NAS = neonatal abstinence syndrome

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PEDiatric PHarmacology AND TOXICOLOGY AND NEONATOLOGY
NAS

• DEFINITION – CONSTELLATION OF BEHAVIORAL AND PHYSIOLOGICAL SIGNS AND SYMPTOMS ASSOCIATED WITH OPIOID WITHDRAWAL THAT ARE MARKEDLY DIFFERENT FROM EACH OTHER BASED ON THE CAUSATIVE AGENT.

• CONFINED TO DRUGS OF ABUSE OR CNS DRUGS AND NOT USE OF ALCOHOL, SMOKING, INSULIN, ETC IN THE MOTHER NOR ADDICTION TO FENTANYL OR MORPHINE USED FOR PAIN OR CONTROL IN THE NEWBORN.- 5 DAYS -FENTANYL
CONSEQUENCES OF NAS

• IN THE OFFSPRING (OS), NAS IS A LEADING PREVENTABLE CAUSE OF MENTAL, PHYSICAL, AND PSYCHOLOGICAL PROBLEMS IN NEWBORNS, INFANTS AND CHILDREN

• IN THE MOTHER/FATHER- CONSEQUENCES INCLUDE LEGAL, HEALTH, AND ECONOMIC

• THREE % OF 4.1 MILLION WOMEN OF CHILDBEARING AGE WHO ABUSE DRUGS CONTINUE DRUG USE DURING PREGNANCY
DRUGS FREQUENTLY ASSOCIATED WITH NAS

- OPIATES AND NARCOTICS

<table>
<thead>
<tr>
<th>Drug</th>
<th>Other Name</th>
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<tbody>
<tr>
<td>Codeine</td>
<td></td>
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<tr>
<td>Methadone</td>
<td>Methadone (Dolophine)</td>
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<tr>
<td>Oxycodone</td>
<td>Hydromorphone (Dilaudid)</td>
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<tr>
<td>Morphine</td>
<td>Butorphan (Stadol)</td>
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<tr>
<td>Pentazocine</td>
<td>Propoxyphene (Darvon)</td>
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<tr>
<td>Heroin</td>
<td>Chlordiazepoxide</td>
</tr>
<tr>
<td>Buprenononorphine</td>
<td>Mixed agonist/antagonist</td>
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</tbody>
</table>
OTHER DRUGS FREQUENTLY ASSOCIATED WITH NAS-MECH ACT?

• OTHER DRUGS
  – BARBITURATES* PHENCYCLIDINE COCAINE(?)
  – ETHANOL* MARIJUANA NICOTINE
  – DIAZEPAM  * LORAZEPAM
  – GLUTHETHIMIDE MEPROBAMATE CAFFEINE
  – ETHCHORVYNOL CLOMIPRAMINE
  – SELECTIVE SEROTONIN REUPTAKE INHIBITORS (SSRIs)
  – ANTIHISTAMINES (DIPHENHYDRAMINE, HYDROXYZINE)
  – POLYDRUG USE???????????????????? FOR ABOVE ETC
OTHER DRUGS OF ABUSE

• CNS STIMULATANTS- AMPHETAMINES, COCAINE, DEXTROAMPHETAMINES, FENFLURAMINE,....

• CNS DEPRESSANTS- ALCOHOL, BARB, BENZODIAZEPINES, QUAAALUDES, CHLORAL HYDRATE (MICKEY FINN), MARIJUANA....

• HALLUCINOGENS- LSD, DMT, PSILOCIN, PEYOTE, MESCALINE, INHALANTS, SOLVENTS AND AEROSOLS (GLUE, GASOLINE, PAINT THINNER, NAIL POLISH REMOVER, FREON), NITRATES, NITROUS OXIDE....
PATHOPHYSIOLOGY

• FETAL / NEONATAL ADDICTION IS DUE TO THE PASSAGE OF THE DRUG ACROSS THE PLACENTA.
  - ALL CHEMICALS WITH FEW EXCEPTIONS – SUCH AS ACETALDHYDE
• M/P/F RATIOS -DEPENDANT ON SPECIFIC DRUG
• CNS DRUGS ARE GENERALLY HIGHLY LIPOPHILIC AND HAVE LOW MOLECULAR WT.
• ACCUMULATE IN FETUS DUE TO DECREASED CLEARANCE (RENAL AND HEPATIC)
NAS- MULTISYSTEM DISORDER

