SCORING SYSTEMS IN NEONATAL MEDICINE AND DETECTION OF RISKS

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- Early identification of newborn danger signs by caregivers with prompt and appropriate referral, serves as backbone of the programs aiming at reduction in neonatal mortality.
- Neonates are more prone to show subtle signs of illness and these can only be identified by the immediate care givers who have adequate knowledge on features to look for.
- Restlessness or difficulty feeding are sometimes the only signs present and illness may advance quickly.
- Different tools to facilitate identification of these health problems and reduce neonatal mortality have been introduced into health programs in many countries

Medical scores, criteria and classification systems support clinical decision-making and management. They enable the clinician to predict the outcome, stratify risk, assess conditions and diagnose diseases accurately. The desirable properties of neonatal scores have been described as including:

- ease of use;
- applicability early in the course of hospitalisation;
- ability to reproducibly predict mortality, specific morbidities, or cost for various categories of neonates;
- usefulness for all groups of neonates to be described.

- However, these properties are difficult, perhaps impossible, to achieve completely. Although it may be possible to derive a risk adjustment score in a particular study, investigators will often require a readymade score. They may lack the data, resources, time, funding, or expertise required to develop their own, and a previously validated score also has the advantage that it is more likely to be accepted by others.

- There are various scores derived for neonates in the medical literature, and the choice of which variables are to be included in the score and their relative weights is obviously vital. It also needs to be remembered that no score can completely quantify the complex factors that make up an individual infant's morbidity.

- Usually, scores are created in one of two ways.
- *Medical* scores are derived by an expert panel using clinical knowledge to select the variables to be included in the score and their relative weights.
- Alternatively, collected data are used in *statistical* models to produce *statistical* scores by identifying which variables have strong association with the outcome of interest and their relative weights.

- There is evidence that, in the long run, statistical scores outperform medical scores and today most scores are statistical as there are often relevant data available. However, clinical knowledge may contribute to the choice of variables included in a final model.
- Although presently there are multiple scores designed for neonates' sickness assessment, none of the score is ideal. Each score has its own advantages and disadvantages along with their merits and demerits.

