared baby foods
 - "Follow-up" milks
 - Bottles

Distribution of samples or "gifts" to mothers and families

- Discharge of mothers of newborns from the hospital with a prescription for any kind of infant formula, except by express authorization by the chief of service.

---> The mother should not take any medication during the period of breastfeeding. However, if necessary, the following medications may be taken with great precautions and are compatible with breastfeeding, according to the American Academy of Pediatrics. Reference: Committee on Drugs. American Academy of Pediatrics. "The transfer of drugs and other chemicals into human breast milk". Pediatrics 1983. 72: 375-383.

- | | |
|----------------|-----------------------------------------------------------------------------|
| * Thyroxine | Evaluate baby's thyroid function |
| * Morphine | Stop use with premature or sick babies. For others, check prothrombin time. |
| * Sulfonamide | Avoid use with premature or jaundiced babies |
| * Theophylline | Irritability. |

--- > The following medications are absolutely contraindicated during the breastfeeding period:

- | | |
|-----------------------|-----------------|
| - Etacrinic acid | - Etretinate |
| - Lysergic acid (LSD) | - Heroin |
| - Amphetamines | - Lithium |
| - Bronocriptin | - Marihuana |
| - Cloramphenicol | - Methotrexate |
| - Cocaine | - Metronidazole |
| - Cyclophosphamide | - Phencyclidine |
| - Ciclosporine | - Diazepam |
| - Ciproheptadine | - Meprobamate |
| - Doxorubicine | |

APPENDIX D

Fluids - Electrolytes - Feeding of the Newborn

The following is a general guide to the feeding and fluid requirements in the neonate. Management of fluids and feeding in neonates with special clinical situations (necrotizing enterocolitis, congestive heart failure, acute renal insufficiency, post operative etc.) should be individualized.

The objective of any alimentary plan in a newborn, be it term or pre-term, healthy or ill, is the attainment of normal growth and development.

☐ ENERGY AND FLUID REQUIREMENTS

At the beginning of extrauterine life, energy requirements are about 60-75 kcal/kg/24 hours. They rise to 110-130 kcal/kg/24 hours at the end of the first week of life. This energy is obtained via fluids (breastmilk and/or infant formula) in amounts from 65-80 ml/kg/24 hours at the beginning of the first day of life up to 180-190 ml/kg/24 hours at the end of the 9th or 10th day of life. A very practical way of filling these requirements is to begin feedings at 60-65 ml/kg/24 hours the first day of life, increasing the amount daily by 12-15 ml/kg/24 hours until the 8th or 10th day of life. This refers to orogastric feedings, as parenteral feedings with dextrose solutions are not available in our environment.

Breastmilk and commonly used infant formulas furnish the following distribution of energy:

Proteins	2.5 - 3 g/kg/24 hours	15 % of kcal/day
Fats		50-60 % of kcal/day
Carbohydrates		25-35 % of kcal/day

The maintenance of these proportions is important if metabolic imbalances are to be avoided.

Electrolyte requirements are the following:

Sodium:	2-3 mEq/kg/day
Potassium:	2 Meq/kg/day
Chloride:	2 Meq/kg/day

These may be added to intravenous solutions after the first 24 hours of life if the neonate is not receiving enteral feeding.

APPENDIX E

Abdominal Emergencies in the Newborn

□ DIFFERENTIAL DIAGNOSIS:

- Vomiting.
 - Physiologic: Newborns frequently regurgitate during the first days of life. This must be differentiated from pathologic processes.
 - Intestinal: Intestinal obstruction, achalasia, hiatus hernia, gastroenteritis. Bilious vomitus suggests intestinal obstruction.
 - Metabolic alterations: Sepsis, aminoacidemias, galactosemia. salt loss in adrenogenital syndrome, drug withdrawal, intracranial lesions.
- Abdominal Distension.
 - Benign: Due to muscular hypotonia (premature babies).
 - Ileal: Decreased intestinal sounds. Sepsis, hypoxemia, congestive heart failure, hypokalemia, drugs (atropine).
 - Peritoneal fluid: Blood, transudate, peritonitis, ascites.
 - Organomegaly.
 - Mechanical intestinal obstruction: Atresia, volvulus, stenosis. meconium plug.
- Respiratory Difficulty.
 - Diaphragmatic hernia.
 - Esophageal atresia with or without fistula.
- Gastrointestinal Bleeding.
 - Swallowed maternal blood : it is the principal cause of blood in stools ---
 - ▶ perform Apt test.
 - Hemorrhagic Diatheses.
 - Vitamin K deficiency (hemorrhagic disease of newborn).
 - Disseminated intravascular coagulation (associated with shock, asphyxia or sepsis).
 - Specific coagulation factor defects.
 - Specific lesions: Traumatic esophageal or stomach ulcers. anal fissures, peptic ulcers. necrotizing enterocolitis. miscellaneous lesions (polyps. intestinal gangrene).