• CNS, GI, AUTONOMIC, RESPIRATORY
• MANIFESTATIONS DEPENDS ON
  – DRUG
  – DOSE
  – FREQUENCY
  – OFFSPING CAPACITY TO CLEAR
  – LAST INTRAUTERINE DOSE & MATERNAL CLEARANCE
TIME TO WITHDRAWAL

• GENERALLY A FUNCTION OF THE T1/2 OF THE DRUG IN MOM & DEEP FETAL COMPARTMENTS
• THE LONGER THE T1/2; LATER THE ONSET OF W/D
• THE LONGER THE T1/2; LESS LIKELIHOOD THAT NAS WILL APPEAR IN THE NEWBORN/INFANT
• SPECIFIC EFFECTS ARE DUE TO THE DRUG ITSELF, FREQUENCY OF ABUSE, EXPOSURE DURING WHICH GESTATIONAL PERIOD, INTERNAL DOSE
TIMING OF WITHDRAWAL

• OPIATES- HEROIN- SHORT T1/2- W/D @24HR, 48-72 HRS (50-80%), UPTO 6 DAYS

• SEDATIVE HYPNOTICS- BENZODIAZEPINES/BARBITURATES-W/D MAY NOT START UNTIL AFTER D/C

• METHADONE- T1/2 IS > 24 HRS;- MAY APPEAR @ 48 HRS & USUALLY LONGER (7-14 DAYS)-SUBACCUTE SIGNS 1-6MOS

• COCAINE- USUALLY 2-3 DAYS, CAN BE 7 DAYS. ?NAS VS EFFECT. 6-33% HAD SCORES TO RX

• SSRI- FLUOXETINE, SERTRALINE, PAROXETINE, ETC- USUALLY APPEAR AT FEW HRS/DAYS- GONE 1-2W
METHADONE EFFECTS

• Methadone – IN MOM DECREASES ILLICIT DRUG BEHAVIOR, IMPROVES PRENATAL CARE & IMPROVES OS OUTCOME (DECR. NAS) & PREVENTS ACUTE MATERNAL W/D THAT IS ASSOCIATED WITH FETAL DEATH & DISTRESS

• CAUSES NAS-DUE TO LONG T1/2 – 24-HRS- MAY NOT BE APPARENT 7-14 DAYS, 1-6 MOS SUBACUTE EFFECTS

• ASSOCIATED WITH (?) + /- INCREASED RISK OF FETAL DISTRESS AND DEMISE, IUGR, SIDS, AND THROMBOCYTOPENIA IN 2ND WK TO 4 MOS.

• NAS MORE FREQ/PROLONGED NAS WITH HEROIN
OPIATE EFFECTS

• PRODUCE THE MOST DRAMATIC EFFECTS ON MOM AND OS BUT ALSO AMPEHTAMINES**
  — WITHDRAWAL SYMPTOMS
  — LBW**, IUGR**
  — PREMATURITY**
  — ABRUPTIO**
  — FETAL DISTRESS**
  — AMPHETAMINES- LONGTERM COGNITIVE, NEUROBEHAVIORAL, AND PHYSICAL DEXTERITY
NONE NAS EFFECTS

• NICOTINE-LEVELS FETUS 15%> MOTHER, IMPAIRS NB HABITUATION, ORIENTATION, AUTONOMIC REGULATION, & ORIENTATION TO SOUND; ALTERS THE ABILITY OF THE NB TO BE COMFORTED & HAS EXAGERATED STARTLE REFLEX & TREMORS

• MARIJUANA- NOT NAS, BUT HIGHER INCIDENCE OF HYPOGLYCEMIA & CALCEMIA, SEPSIS, HIE, ICH, AND JITTERINESS, WITH HIGH USE-IUGR, NO EFFECTS WHEN 5-6 YRS OF AGE WITH CATCH UP GROWTH

• COCAINE-CONFLICTING DATA ON NEUROBEHAV; INCREASES INCIDENCE OF PLACENTAL ABRUPTIO
NONE NAS EFFECTS

• CIGARETTE SMOKING- INCREASED RISK OF LBW, 1 PACK PER DAY REDUCES THE BIRTH WT BY 150-250 GRAMS.