Finegan

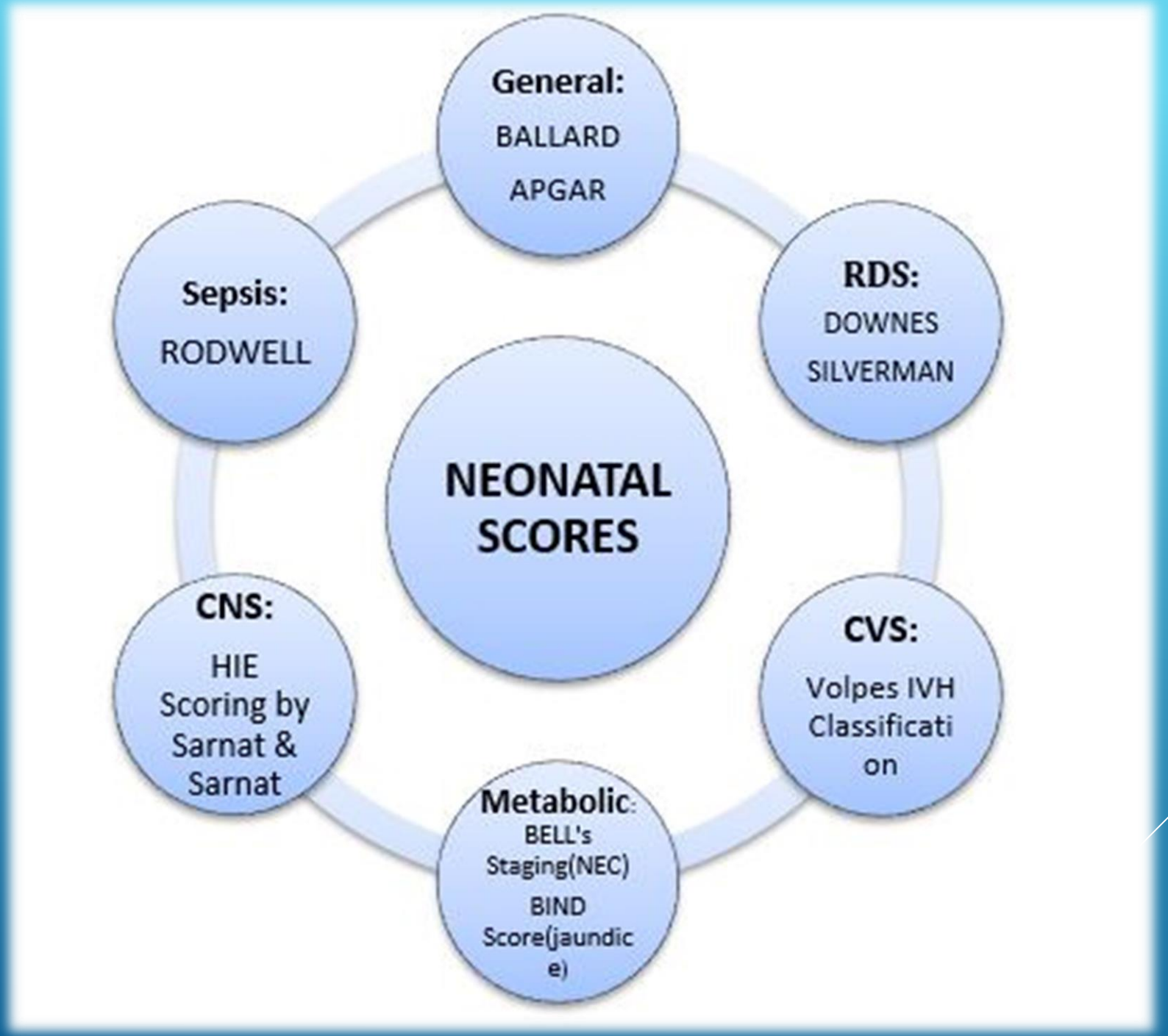
Pain score

NBAS

CRIB score

MAIN score

SNAPPE



CONTENT OF THE PRESENTATION

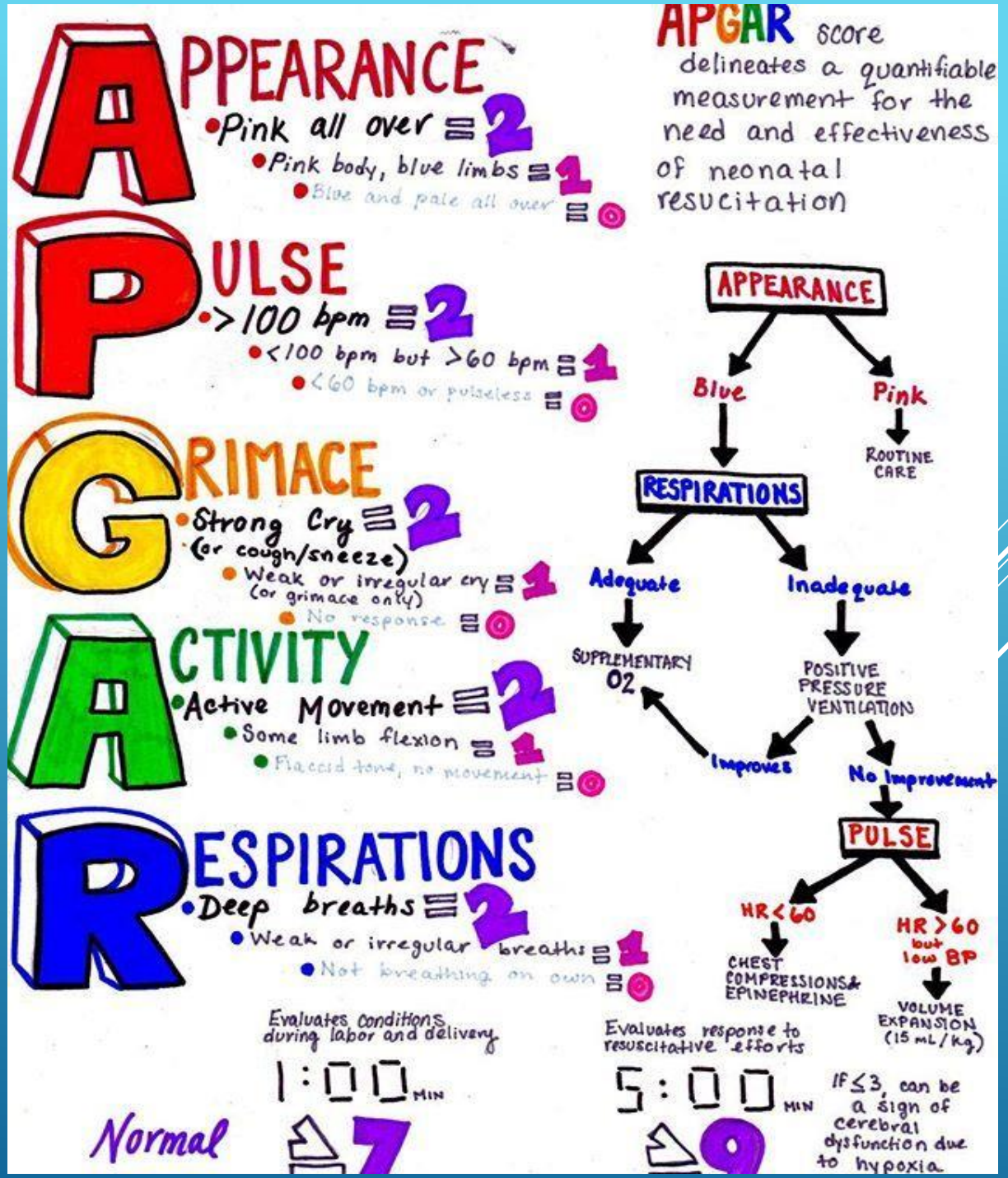
- Assessment before the birth – Obstetrician, antenatal controls
- Assessment immediately after the birth
  - Apgar score
  - Gestational age
- Assessment during the early neonatal period
  - Danger signs, Silverman score, Sepsis score
  - HIE: Sarnat&Sarnat, Finner
- Prediction of the neonatal outcome
  - CRIB score, SNAPPE
  - MAIN score, Perinatal score
- Assessment of the neonatal behavior - NBAS
- Assessment of the procedural pain

APGAR SCORE

- a rapid method of assessing the clinical status of the newborn.
- Limitations of Apgar score: the Apgar score is an expression of the infant's physiologic condition at one point in time, which includes subjective components. There are numerous factors that can influence the Apgar score, including maternal sedation or anesthesia, congenital malformations, gestational age, trauma, and interobserver variability. In addition, the biochemical disturbance must be significant before the score is affected. Elements of the score can be subjective, and partially depend on the physiologic maturity of the infant.
- There is also an expanded Apgar score which may prove to be useful in the setting of delayed cord clamping, where the time of birth, the time of cord clamping, and the time of initiation of resuscitation all can be recorded in appropriate box

APGAR is an acronym for

- **A** Appearance (skin color)
- **P** Pulse (pulse rate)
- **G** Grimace (reflex irritability)
- **A** Activity (muscle tone)
- **R** Respiration (breathing)



Apgar Scoring System

Indicator		0 Points	1 Point	2 Points
A	Activity (muscle tone)	Absent	Flexed arms and legs	Active
P	Pulse	Absent	Below 100 bpm	Over 100 bpm
G	Grimace (reflex irritability)	Floppy	Minimal response to stimulation	Prompt response to stimulation
A	Appearance (skin color)	Blue; pale	Pink body, Blue extremities	Pink
R	Respiration	Absent	Slow and irregular	Vigorous cry

- the Apgar score quantitates clinical signs of neonatal depression, however, it has been inappropriately used to predict individual adverse neurologic outcome.

- The Apgar score does not predict individual neonatal mortality or neurologic outcome, and should not be used for that purpose.

- Limitations of Apgar score: the Apgar score is an expression of the infant's physiologic condition at one point in time, which includes subjective components.

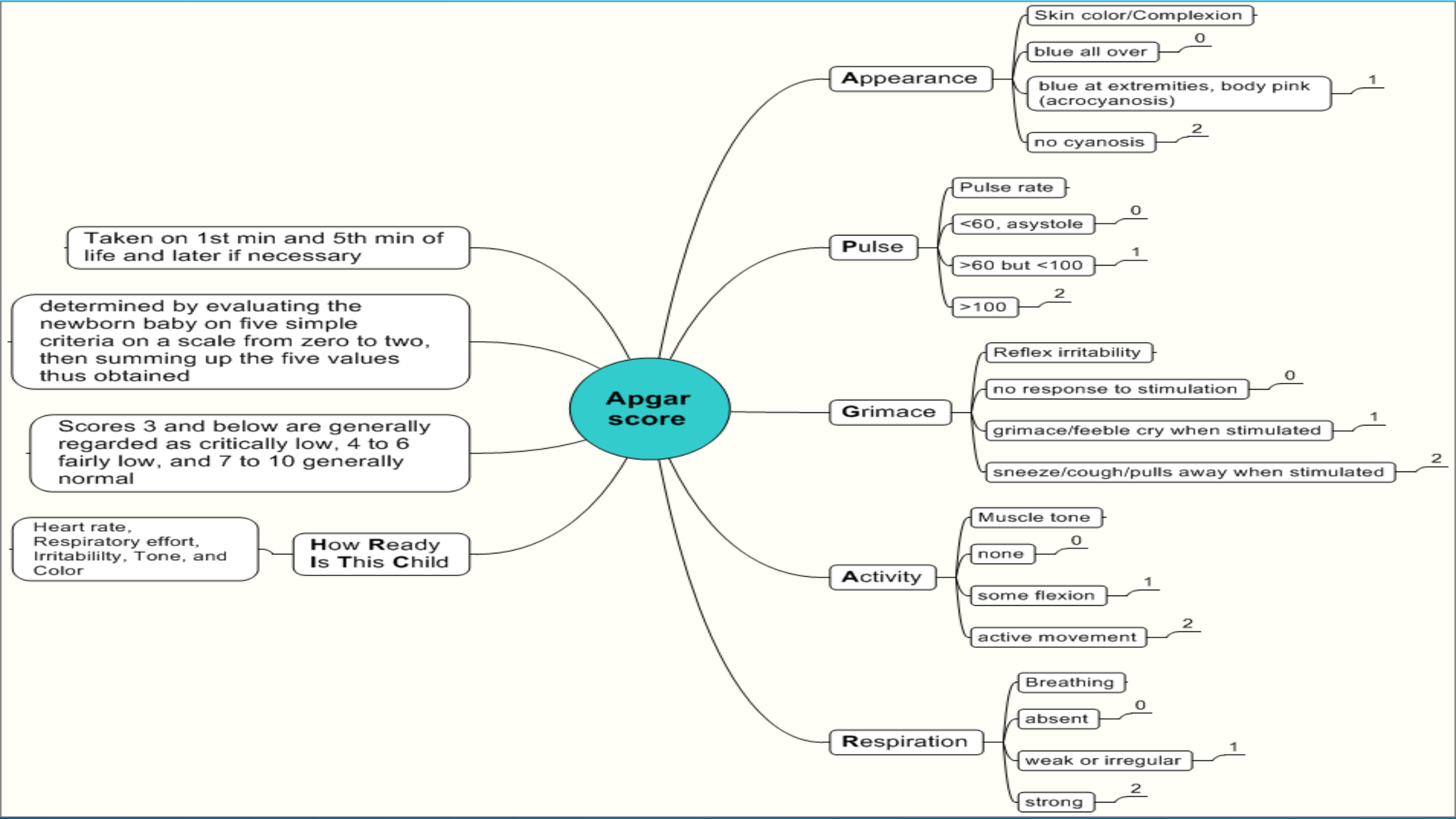
- There is also an expanded Apgar score which may prove to be useful in the setting of delayed cord clamping, where the time of birth, the time of cord clamping, and the time of initiation of resuscitation all can be recorded in appropriate box.