- Shock must be treated with rapid volume expansion, utilizing crystalloid, blood or 25% albumin.
- A nasogastric tube at gravity drainage is a good alternative in diseases that produce intestinal dilatation, or that necessitate intestinal rest.
- Antibiotics are indicated in conditions that carry a risk of intestinal perforation (peritonitis, necrotizing enterocolitis, pneumonia etc.).

APPENDIX F

Glossary of Commonly Used Medications in Neonatology

<u>MEDICATION</u>	<u>DOSAGE</u>	<u>ROUTE</u>
ACETAMINOPHEN	- 5 mg/kg/dose every 4-6h	PO. RECTAL
ACYCLOVIR	- 15-30 mg/kg/day every 8h x 10 days	IV
AMIKACIN	- 15 mg/kg/day every 12h (<7 days) - 20 mg/kg/day every 12h (>7 days)	IV or IM
AMOXICILLIN	- 20-30 mg/kg/day every 8h	IV or PO
AMPICILLIN	- 100-400 mg/kg/day every 12h	PO. IV, IM
AMPHOTERICIN B	- Initiate 0.1-0.3 mg/kg/day every 12h. Increase daily by 0.5 mg/kg/day to maximum dose of 1 mg/kg/day	IV
ATROPINE	- 0.01 mg/kg/dose	IV. IM, ET
BICARBONATE	- 1-3 mg/kg/dose	IV
CALCIUM GLUCONATE	- 200-500 mg/kg/day	IV or PO
CAPTOPRIL	- 0.5 mg/kg loading dose, then 0.1-1.0 mg/kg/dose every 6-12h	IV
CEFAZOLIN	- 50 mg/kg/day every 12h	PO. IV, IM
CEFOTAXIME	- 150 mg/kg/day every 12h(<7 days) - same dose every 8h >7 days	IV or IM
CHLORAL HYDRATE	- 25-50 mg/kg/day every 6h	PO
CHLORAMPHENICOL	- 25-75 mg/kg/day every 6-8h	IV or PO

<u>EDICATION</u>	<u>DOSAGE</u>	<u>ROUTE</u>
ENTAMICIN	- 5 mg/kg/day every 12h < 1500 gm every 18h < 1000 gm every 24h > 44 weeks every 8h	IV or IM
YDRALAZINE	- 0.1-0.5 mg/kg/dose every 3-6h Maximum 2 mg/kg every 6h.	IV, IM, PO
YDROCHLOROTHIAZIDE	- 20-40 mg/kg/day every 12h	PO
YDROCORTISONE	- 0.5-1 % cream - 2-8 mg/kg/day every 4-6h	PO
IMUNOGLOBULIN	- 400 mg/kg dose	IV m
DOMETHACIN	- 0.2 mg/kg/dose every 12h (3 dose maximum)	IV
OPROTERENOL	- 0.1-1.0 µg/kg/minute	IV
AYEXALATE	- 1 g/kg/dose in 3-5 ml	PO. RECTAL
DOCAINE	- 0.5-2.0 mg/kg dose over 5 minutes, every 10 min. Maximum 5 mg/day	IV
YRAZEPAM	- 0.05 mg/kg dose	IV
EPERIDINE	- 0.5-1.0 mg/kg/dose every 4-6h	IV, IM. PO
ETACLOPRAMIDE	- 0.1 mg/kg dose 30 min. before each meal	PO
ETHYLDOPA	- 2-3 mg/kg/dose every 6-8h	IV or PO
ORPHINE	- 0.1 mg/kg/dose every 4h	IV
AFILLIN	- 50-100 mg/kg/day every 12h	PO. IV. IM
ALOXONE	- 0.01-0.1 µg/kg/dose	IV. IM. ET

EDICATIONDOSAGEROUTE

ANCOMYCIN

- 20-30 mg/kg/day every 12-18h
(< 7 days)
- 45 mg/kg/day every 8h (> 7 days)