• MAY DEVELOP NICOTINE WITHDRAWAL DEPENDENT UPON THE AMOUNT OF SMOKING DURING PREGNANCY- MORE EXCITABLE, HYPERTONIC, AND DEMONSTRATES MORE STRESS AND ABSTINENCE SIGNS.
SSRIs- SEROTONIN DISCONTINUATION SYNDROME
fluoxetine, paroxetine, sertaline, citalopram, escitalopram, fluvoxamine

- Treat maternal depression+ during pregnancy
- Use in third trimester results in NAS SIGNS
- CNS-Symptoms include irritability, seizures, & motor signs of agitation, tremors, hypertonia
- Respiratory- tachypnea and nasal congestion
- GI- emesis, diarrhea, feeding difficulty
- Fever
- Hypoglycemia
- Usually disappear by two weeks of age
Epi and demographics

• NHANES- 4.4% PREGNANT FEMALES (15-44 Y/O) REPORT USING ILLICIT DRUGS DURING PREGNANCY VS 10.9% OF NONE PREGNANT FEMALES.

• AGE 15-17 YRS- 16.2%

• 18-25 YRS OLD REPORTED 7.4%

• 26-44YRS OLD REPORTED 1.9%

• ALCOHOL USE WAS 10.8%, BINGE 3.7%, HEAVY USE 1%; FOR SAME AGE NONE PREG 55,25,5%
EPI AND DEMOGRAPHICS

• SMOKING- 16% SMOKED WITHIN LAST MONTH OF PREGNANCY,

• FOR THOSE AGES 15-17 YRS OLD- 23% WHO WERE PREG SMOKED WHILE ONLY 13% OF THOSE WHO WERE NOT PREGNANT SMOKED

• AFTER DELIVERY WITH AT LEAST MARIJUANA; USE GOES UP BY 3 MONTHS (1.4 % TO 3.8%)

• OFFSPRING EXPOSED TO OPIOIDS OR HEROIN IN UTERO HAVE NAS SIGNS IN 55-94% OF NBs
RACE

• WOMEN WHO USE ILLICIT DRUGS
  – HISPANIC – 3%
  – WHITE – 4%
  – BLACK 8%

SMOKING – HIGHER IN WHITES THAN BLACKS OR HISPANICS
SIDS

- OPIATES - RATE IS 3.7 TIMES HIGHER IN INFANTS EXPOSED IN UTERO TO OPIATES
- COCAINE – RATE IS 2.3 TIMES HIGHER

- ???? IS THIS ASSOCIATED WITH OTHER FACTORS AND NOT A PRIMARY EFFECT????
HISTORY TAKING

• THE MOST RELIABLE METHOD OF DETERMINING THE EXTENT OF DRUG USE IS THE MATERNAL HISTORY WITH A STRUCTURED INTERVIEW, BUT ALWAYS SUSPECT.

• SELF – REPORTING INTAKE UNDERESTIMATES USE BY AS MUCH AS 44% AS COMPARED TO MECONIUM ANALYSIS
**PHYSICAL FINDINGS**- NAS SUSPECTED IF ANY OF THESE SIGNS -NE RELEASE

- CNS- HIGH-PITCHED CRY  RESTLESSNESS
  - SLEEP DURATION <1-3 HRS AFTER FEEDING
  - HYPERACTIVE REFLEXES (MORO)  JITTERINESS
  - TREMORS  MYOCLONIC JERKS  SEIZURES (2-11%)
  - INCREASED TONE  ABNORMAL EEG SEEN IN > 30%

- METABOLIC, VASOMOTOR, & RESPIRATORY
  - SWEATING  FEVER  INCR AUTONOMIC SIGNS
  - MOTTLING  FREQUENT YAWNING AND/OR SNEEZING
  - APNEA  NASAL FLARING  RR>60 W/O RETRACTIONS
NAS PHYSICAL SIGNS

• GI
  – EXCESSIVE/FRANTIC SUCKING OR ROOTING
  – POOR FDING LOOSE WATERY STOOLS
  – HYPERPHAGIA WITH POOR WT GAIN VOMITING
  – DEHYDRATION

• ALCOHOL-SPECIFIC SYMPTOMS-NONE NAS BUT
  – W/D THAT PRESENTS W/I 24 HRS ASSOCIATED WITH FAS FACIES ABDOMINAL DISTENTION
  – IRRITABILITY TREMOR OPISTHOTONUS
  – SZ- (BARBITURATES, SEDATIVE-HYPNOTICS)
NAS PRETERM VS FULLTERM