INTERPRETATION

- Apgar score in the first minute
- Apgar score in the fifth minute

- Who carries less risk?
- Apgar score 4/7
- Apgar score 7/7
- Apgar score 5/8
- Apgar score 3/7
- Apgar score 8/5

A score of 10 is uncommon, due to the prevalence of transient cyanosis, and does not substantially differ from a score of 9. Transient cyanosis is common, particularly in babies born at high altitude.


Apgar score
Appearance
Skin color/Complexion
blue all over
0
blue at extremities, body pink (acrocyanosis)
1
no cyanosis
2
Pulse
Pulse rate
<60, asystole
0
>60 but <100
1
>100
2
Grimace
Reflex irritability
no response to stimulation
0
grimace/feeble cry when stimulated
1
sneeze/cough/pulls away when stimulated
2
Activity
Muscle tone
none
0
some flexion
1
active movement
2
Respiration
Breathing
absent
0
weak or irregular
1
strong
2
Taken on 1st min and 5th min of life and later if necessary
determined by evaluating the newborn baby on five simple criteria on a scale from zero to two, then summing up the five values thus obtained
Scores 3 and below are generally regarded as critically low, 4 to 6 fairly low, and 7 to 10 generally normal
How Ready Is This Child
Heart rate, Respiratory effort, Irritabililty, Tone, and Color

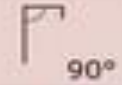
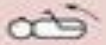
ASSESSMENT OF GESTATIONAL AGE

Estimations of gestational age can be based on:

- Menstrual periods
- Date of conception
- Fetal ultrasonography
- Physical parameters after birth (eg, using scoring systems for estimation of gestational age (Ballard/Dubowitz, Lubschenko and other scores)

- Different scoring systems based on neurological and physical examination are used in the neonatal units for assessment of gestational age. Assessment of gestational age is very much helpful in labelling the newborn to be preterm, term or post–term and to assess the further outcome of the newborn infants. There are two combined clinical systems for such a purpose, Ballard and Dubowitz scoring system, and few other, rarely used, as the methods of Farr, Finnstrom, Lubchenko and Parkin which are based on external criteria, while those of Robinson and Amiel-Tison based on neurological criteria. Although separately neurological and physical criteria can estimate the gestational age but combining them makes the method more accurate.

Neuromuscular maturity

	−1	0	1	2	3	4	5
Posture							
Square window (wrist)	>90°	 90°	60°	45°	30°	0°	
Arm recoil		180°	140–180°	110–140°	90–110°	<90°	
Popliteal angle	180°	160°	140°	120°	100°	90°	<90°
Scarf sign							
Heel to ear							

Physical maturity

Skin	Sticky friable transparent	Gelatinous red, translucent	Smooth pink, visible veins	Superficial peeling &/or rash, few veins	Cracking pale areas rare veins	Parchment deep cracking no vessels	Leathery cracked wrinkled
Lanugo	none	sparse	abundant	thinning	bald areas	Mostly bald	
Plantar surface	heel-toe 40–50 mm: −1 <40 mm: −2	>50 mm no crease	faint red marks	anterior transverse crease only	creases ant. 2/3	creases over entire sole	
Breast	imperceptible	barely perceptible	flat areola no bud	stippled areola 1–2 mm bud	raised areola 3–4 mm bud	full areola 5–10 mm bud	
Eye/ ear	lids fused loosely: −1 tightly: −2	lids open pinna flat stays folded	sl. curved pinna; soft; slow recoil	well-curved pinna; soft but ready recoil	formed & firm instant recoil	thick cartilage ear stiff	
Genitals (male)	scrotum flat, smooth	scrotum empty faint rugae	testes in upper canal rare rugae	testes descending few rugae	testes down good rugae	testes pendulous deep rugae	
Genitals (female)	clitoris prominent labia flat	prominent clitoris small labia minora	prominent clitoris enlarging minora	majora & minora equally prominent	majora large minora small	majora cover clitoris & minora	

Maturity rating

Score	Weeks
−10	20
−5	22
0	24
5	26
10	28
15	30
20	32
25	34
30	36
35	38
40	40
45	42
50	44

Physical maturity

Physical maturity sign	Score							Record score here
	–1	0	1	2	3	4	5	
Skin	sticky friable transparent	gelatinous red translucent	smooth pink visible veins	superficial peeling &/or rash, few veins	cracking pale areas rare veins	parchment deep cracking no vessels	leathery cracked wrinkled	
Lanugo	none	sparse	abundant	thinning	bald areas	mostly bald		
Plantar surface	heel-toe 40–50 mm: –1 <40 mm: –2	>50 mm no crease	faint red marks	anterior transverse crease only	creases ant. 2/3	creases over entire sole		
Breast	imperceptible	barely perceptible	flat areola no bud	stippled areola 1–2 mm bud	raised areola 3–4 mm bud	full areola 5–10 mm bud		
Eye/ear	lids fused loosely: –1 tightly: –2	lids open pinna flat stays folded	sl. curved pinna; soft slow recoil	well curved pinna; soft but ready recoil	formed and firm, instant recoil	thick cartilage ear stiff		
Genitals (male)	scrotum flat, smooth	scrotum empty, faint rugae	testes in upper canal rare rugae	testes descending few rugae	testes down good rugae	testes pendulous deep rugae		
Genitals (female)	clitoris prominent & labia flat	prominent clitoris & small labia minora	prominent clitoris & en-larging minora	majora & minora equally prominent	majora large minora small	majora cover clitoris & minora		
							Total physical maturity score	

Gestational age (weeks)

By dates _____

By ultrasound _____

By exam _____

Source: T. L. Gomella, M. D. Cunningham, F. G. Eyal, D. J. Tuttle: Neonatology: Management, Procedures, On-Call Problems, Diseases, and Drugs, 7th Ed.
www.accesspediatrics.com
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MORBIDITY SCORING SYSTEMS

WHO DANGER SIGNS OF ILLNESS

- Health Organization (WHO) focuses on assessment of general danger signs in the examination of children presenting with illness at health care centers. WHO in 2013 strongly recommended specific danger signs that should be assessed during each postnatal care contact and the new born should be referred for further evaluation if any of the signs are present. The family should also be encouraged to seek health care early if they identify any danger signs in-between postnatal care visits

DANGER SIGNS OF ILLNESS

The danger signs are as follows;

- stopped feeding well,
- History of convulsions,
- fast breathing (breathing rate >60/min)
- severe chest in-drawing,
- no spontaneous movement,
- fever (temperature >37.5 °C),
- low body temperature (temperature