IV or PO

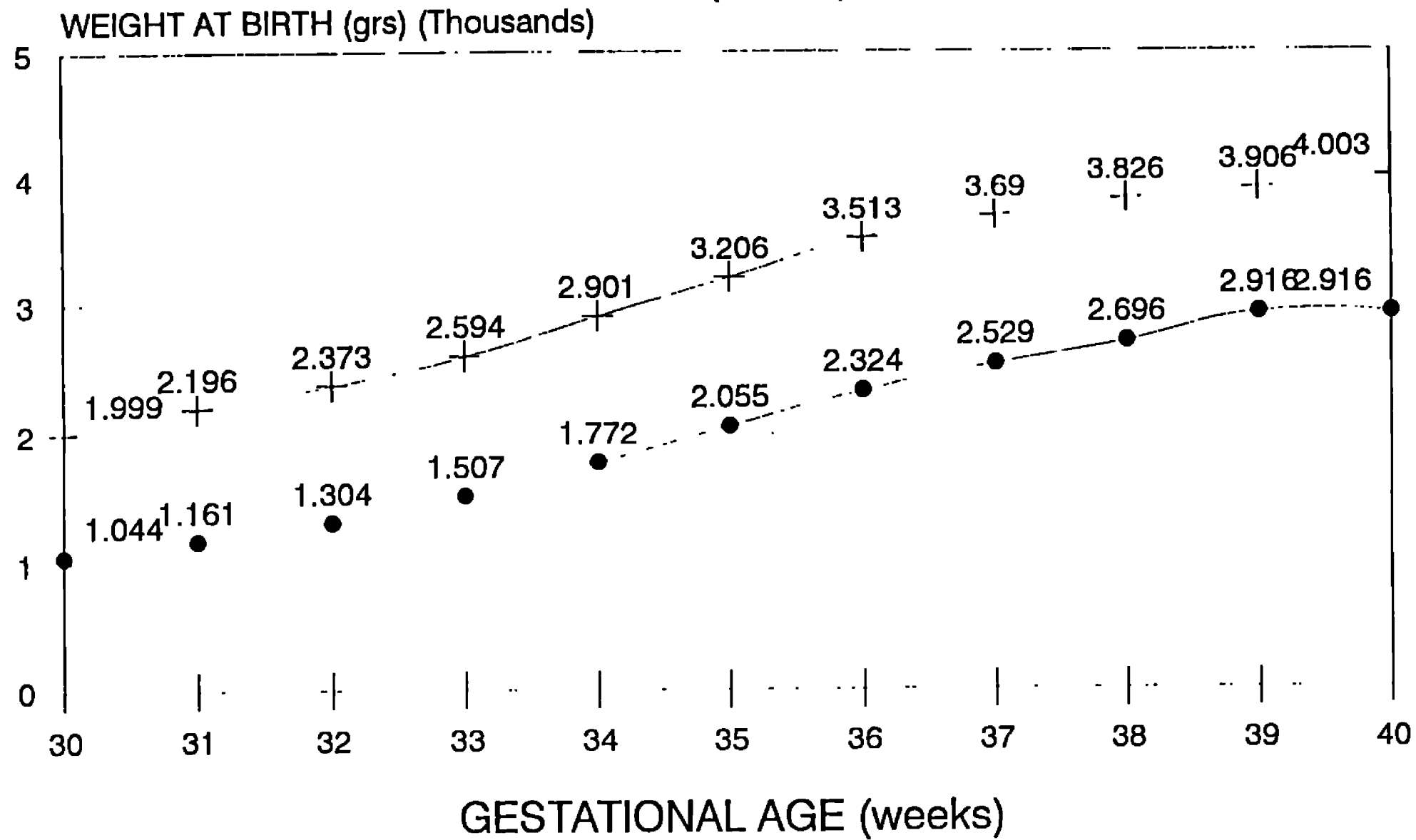
IV	=	intravenous
IM	=	intramuscular
PO	=	by mouth
ET	=	endotracheal