• PRETERM NB ARE AT LOWER RISK FOR DEVELOPING NAS WITH LOWER SCORES

• MOTHERS ON SIMILAR METHADONE DOSING
  – PRETERM NBs HAD LOWER TOTAL AND CNS ABSTINENCE SCORES
  – LOWER THE GESTATIONAL AGE, LOWER THE RISK FOR NAS
SCORING REGIMENS
FINNEGAN, STREA, LIPSITZ, RIVERS, NICU NETWORK SCALE

• FINNEGAN and modified Finnegan
  – BASED ON OPIATES W/D, NOT OTHERS
  – 21 (20) SYMTOMS AND WEIGHTED FOR SEVERITY
  – SIMPLE BUT EASILY BIASED
  – ASSESSMENTS EVERY 3- 4 HRS
  – 2 OR MORE SCORE > 8 (1HR REPEAT), TREATMENT IS INDICATED
  – EXPERIENCED CARETAKERS ARE CRITICAL TO ASSESS AND TREAT.
DIFFERENTIAL DIAGNOSIS

• DIFFICULT TRANSITION, VERY DIFFICULT

• HYPO-GLYCEMIA
  – CALCEMIA
  – MAGNESEMIA

• SEPSIS

• HYPERTHYROIDISM

• ICH

• HIE

• HYPERVISCOSITY

• LOOK FOR CO-MORBIDITIES – HEPATITIS/HIV/...
LABORATORY STUDIES/CONFIRMATION

• NEED TO ID THESE NB AND MOTHERS TO PROVIDE SUPPORT ETC

• INDICATIONS
  – SYMPTOMS
  – NO OR SPORATIC PRENATAL CARE/H/O SPONT AB
  – IUGR
  – PRETERM DEL./UNEXPLAINED LATE FETAL DEMISE
  – ABRUPTIO PLACENTAE, PRECIPITOUS DELIVERY
  – H/O DRUG ABUSE/ DYFS/CV ACCIDENTS
  – H/O HYPERTENSION, MOOD SWINGS
LAB STUDIES

• RADIOIMMUNOASSAY AND IMMUNUNASSAY
  – SEMIQUANTITATIVE BUT VERY SENSITIVE
  – Can’t distinguish opiates (Cocaine vs ms vs gluc met)

• BLOOD TEST- LIMITED USE Due TO CLI

• URINE TOX ASSAY- only provides info on Mom’s last few days PTD but can be wks for marijuana
  Cocaine-8 hrs in Mom, 48-72 in NB/etoh 6-16h

• False + for amphetamines with OTC products containing ephedrine
MECONIUM TOX SCREEN

• BEST METHOD FOR DETECTING DRUG EXPOSURE IN PREGNANCY (80% VS 46% FOR URINE)

• LONGER WINDOW OF EXPOSURE DETECTION, EVEN AS EARLY AS 2ND TRIMESTER FROM FETAL INGESTION OF AMNIOTIC FLUID

• FALSE POSITIVE- IF URINE CONTAMINATION OCCURS WITH PERINATAL ADMINISTERED DRUGS

• AT RM TEMP- CANNABINOID LEVELS DECREASE 25% / DAY
HAIR ANALYSIS

• MONITORS LAST TRIMESTER
• CAN BE COLLECTED UP TO 3 MOS. OF AGE, AFTER WHICH NEWBORN HAIR REPLACES FETAL HAIR
• DETECTS NARCOTICS, MARIJUANA, COCAINE AND ITS METS, ALCOHOL AND METS
• EXPENSIVE AND NOT WIDELY AVAILABLE
• RECENT EXPOSURE MAY BE MISSED DUE TO SLOW HAIR GROWTH
• HAIR GROWS AT 1.5 CM PER MONTH??3 MOS
NEUROIMAGING OF CNS

• NOT RECOMMENDED ROUTINELY UNLESS PT HAS MICROCEPHALY OR OTHER ANATOMIC CONCERNS OR IF HAS SEIZURES OR NEUROBEHAVIORAL DYSFUNCTIONS

• DUE TO LIFESTYLE ISSUES, TESTING OF MOM FOR HIV, HEPATITIS, SEXUALLY TRANSMITTED DISEASES ETC IS IMPERATIVE.
NAS MEDICAL CARE