SEPSIS SCORE

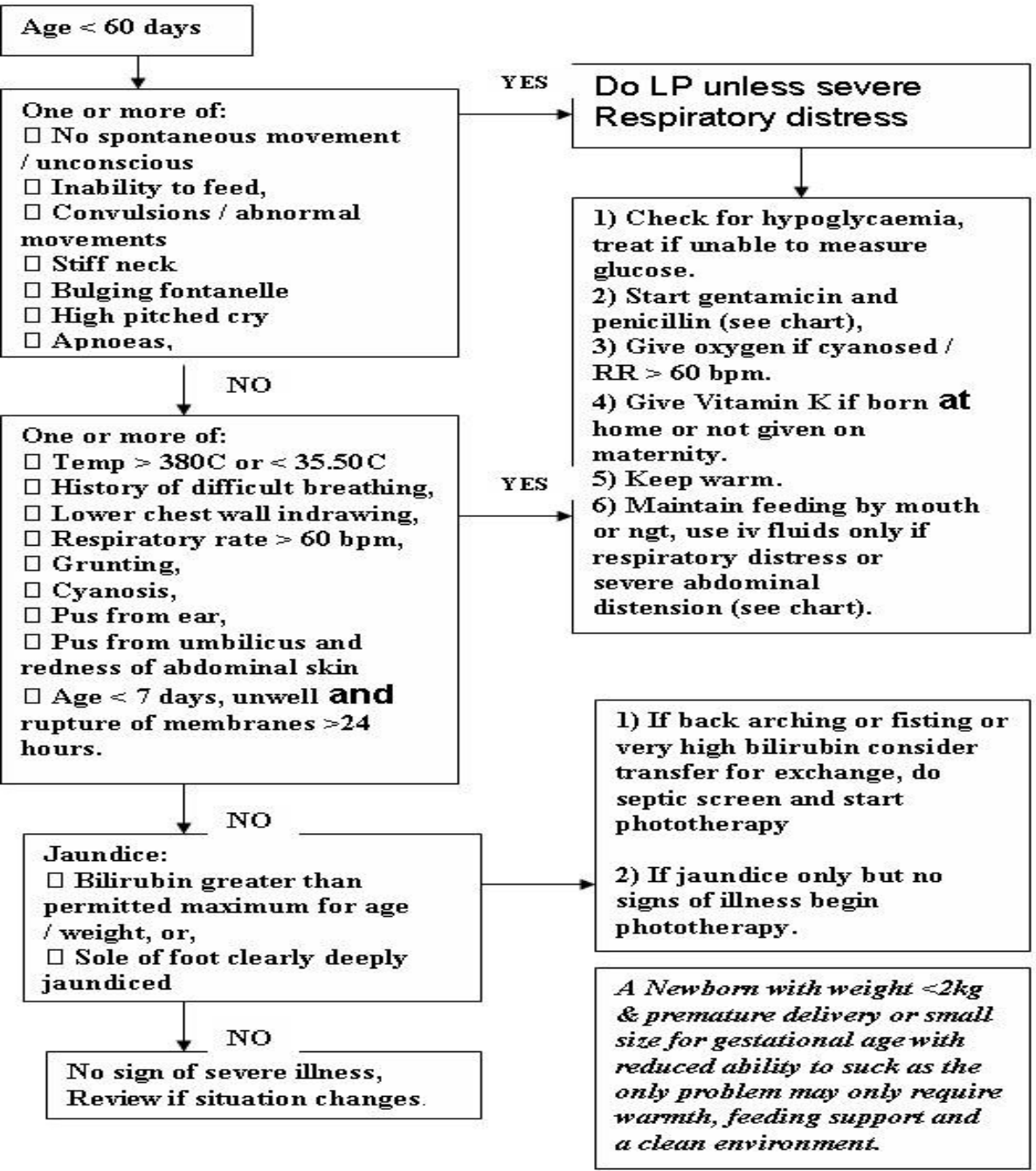
- The tool below is intended for the use of clinicians trained and experienced in the care of newborn infants. Using this tool, the risk of early-onset sepsis can be calculated in an infant born ≥ 34 weeks gestation. The interactive calculator produces the probability of early onset sepsis per 1000 babies by entering values for the specified maternal risk factors along with the infant's clinical presentation.
- **World Sepsis Day 13th september**

Criteria	Abnormality	Score
Total WBC count	≤5,000/μl	1
	≥25,000 at birth	1
	≥30,000—12–24 h	
	≥21,000—Day 2 onwards	
Total PMN count	No mature PMN seen	2
	Increased/decreased	1
Immature PMN count	Increased	1
I:T PMN ratio	Increased	1
I:M PMN ratio	≥0.3	1
Degenerative changes in PMN	Toxic granules/cytoplasmic vacuoles	1
Platelet count	≤150,000/μl	1

Hematological scoring system
The normal values are
Total PMN count—1800–5400
Immature PMN count—600
Immature: Total PMN ratio—0.120
Immature: Mature PMN ratio—≥0.3

Score	Interpretation
≤2	Sepsis is unlikely
3 or 4	Sepsis is possible
≥5	Sepsis or infection is very likely

Neonatal Sepsis / Prematurity / LBW / Jaundice



Scores	Clinical manifestations
1	Apnea, tachypnea, respiratory distress, cyanosis
1	Bradycardia, tachycardia
1	Hypotonia, seizures
1	Poor skin color, poor perfusion
1	Irritability, lethargy, poor feeding
1	Hepatomegaly, splenomegaly, abdominal distension
1	Hypothermia, hyperthermia

Perinatal infection risk score.

Perinatal factor	Risk Score
Foul smelling liquor	2
Unclean vaginal examination done before delivery	2
Duration of labour exceeding 24 hours	2
One minute Apgar score of 0 -6	2
Duration of rupture of membrane before delivery > 24 hours	1
Birth weight 2 kgs or less and / or gestation less than 37 wks	1
Total	10