APPENDIX G

SOMATIC METHOD (B)-EXTERNAL CRITERIA					
EAR FORM	FLAT PINNA, SHAPELESS, NOT INCURVING OF EDGE	INCURVING OF PART OF EDGE OF PINNA	PARTIAL INCURVING WHOLE UPPER PINNA	WELL-DEFINED INCURVING OF THE WHOLE EAR	
BREAST SIZE	NOT PALPABLE	PALPABLE LESS THAN 5 MM	PALPABLE, BETWEEN 5- 10 MM	PALPABLE, BIGGER THAN 10 MM	
NIPPLE FORMATION	NIPPLE BARELY VISIBLE, NO AREOLA	DIAMETER LESS THAN 7.5 MM, AREOLA SMOOTH AND FLAT	DIAMETER BIGGER THAN 7.5 MM, AREOLA STIPPLED, EDGE NOT RAISED	DIAMETER BIGGER THAN 7.5 MM, AREOLA STIPPLED, EDGE RAISED	
SKIN TEXTURE	VERY THIN, GELATINOUS 0./	THIN AND SMOOTH 5./	MEDIUM THICKNESS, SUPERFICIAL PEELING 10./	THICK, SUPERFICIAL CRACKING AND PEELING OF HANDS AND FEET 15./	THICK, PACHMENT, LIKE DEEP CRACKING 20./
PLANTAR CREASES	NO SKIN CREASES	FAINT RED MARKS OVER ANTERIOR HALF OF SOLE	DEFINITE RED MARKS OVER ANTERIOR HALF, INDENTATION OVER THE ANTERIOR 1/3	INDENTATION OVER THE ANTERIOR HALF	INDENTATIONS ON MORE THAN THE ANTERIOR HALF
THE GESTATIONAL AGE IN DAYS IS CALCULATED ADDING THE SCORE OBTAINED IN EACH PARAMETER + 204; THE ERROR IS ± 9.2 DAYS AND THE R = 88.					

REF: TAKEN FROM: SCIENTIFIC PUBLICATION CLAP-1016,171,1984 HAROLDO CAPURRO. RESUMENES Y RECOMENDACIONES. TECNOLOGIAS APROPIADAS EN PERINATOLOGIA.CENTRO LATINOAMERICANO DE PERINATOLOGIA Y DESARROLLO HUMANO

Adequation of Weight for Gestational Age Latin American Center of Perinatology (CLAP)



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APPENDIX I

TABLE OF CONVERSION OF POUNDS TO KILOGRAMS

		POUNDS														
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
O	0	0	454	907	1361	1814	2268	2722	3175	3629	4082	4536	4990	5443	5897	6350
	1	28	482	936	1389	1843	2296	2750	3203	3657	4111	4564	5018	5471	5925	6379
	2	57	510	964	1417	1871	2325	2778	3232	3685	4139	4597	5046	5500	5953	6407
U	3	85	539	992	1446	1899	2353	2807	3260	3714	4167	4621	5075	5528	5982	6435
	4	113	567	1021	1474	1928	2381	2835	3289	3642	4196	4649	5103	5557	6010	6464
	5	142	595	1049	1503	1956	2410	2863	3317	3770	4224	4678	5131	5585	6036	6492
N	6	170	624	1077	1531	1984	2438	2892	3345	3799	4252	4706	5160	5613	6067	6520
	7	198	652	1106	1559	2013	2466	2920	3374	3827	4281	4734	5188	5642	6095	6549
	8	227	680	1134	1588	2041	2495	2948	3402	3856	4309	4763	5216	5670	6123	6577
C	9	225	709	1162	1616	2079	2523	2977	3430	3884	4337	4791	5245	5698	6152	6605
	10	282	737	1191	1644	2098	2551	3005	3459	3912	4366	4819	5273	5727	6180	6634
	11	312	765	1219	1673	2126	2580	3033	3487	3941	4394	4848	5301	5755	6209	6662
E	12	340	794	1247	1701	2155	2608	3062	3515	3969	4423	4876	5330	5783	6237	6690
	13	369	822	1276	1729	2183	2637	3090	3544	3997	4451	4904	5358	5812	6265	6719
	14	397	850	1304	1758	2211	2665	3118	3572	4025	4479	4933	5386	5840	6294	6747
S	15	425	879	1332	1786	2240	2693	3147	3600	4054	4509	4961	5415	5868	6322	6776

NOTE: 1 POUND = 453.59237 GRAMS
2 OUNCES = 28,349523 GRAMS
1000 GRAMS = 1 KILOGRAM

THE EQUIVALENTS OF GRAMS HAVE BEEN ROUNDED UP TO THE IMMEDIATE SUPERIOR WHERE THE FIRST DECIMAL IS EQUAL TO OR SUPERIOR TO 5