• IN REGARDS TO HOW TO MANAGE, THERE IS LACK OF RCT TO STUDY EACH MODE OF CARE

• NBs AT RISK SHOULD BE CAREFULLY MONITORED, THE EXACT DURATION OF HOSPITALIZATION DEPENDS ON MOM HISTORY, LAB DATA, NB STATE

• LOW DOSE PRESCRIBED HYDROCODONE COULD GO HOME BY 3 DAYS BUT BORN TO A MOM ON HIGH DOSES OF METHADONE MAY NEED TO BE WATCHED FOR A MINIMUM OF 5-7 DAYS
NAS MEDICAL CARE

• VOMITING AND DIARRHEA CAUSING POOR WT GAIN & DEHYDRATION EVEN WITH LOW SCORES MAY REQUIRE TREATMENT

• NALOXONE IS CONTRAINDICATED IN THE DR IN ANY NB UNTIL IS FULLLY RESUSCITATED, AND PROBABLY IN MOST ALL NBs WHO MAY HAVE NAS SINCE IT MAY CAUSE ACUTE W/D SEIZURES

•
NAS NON-PHARM. MEDICAL CARE

• ASSESS DAILY FOR SIGNS OF WITHDRAWAL INCLUDING FDING, SLEEPING, AND WT GAIN
• REDUCE AMBIENT LIGHT, NOISE, UNNECESSARY HANDLING; AND PROVIDE SWADDLING (FREQ. SUCCESSFUL IF EXPERIENCED STAFF)
• PROVIDE SMALL FREQUENT FDS-?HYPERCAL. CALORIC REQUIREMENTS 140-250 CAL/KG/DAY
• INTERDISCIPLINARY APPROACH- SW, MENTAL HLTH, ABUSE COUNSELORS, NUTRITIONISTS, DEVELOPMENTALISTS, OB/PEDS/NURSES, STATE
PHARM INTERVENTION OF NAS

• INDICATED IF SUPPORTIVE MEASURES FAIL TO AMELIORATE THE W/D

• WITH FINNEGAN SCORING, IF AVERAGE OF 2 OR MORE SCORES IS 9 OR MORE THAN PHARM INTERVENTION IS COMMONLY BEGUN

• FOR OPIOID RELATED NAS MORPHINE OR METHADONE IS GIVEN, NONMORPHINE TREATMENTS GIVE SYMPTOMATIC RELIEF

• 30-91% OF NAS NBs RECEIVED PHARM INTERVENTION, DEPENDENT UPON.....
PHARM INTERVENTION MEDS

• OPTIMAL INTERVENTION MED HAS NOT BEEN ESTABLISHED, AT RWJUH CONSENSUS OF PEDS, NEO, & NURSING HAVE AGREED MORPHINE AS THE AGENT IN ACCORDANCE HANDOUTS.

• OTHER INSTITUTIONS HAVE EXPLORED METHADONE, OR WITH OTHER AGENTS, BUPRENORPHINE

• PHENOBARB FOR OPIATES AND POLYDRUG USERS.
ANTIEPILEPTICS

• LONG T1/2
• ?CAN BE SENT HOME ON MEDS?
• LACK OF EFFECT ON GI OR SZ
• CONTAINS 14-25% ALCOHOL
• CAN INTERFER WITH CNS NERVE CONDUCTION
• SOME USE WITH OPIATES
RWJUH NAS GUIDELINES

• ALL NBs AT RISK OF NAS (NO PNC, H/O ABUSE, ON METHADONE, OR SIGNS OF W/D) WILL BE EVALUATED BY NURSERY RESIDENT; AND OR NICU FELLOW, OR ATTENDING

• SIGNS OF NAS IN DR, GOES TO NICU

• IF STABLE, NB CAN TRANSITION IN NNBN

• LAB TESTS (MEC/URINE) ORDERED AND COMPLETED
RWJUH NAS GUIDELINES

• MODIFIED FINNEGAN Q 2 - 4H BY NURSERY NURSES AND DOCUMENTED ON EMR

• INFORM PARENTS THAT NB WILL STAY IN NURSERY FOR AT LEAST 4-7 DAYS FOR MONITORING AND IF TREATMENT NEEDED POTENTIALLY MUCH LONGER

• IF HAS RD, SZ, FD INTOL, AUTONOMIC DYS THAT REQUIRES CLOSER MONITORING WILL BE TRANSFERRED TO NICU
SOCIAL SERVICE CONSULT