SEPSIS SCREEN

At Birth

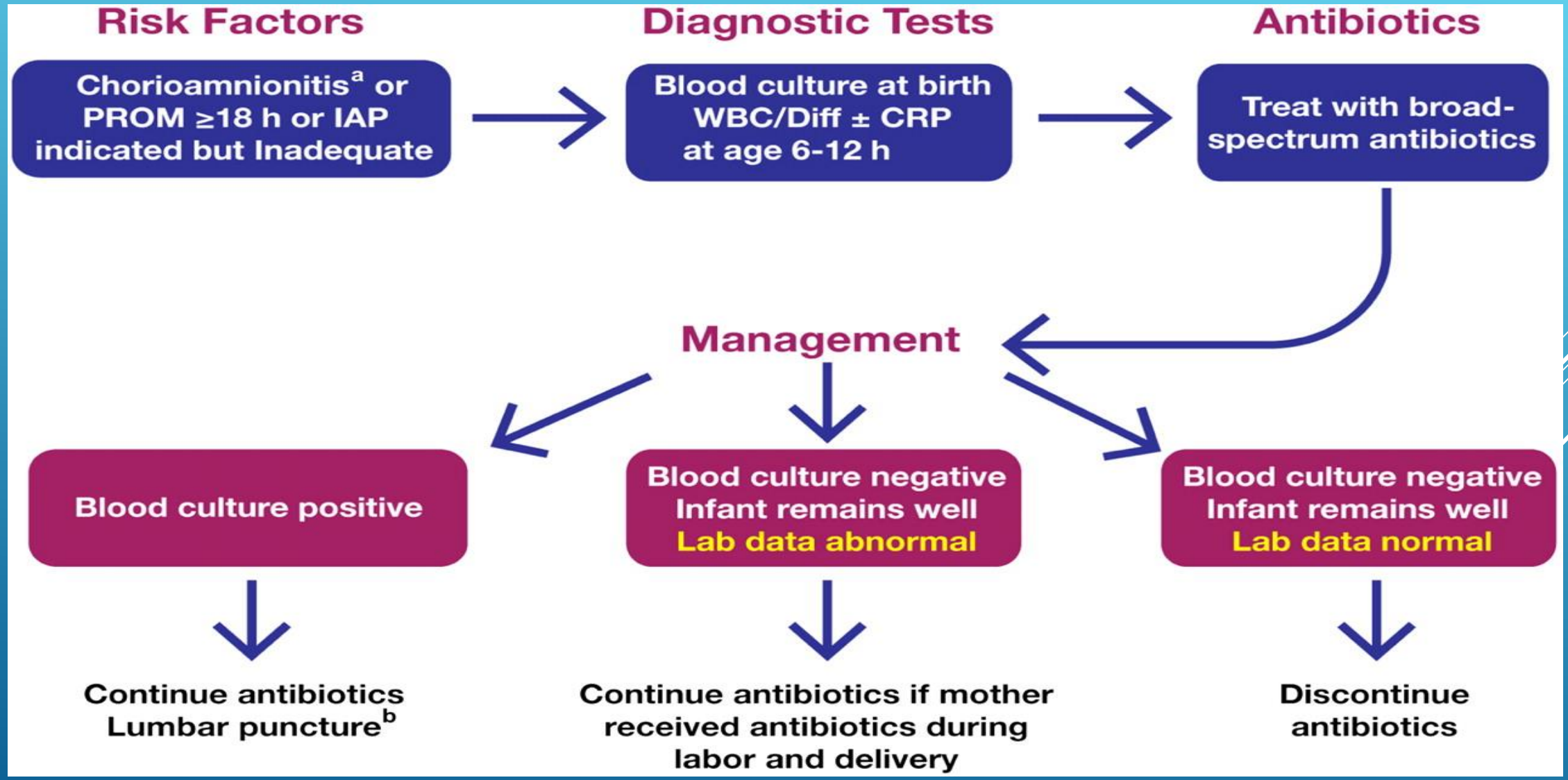
Major risk factors

1. **Rupture of membranes > 24 hrs**
2. **Maternal intrapartum fever > 100.4^0 F (>38oC)**
3. **Chorioamninitis**
4. **Sustained fetal heart rate >160/min**

Minor risk factors

1. **Rupture of membrane > 12 hours**
2. **Maternal intrapartum fever > 99.5^0 F , ≥37.5oC**
3. **Maternal WBC > 15000 / mm^3**
4. **Low apgar score(< 5 at 1 min, < 7 at 5min)**
5. **LBW (< 1500 g)**
6. **Preterm labour (< 37 weeks)**

Evaluation of asymptomatic infants <37 weeks' gestation with risk factors for sepsis. The diagnosis of chorioamnionitis is problematic and has important implications for the management of the newborn infant.



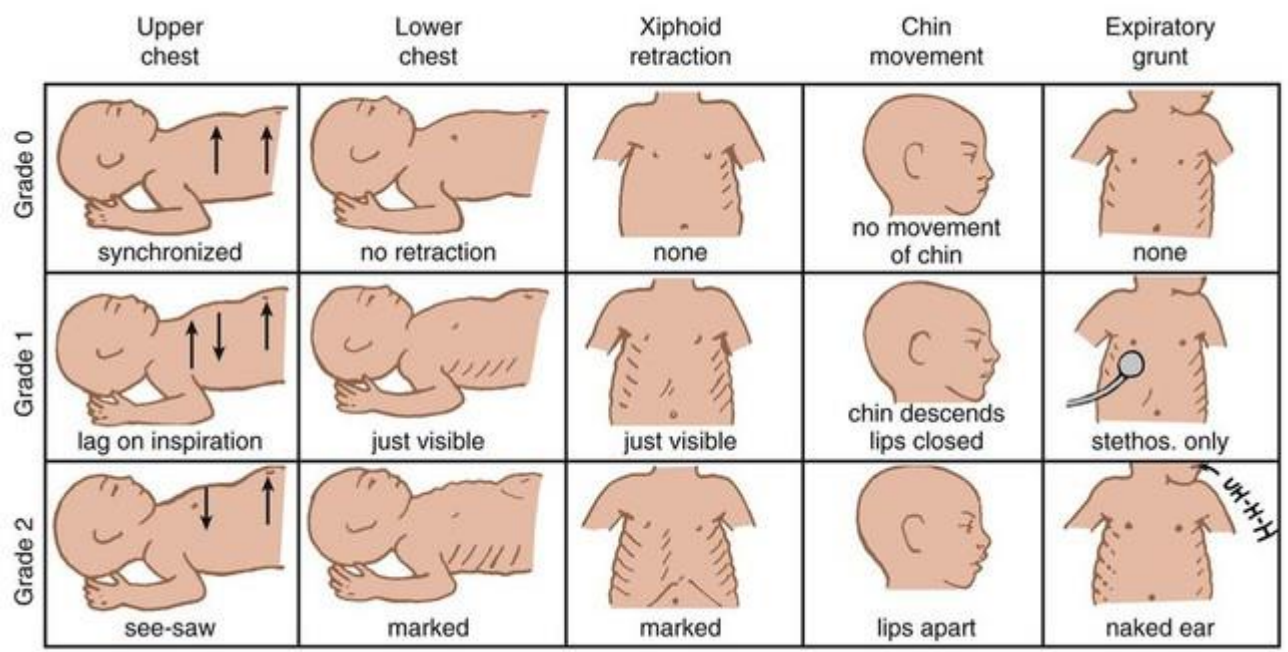
Richard A. Polin, and the COMMITTEE ON FETUS AND NEWBORN Pediatrics 2012;129:1006-1015

Silverman score

Assessment Criteria of RDS:

Clinical Manifestations:

- Tachypnea (80 to 120 breaths/min).
- Dyspnea.
- Substernal retraction.
- Fine inspiratory crackles.
- Audible expiratory grunt.
- Flaring of the nares.
- Cyanosis or pallor.

