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Measures of Neonatal Morbidity

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Section A

Conventional Measures of Neonatal Morbidity

Conventional Measures of Neonatal Morbidity

- General broad measures
  - LBW: Less than 2,500 grams
  - Preterm birth: Less than 37 weeks of gestation
  - Low Apgar score
- Reason: Readily available from routine records/birth certificates
- Advantage: Covers large populations

Continued

Conventional Measures of Neonatal Morbidity

- Disadvantages
  - Do not capture the full range (or degree of severity) of complications in the neonate
  - Fail to characterize morbidity after the first few moments of life
  - Exclude a large number of infants with problems in the neonatal period

Continued

Conventional Measures of Neonatal Morbidity

Birth Weight

- Excellent agreement of birth weight, as reported on birth certificates, when compared with hospital records
- Maternal reports of infant's birth weight are also highly accurate
  - Washington HMO: 91% agreement, only 1% disagree by over 8 oz.

Continued

Conventional Measures of Neonatal Morbidity

Birth Weight

- Maternal reports of infant's birth weight are also highly accurate
  - Two Jerusalem Hospitals: 75% accurate within 100 gm, only 8% more than 300 gm.
- Recall of one's own birth weight by adult women is more problematic

Continued

Conventional Measures of Neonatal Morbidity

Low Birth Weight

- Selected by Yippo because it was the point at which the maximum deceleration in the death rate occurred in relation to birth weight
- Data from Wilcox and Russell show the relevance of this criterion today (includes vast majority of births in their residual distribution)

Continued

Conventional Measures of Neonatal Morbidity

Apgar Score

- Developed by anesthesiologist Virginia Apgar to increase the awareness of obstetricians and other birth attendants of the status of the newborn
- Measured at one and five minutes (ten minutes for newborns slow to adjust to their new environment)

Continued

Conventional Measures of Neonatal Morbidity

Apgar Score

- Scores five aspects of newborn's condition on a scale of 0–2
  - Heart rate (pulse)
  - Respiratory effort (respiration)
  - Muscle tone (activity)
  - Reflex irritability (grimace)
  - Color (appearance)

Continued

Conventional Measures of Neonatal Morbidity

Apgar Score

- Values for each item are summed to achieve the total score
- General appraisal of scores
  - 7–10—Satisfactory
  - 4–6—Infant moderately depressed
  - 0–3—Infant requires emergency procedures

Continued

Conventional Measures of Neonatal Morbidity

Apgar Score

- Excellent indicator of an infant's need for resuscitation and predictor of mortality for LBW infants
- Shown also among term births in Norway

Continued

Conventional Measures of Neonatal Morbidity

Apgar Score

- Controversies about Apgar scores
  - Apgar scores alone are not evidence of sufficient hypoxia that results in neurologic damage

Continued

Conventional Measures of Neonatal Morbidity

Apgar Score

- Controversies about Apgar scores
  - They are dubious as a measure of asphyxia
  - Scores are difficult to evaluate for pre-term infants

Continued

Conventional Measures of Neonatal Morbidity

Apgar Score

- Controversies about Apgar scores
  - Of questionable predictive value for sequelae related to neurological or developmental problems (although a recent Norwegian study shows a strong correlation of low Apgar scores with CP among term births)

Infant's Length of Stay in the Nursery

Advantages:

- Associated with delayed congenital anomalies, developmental delays and hospitalization in the first year
- Can be easily measured from abstraction of medical records or from hospital discharge data

Continued

Infant's Length of Stay in the Nursery

Disadvantages:

- Measured after the fact, so not appropriate for clinical use (except to identify high risk infants for follow-up)
- Some variation in length of stay due to institutional differences in health care practices (primarily related to mean values, not extremes)

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Section B

Alternative Measures of Neonatal Morbidity

Specific Clinical Entities

Respiratory Disease Distress Syndrome

- Classification systems available which utilize signs and symptoms and laboratory criteria
  - For example, severity of RDS measures use ventilator therapy, blood gas values, oxygen therapy, and radiological classification

Neurological Examination of the Newborn (Allen and Capute)

- Assessment of the following:
  - Posture, extremity and axial tone
  - Deep tendon reflexes, pathologic reflexes, primitive reflexes
  - Symmetry, oromotor function, cranial nerve function, auditory and visual responses
  - Behavior (jitteriness, irritability, lethargy, consolability)

Continued

Neurological Examination of the Newborn (Allen and Capute)

- High correlation with neurological/ developmental outcome at one year
- Useful even in extremely pre-term infants with chronic lung disease and infants with brain hemorrhage
- Relationship to other morbidity is unclear
- Summary score is not computed

Neonatal Risk Score of Hobel

- 35 factors arbitrarily selected and scored by Hobel, et al.
- Based on the results of perinatal studies and personal clinical experience
  - Factors generally include a morbid condition or signs and symptoms of morbidity

Continued

Neonatal Risk Score of Hobel

- Each factor is assigned a weight of one, five, or ten depending on its presumed value in predicting neonatal mortality
- The overall score represents the weighted sum of the values of each factor present in the newborn
- The weights appear unnecessary; a sum of the risk factors yield the same results as the score using the weights

Continued

Neonatal Risk Score of Hobel

- Self-weighting concept is supported in the score
- The most severe conditions occur in concert with several other conditions
- The score is highly correlated with length of nursery stay
- The score with factors occurring after birth give higher correlation with length of nursery stay than score of events measured at birth

Continued

Neonatal Risk Score of Hobel

- The score measures morbidity in the normal weight infant
- The relation of the score with subsequent morbidity is not established
- Seldom used, despite evaluation of the measure

Morbidity Assessment Index for Newborns (MAIN)

- Developed as a global measure of morbidity consisting of clinically relevant items that can reliably discriminate between two outcomes across a spectrum of severity of illness
- Focus is to detect clinically important effects of obstetric intervention

Continued

Morbidity Assessment Index for Newborns (MAIN)

- 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

Continued

Morbidity Assessment Index for Newborns (MAIN)

- Assessment of the index included
  - Evaluation of the “face” or “content” validity of items
  - Construct validation: Item analysis, internal consistency (dimensionality), degree items fit into the underlying construct, item contributed additional information above and beyond other items

Neonatal Therapeutic Intervention Scoring System (NTISS)

- Assesses severity of illness indirectly through the therapy given by the physician rather than through the direct measurement of physiologic status

Continued

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

Continued

Neonatal Therapeutic Intervention Scoring System (NTISS)

- 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

Score of Neonatal Acute Physiology Perinatal Extension (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

Continued

Score of Neonatal Acute Physiology Perinatal Extension (SNAP-PE)

- 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

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Section C

Measures of Infant Health Status

Measures of Infant Health Status

- Very limited area of development
- Hospitalization of the infant: 10-15% in most samples
- Global measures of health status
- Four and nine month *Pediatric Complications Scales* of Littman and Parmalee
  - A mix of growth, illnesses, anomalies, deficits, and behavioral problems

Continued

Measures of Infant Health Status

- Four and nine month *Pediatric Complications Scales* of Littman and Parmalee
  - Show only small correlations with measure of infant or early childhood development status

Conclusions: Measures of Neonatal Morbidity

- Global measures
  - Readily available
  - Miss considerable morbidity
- More specific measures
  - Specific disease focus
  - Summary scores
    - Used to evaluate OB practice
    - Used to evaluate NICU

Continued

Conclusions: Measures of Neonatal Morbidity

- More specific measures
  - Require access to and use of clinical records
    - Considerable time to obtain data
  - Not widely used except for specific diseases or limited focus of studies
- No good measures of infant morbidity