• SOCIAL SERVICE CONSULT ORDERED, ?DYFS

• INCLUDES
  – DETAILED H/O ALCOHOL, PRESCRIPTION AND NONE PRESCRIPTION DRUG USE
  – ASSESSMENT OF PHYSICAL ABUSE OR DOMESTIC VIOLENCE
  – COMPLIANCE WITH REHAB PLANS/DYFS INVOLVED
  – DYFS WILL BE CONTACTED FOR ALL NBS AT RISK; ?OPEN CASE, IF DRUG SCREEN POSITIVE DYFS INFORMED
RWJUH NAS GUIDELINES

• BREAST FDING- IF MOM ON CONTROLLED DOSE OF METHADONE, OK TO BREAST FD IF ALL ELSE OK. DECREASES SCORE AND SYMTOMS!!!

  – IF ON OTHER DRUGS, BREAST FDING MUST BE CLEARED BY MEDICAL TEAM AND POSSIBLY THE LACTATION CONSULTANT

FAMILY EDUCATION- ALL ASPECTS OF NL CARE, FREQ-UENT SMALL FDS WITH BURPING, HANDLE BABY GENTLY, LEARN, WATCH & RESPOND TO W/D SIGNS, SOME SYMPTOMS MAY LAST UP TO 6 MONTHS, SUCH AS NOT WANTING TO CUDDLE, AVOID OVERSTIM.
CASE MANAGEMENT CONSULT-VNA

- REQUIRED NEED FOR ALL AT RISK FOR NAS FOR HOME HEALTH VISIT (VNA)
- HOME VNA VISIT TAKE PLACE W/I 48 HRS OF DISCHARGE
- INCLUDES FINNEGAN SCORE, ENVIRONMENTAL ASSESSMENT FOR OVERSTIMULATION, ASSESS FOR APPROPRIATE RESOURCES, REINFROCE BACK TO SLEEP, ASSESS NUTRITION & CONFIRM APPTS
DISCHARGE CRITERIA

• ADEQUATE WT GAIN ON FULL AD LIB FDS VIA BREAST OR BOTTLE
• STABLE AND NL TEMP
• OFF ALL MEDS FOR W/D AND FINNEGAN SCORE = OR< 8 FOR AT LEAST 24 HRS
• CLEARANCE FROM MEDICAL TEAM, SOCIAL WORKER, DYFS( IF INDICATED), & CASE MANAGER
• PARENTS DEMONSTRATE CAPACITY TO CARE FOR.
• APPT MADE AND DOCUMENTED FOR F/U VNA VISIT&LMD W/I 2-3 DAYS POSTDISCHARGE & HRC
HIGH RISK CLINIC

• ALL AT RISK FOR NAS WILL BE GIVEN F/U APPT AT 2WKS AND 6 WKS AFTER DISCHARGE AT MINIMUM

• FILL OUT THE FORM – SEE HANDOUTS

• PARENTAL LETTER TO BE REVIEWED WITH PARENTS/GUARDIAN WITH DOCUMENTATION
RWJUH NAS GUIDELINES

• TREATMENT, NO RTCs for almost anything
  – NONPHARM- QUIET ENVIRONMENT WITH VISUAL, AUDITORY, AND TACTILE STIMULATION AT MINIMUM
  – COMFORTING TECHNIQUES INCLUDING SWADDLING, RUBBING, MITTENS
  – DEMAND FDING CONSIDERED, CAREFUL NOT TO OVERFD, SMALL FREQUENT FDS? CLOSELY MONITORED
  – WATCH FOR SKIN BREAKDOWN & RX ACCORDING
  – MOD FINNEGAN >8 AND CONFIRMED AFTER 1 HR BEGIN OR INCREASE PHARMACOLOGICAL RX
PHARMACOLOGICAL INTERVENTION

OPIATES W/D MORPHINE OR METHADONE
  - MS 83% OF US PEDS USE FOR W/D R/X

NON-OPIOIDS OR POLYDRUG W/D CONSIDER PHENOBARBIT..
**RWJUH NAS RX GUIDELINES**

- **MORPHINE SULFAT ORAL SOLUTION-IS NOT WT BASED** and uses the modified Finnegan score