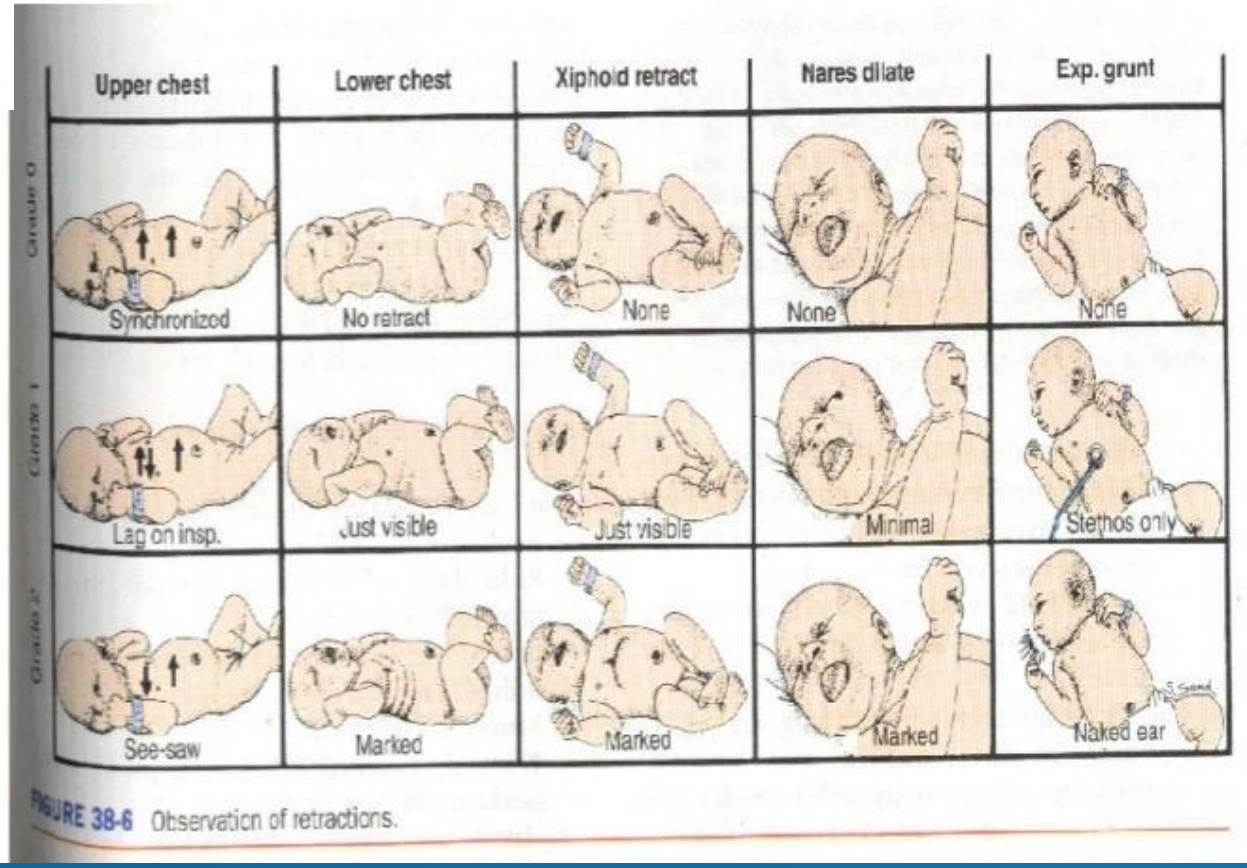


Silverman Scoring System

Silverman Anderson Score

Features	Score 0	Score 1	Score 2
Upper chest movement	Synchronous	Inspiratory lag	See – saw respiration
Lower chest movement	None	Minimal	Marked
Xiphoid retractions	None	Minimal	Marked
Nasal flaring	None	Minimal	Marked
Grunting	None	Audible with steth	Audible without steth

Score >4 indicates clinical respiratory distress
Score >7 indicates impending respiratory failure



Assessment of Severity

Modified Downe's Scoring System

Score	0	1	2
Respiratory Rate (rate/min)	<60	60-80	>80
Cyanosis	None in room air	No cyanosis with oxygen support	Cyanosis in spite oxygen support
Retractions	None	Mild	Moderate to Severe
Grunting	None	Audible with Stethoscope	Audible without Stethoscope
Air Entry	Good	Decreased	Barely Audible

DOWNES' SCORE

Evaluation of RD in NB – Downes' Score

	0	1	2
Cyanosis	None	In room air	In 40% FiO2
Retractions	None	Mild	Severe
Grunting	None	Audible with stetho.	Audible without stetho.
Air entry	C;ear	Decreased	Barely audible
RR	Under 60	60-80	Over 80 or apnea

Score : > 4 = Clinical respiratory distress; monitor ABG

> 8 = Impending respiratory failure

ESTIMATION OF THE SEVERITY OF THE HYPOXIC-ISCHEMIC ENCEPHALOPATHY (HIE)

- Still, the original Sarnat&Sarnat classification is the scoring system with high specificity- 100% for severe HIE, in detecting neonates who may not have convulsions by 6 months.
- The positive predictive value to predict convulsions were found to be 63.6% for moderate HIE and 100% for severe HIE. Modifications are made by Portman and Finner.
- The newest modification is that of Thompson, with very high specificity and sensitivity.

SCORING SYSTEM FOR HIE (SARNAT&SARNAT)

Severity	Stage 1 (Mild)	Stage 2 (Moderate)	Stage 3 (Severe)
Level of consciousness	Hyperalert	Lethargic or Obtunded	Stupor or coma
Activity	Normal	Decreased	Absent
Neuromuscular Control			
Muscle Tone	Normal	Mild hypotonia	Flaccid
Posture	Mild distal flexion	Strong distal flexion	Intermittent decerebration
Stretch Reflexes	Overactive	Overactive	Decreased or absent
Complex or primitive reflexes			
Suck	Weak	Weak or absent	Absent
Moro (Startle)	Strong	Weak	Absent
Tonic neck	Slight	Strong	Absent
Autonomic Function			
Pupils	Mydriasis	Miosis	Variable
Heart Rate	Tachycardia	Bradycardia	Variable
Seizures	None	Common	Uncommon

doi:10.1371/journal.pone.0122116.t002

Hypoxic-Ischemic Encephalopathy in Term Infants
SARNAT AND SARNAT STAGING

SIGNS	STAGE 1	STAGE 2	STAGE 3
Level of consciousness	Hyperalert	Lethargic	Stuporous, coma
Muscle tone	Normal	Hypotonic	Flaccid
Posture	Normal	Flexion	Decerebrate
Tendon reflexes/clonus	Hyperactive	Hyperactive	Absent
Myoclonus	Present	Present	Absent
Moro reflex	Strong	Weak	Absent
Pupils	Mydriasis	Miosis	Unequal, poor light reflex
Seizures	None	Common	Decerebration
EEG	Normal	Low voltage changing to seizure activity	Burst suppression to isoelectric
Duration	<24 hr if progresses; otherwise, may remain normal	24 hr to 14 days	Days to weeks
Outcome	Good	Variable	Death, severe deficits

HIE: Classification

CLASSIFICATION OF HIE (LEVENE)

Feature	Mild	Moderate	Severe
Consciousness	Irritable	Lethargy	Comatose
Tone	Hypotonia	Marked	Severe
Seizure	No	Yes	Prolonged
Sucking / Resp.	Poor Suck	Unable to suck	Unable to sustain spont. Resp.

Sign	0	1	2	3
Tone	Normal	Hyper	Hypo	Flaccid
Level of consciousness	Normal	Hyperalert/stare	Lethargic	Comatose
Fits	None	<3 per day	>2 per day	
Posture	Normal	Fisting, cycling	Stron distal flexion	Decerebrate
Moro	Normal	Partial	Absent	
Grasp	Normal	Poor	Absent	
Suck	Normal	Poor	Absent, bites	
Respiration	Normal	Hyperventilation	Brief apnea	IPPV (apnea)
Fontanel	Normal	Full not tense	Tense	

IPPV – Intermittent positive pressure ventilation

Levene Staging

Feature	Mild	Moderate	Severe
Consciousness	Irritability	Lethargy	Comatose
Tone	Hypotonia	Marked Hypotonia	Severe Hypotonia
Seizures	No	Yes	Prolonged
Sucking/Respiration	Poor Suck	Unable to Suck	Unable to sustain spontaneous respiration

Thompson Score

Sign	0	1	2	3
Tone	normal	hyper	hypo	flaccid
LOC	normal	hyperalert, stare	lethargic	comatouse
Fits	none	< 3 per day	> 2 per day	
Posture	normal	fisting, cylcing	strong distal flexion	decerebrate
Moro	normal	partial	absent	
Grasp	normal	poor	absent	
Suck	normal	poor	absent ± bites	
Respir	normal	hyperventilation	brief apnea	IPPV (apnea)
Fontanell	normal	full, not tense	tense	

Date							
Time							
Tone							
LOC							
Fits							
Posture							
Moro							
Grasp							
Suck							
Respir							
Fontanell							
TOTAL							

Thompson CM, Puterman AS, Linley LL, Hann FM, van der Elst CW, Molteno CD, Malan AF. The value of a scoring system for hypoxic ischaemic encephalopathy in predicting neurodevelopmental outcome. Acta Paediatr 1997; 86: 757-61

FINEGAN SCORE

	Time →									
CNS		Score								
Cry	Highpitched, possible to soothe	2								
	Highpitched, not possible to soothe	3								
Sleep	Sleeps < 3 h after feed	1								
	Sleeps < 2 h after feed	2								
	Sleeps < 1 h after feed	3								
Moro-reflex	Over active	2								
	Very over active	3								
Tremor	Moderate tremors disturbed	1								
	Severe tremors disturbed	2								
	Moderate tremors undisturbed	3								
	Severe tremors undisturbed	4								
	Scratch marks	1								
Tone	Increased muscle tone	2								
Seizures	Myoclonic jerks	3								
	Generalised seizures	5								
Respiratory										
Yawning	Frequent yawning >3-4/interval	1								
Nose	Congested nose	1								
Sneezing	>3-4 times/interval	1								
	Nasal flaring	2								
Tachypnea (>60/min)	No retractions	1								
	With retractions	2								
Gastrointestinal										
Sucking behaviour	Excessive sucking	1								
Feeding	Poor feeding	2								
Vomiting	Regurgitation	2								
	Projectile vomiting	3								
Stool	Loose	2								
	Watery	3								
Other symptoms										
	Sweating	1								
Fever	37.2-38.2°C	1								
	>38.2°C	2								
Colour	Mottling	1								
TOTAL SCORE										

SCORING SYSTEMS FOR PROGNOSIS

Mainly, statistical scores

- CRIB score (clinical risk factor score)
- SNAPPE (Score of Neonatal Acute Physiology PerinatalExtension)
- MAIN score(morbidity assessment index for newborns)
- Survival index in low birth weight infants
- Perinatal risk score
- Neonatal scale of morbidity

CRIB SCORE

CRIB (Clinical Risk Index for Babies)

CRIB score is a validated measure of initial mortality risk and illness severity within one hour of admission that contains only few variables. It is simple to calculate and non subjective. It is useful in identifying high-risk neonates, auditing of neonatal units and also provides a standardized mortality rate for performance comparison among neonatal units.

CRIB score takes into account the birth weight, gestational age, body temperature, base excess and sex of the baby to determine initial mortality risk.

The total CRIB score ranges from 0 to 27. The scores have further been classified into four levels as follows:

- Level 1 0 to 5
- Level 2 6 to 10
- Level 3 11 to 15
- Level 4 above 15

The higher the score, the poorer the prognosis, with worst prognosis in level 3 and 4

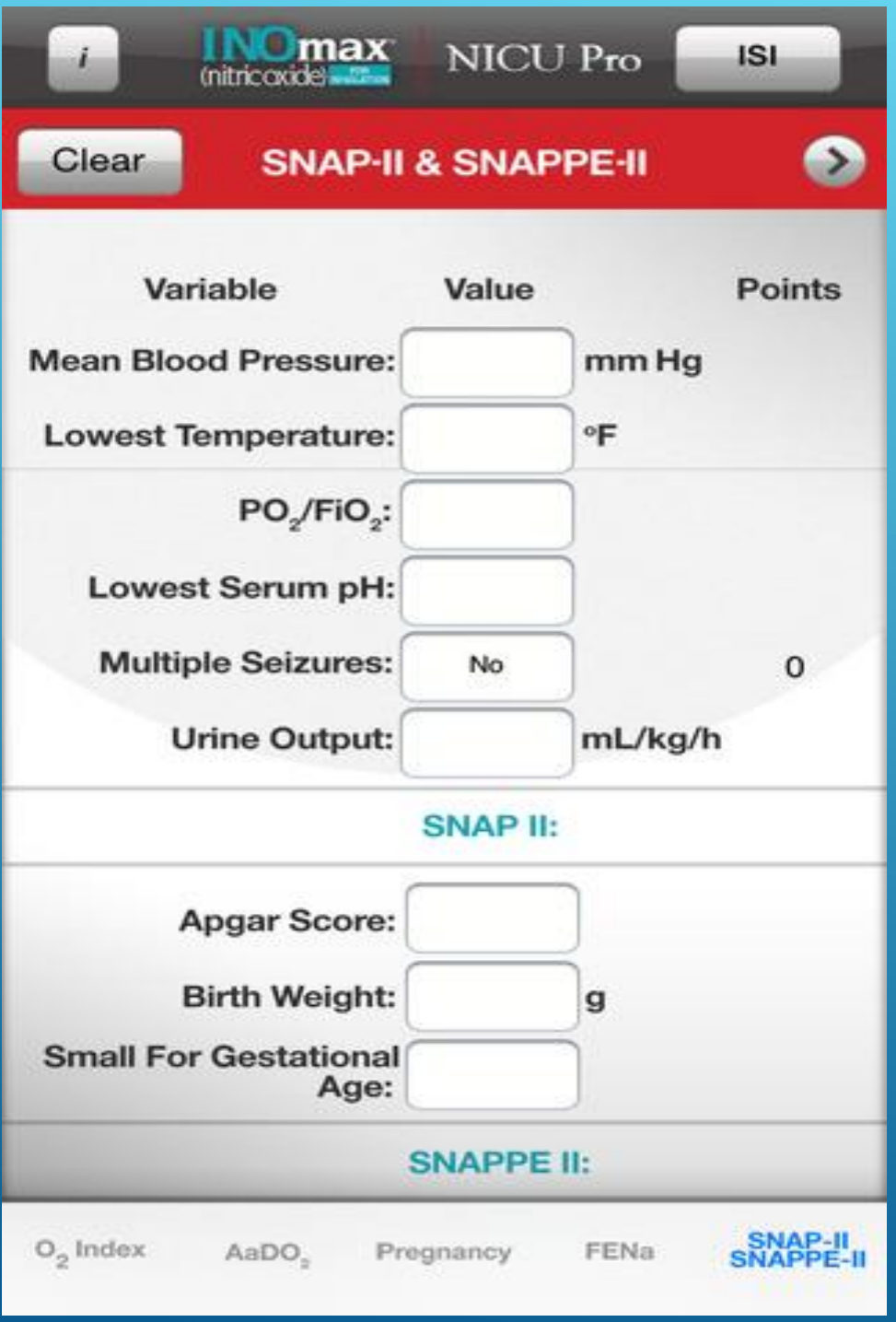
Variable	Values	Points
1. Gestation (weeks)		
	>24	0
	<24	1
2. Birth weight (g)		
	>1350g	0
	851-1350 g	1
	701-850 g	4
	< 700g	7
3. Congenital Malformation	No imminent life threatening	1
	With imminent life threatening	3
4. Maximum Base Excess (BE)		
	> -7.0 mmol/l	0
	- 7.0 to – 9.9 mmol/l	1
	- 10.0 to - 14.9 mmol/l	2
	< -15.0 mmol/l	3
5. Minimum appropriate Fio2 in first 24hrs		
	<0.4	0
	0.41 – 0.80	2
	0.81 – 0.90	3
	0.91 – 1.00	4
6. Maximum appropriate Fio2 in first 24hrs		
	<0.4	0
	0.41 – 0.80	1
	0.81 – 0.90	3
	0.91 – 1.00	5

Score of Neonatal Acute Physiology PerinatalExtension (SNAP-PE)

-An organ system, physiologic-based severity of illness index developed specifically for evaluating neonatal intensive care
-Based on objective physiologic measurements obtained from routine clinical tests and vital signs

-Contains 34 items that are scored from zero to five representing the worst physiologic derangement in the first 24 hours

-A major predictor of mortality, which is independent of birth weight



Scores	Variables
SNAPPE-II	Birth weight
	Mean blood pressure
	Lowest temperature
	PO2/FiO2 ratio
	Lowest serum pH
	Urine output
	Multiple seizures
	Apgar Score at 5 min
	Small for gestational age <3rd percentile
MDAS	Metabolic acidosis
	Neutropenia
	Left shift of segmented neutrophils
	Hyponatremia
	Bacteremia
	Trombocytopenia
	Hypotension

The values of SNAPPE-II and MDAS were taken from [11, 12]

MAIN (MORBIDITY ASSESSMENT INDEX FOR NEWBORNS)

Morbidity Assessment Index for Newborns (MAIN), a validated outcome scale designed for ranking neonatal morbidity beyond 28 weeks' gestation.

-Focus is to detect clinically important effects of obstetric intervention

-Items included are clinical and laboratory data that are easily collected from the usual clinical records

-The final inventory includes 47 clinically relevant pathophysiologic items describing morbidity at birth, based on 24 attributes, and collapsed into four categories (severe, moderate, mild and no morbidity) for statistical analysis, losing much of the score's detailed information.

NBAS - *BRAZELTON NEONATAL BEHAVIORAL ASSESSMENT SCALE*

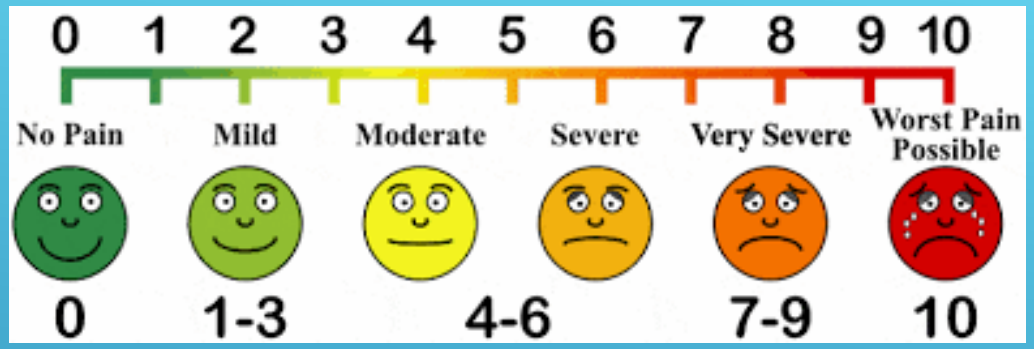
- The NBAS attempts to capture the behaviors of the neonate fighting with the negative stimuli, and controls interfering motor and autonomic responses in order to attend to important social and nonsocial stimuli.
- This assessment has been shown to improve developmental outcomes by enhancing the infant-caregiver relationship, and provides health visitors with the opportunity to consolidate their relationship of trust with families.[26]
- The NBAS is a multidimensional, multi-item scale and the basic score sheet includes 27 behavioral items, 18 reflex items, and 6 supplementary items. The supplementary items were constructed to measure the quality of the baby's responsiveness, the help the examiner has to invest to get the infant's optimal performance, and also the response of the examiner to the infants.

The Neonate's Health
Measuring Neonatal Health

- Brazelton Neonatal Behavioral Assessment Scale (NBAS)
  - Rates neonates on 27 items
  - Receives rating of worrisome, normal or superior
  - Most effective if given at one day and a week later
  - Can help parents interact with infants
  - Useful in research on cultural differences in parenting practices

Brazelton Scale

- Includes tests of infant reflexes, motor capacities, muscle tone, capacity for responding to objects and people, capacity to control own behavior, attention
  - Orientation to animate objects (visual/auditory)
  - Pull-to-sit (e.g., try to right his head)
  - Cuddliness (e.g., resist, passive, tries to cuddle)
  - Defensive movements (e.g., try to remove cloth from face)
  - Self-quieting activity (e.g., suck thumb, look around)



PAIN SCORE

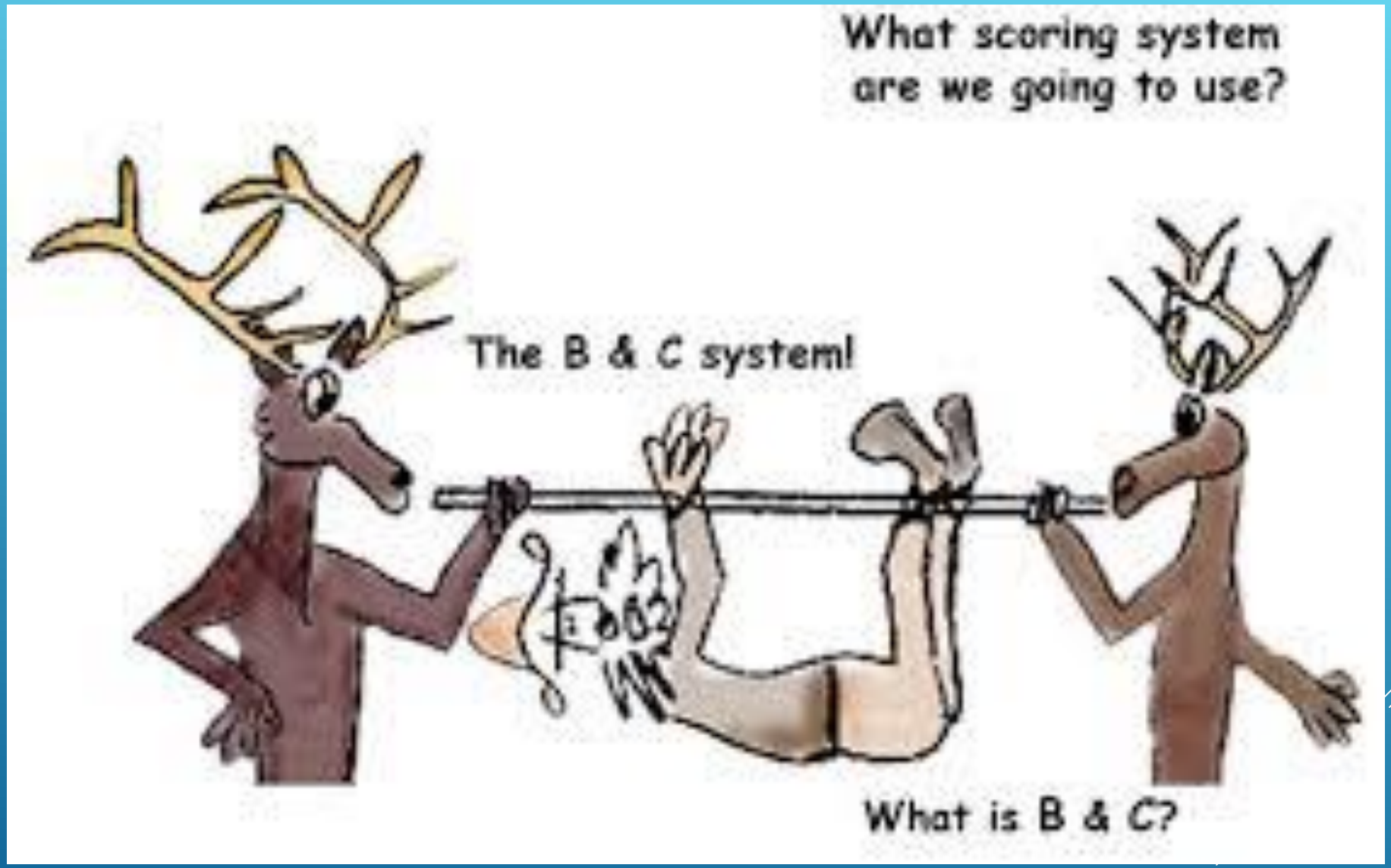
COMPARATIVE PAIN SCALE CHART (Pain Assessment Tool)

0 Pain Free	1 Very Mild	2 Discomforting	3 Tolerable	4 Distressing	5 Very Distressing	6 Intense	7 Very Intense	8 Utterly Horrible	9 Excruciating Unbearable	10 Unimaginable Unspeakable
No Pain	**Minor Pain**			**Moderate Pain**			**Severe Pain**			
Feeling perfectly normal	Nagging, annoying, but doesn't interfere with most daily living activities. Patient able to adapt to pain psychologically and with medication or devices such as cushions.			Interferes significantly with daily living activities. Requires lifestyle changes but patient remains independent. Patient unable to adapt pain.			Disabling; unable to perform daily living activities. Unable to engage in normal activities. Patient is disabled and unable to function independently.			

NEONATAL THERAPEUTIC INTERVENTION SCORING SYSTEM (NTISS)

-Includes 70 therapies unique to neonatal intensive care, assigned a weight of one to four points by an expert panel, based on therapeutic intensity and complexity
-Score can be easily abstracted from medical records
-Provides information beyond traditional measures such as birth weight

Directly and strongly related to in-hospital mortality, length of hospital stay, clinicians' estimates of mortality risk, and total hospital charges
-But the measure is independent of birth weight and gestational age
-Appears to be problematic for infants who die within the first few hours of life


What scoring system are we going to use?
The B & C system!
What is B & C?