<table>
<thead>
<tr>
<th>MOSCORE</th>
<th>TOTAL MORPHINE DOSE (Q 3-4 H)</th>
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<tbody>
<tr>
<td>0-8</td>
<td>0 mg</td>
</tr>
<tr>
<td>9-12</td>
<td>0.04 mg</td>
</tr>
<tr>
<td>13-16</td>
<td>0.08 mg</td>
</tr>
<tr>
<td>17-20</td>
<td>0.12 mg</td>
</tr>
<tr>
<td>21-24</td>
<td>0.16 mg</td>
</tr>
<tr>
<td>=or &gt; 25</td>
<td>0.2mg and nicu consult/transfer</td>
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</table>
ESCOLATING DOSING

• INCREASE DOSE OF MORPHINE BY THE PREVIOUS SCORE
  – IF SCORE 9-12 INCREASE BY 0.02 mg Q 3-4H
  – IF SCORE 13-16 INCREASE BY 0.04mg Q 3-4 H
  – IF SCORE 17-20 INCREASE BY 0.06 mg Q 3-4H
  – MAXIMUM DOSE- 0.2 mg/kg/dose
WEAN SCHEDULE

MAX DOSE 0.2MG/KG/DOSE
- IF SCORE IS 0-8, MAINTAIN DOSE FOR 48 HRS BEFORE WEAN
- WEAN BY 0.02 mg EVERY 24 HRS IF SCORE = OR < 8
- IF OFF ALL MORPHINE FOR 24HRS or more and score = or < 8 – HOME

If on weaning, scores are > 8 increase dose ....
METHADONE

• INITIAL PO DOSE 0.05 – 0.2 MG/KG/DOSE Q 12-24 HRS
• WEAN BY 10-20% EVERY WEEK OVER 4-6 WEEKS
• IF OFF FOR 24 HOURS MAY GO HOME
  • PHENOBARBITAL
  • MAINTENANCE 1-4 MG/KG/DOSE Q 12H
  • WEAN BY 20% EVERY OTHER DAY, IF STABLE
  • GO BACK IF NECESSARY AND WEAN AFTER 48H
  • HOME 24 HRS OFF MEDS WITH LOTS OF EDUCATION
Drug Exposed Newborn Treatment Decision Tree:

**BEGIN TREATMENT** and **ESCALATION** of Morphine Sulfate Oral Solution For NAS

**NAS scoring every 3-4 hrs with feedings + environmental controls.**

The decision to treat or escalate is based on 2 consecutive scores greater than 8, 1 hour apart, treating the highest score if scores are in disparate categories. Doses can be escalated in this fashion until NAS scores are less than or equal to 8. If infant is receiving 0.2mg Morphine Sulfate every 3 hours and continues to have NAS scores greater than 8 on this dose, or if infant appears somnolent or difficult to arouse, notify physician immediately.

**Morphine is a standing dose and IS NOT WEIGHT BASED**

**Discharge**
Scores less than or equal to 8 for at least 24 hours

**Wean**
Wean Morphine by 0.02mg every 24 hours until off

**Observation for at least 96 hrs**
All scores less than or equal to 8

**Treat**
Begin Morphine 0.04mg

2 consecutive scores between 9-12
2 consecutive scores between 13-16
2 consecutive scores between 17-20
2 consecutive scores between 21-24
2 consecutive scores 25 and greater

**Treat**
Begin Morphine 0.08mg

**Treat**
Begin Morphine 0.12mg

**Treat**
Begin Morphine 0.16mg

**Treat**
Begin Morphine 0.2mg

**Escalate**
Increase Morphine by 0.02mg

2 consecutive scores between 9-12
2 consecutive scores between 13-16
2 consecutive scores between 17-20
2 consecutive scores between 21-24
2 consecutive scores 25 and greater

**Escalate**
Increase Morphine by 0.04mg

Escalate by 0.06mg

**Escalate**
Increase Morphine by 0.08mg

**Escalate**
Increase Morphine by 0.1mg

**Escalate**
Increase Morphine by 0.2mg

Scores less than or equal to 8 for 48 hours
Drug Exposed Newborn Treatment Decision Tree:

**WEANING** and **RE-ESCALATION** of Morphine Sulfate Oral Solution For NAS

Infants may require increasing doses of morphine sulfate to maintain their NAS scores less than or equal to 8 once weaning has begun. The decision to reescalate treatment once a wean has begun is based on 2 consecutive NAS scores greater than 8, 1 hour apart, treating the highest score if the scores are in disparate categories. Increase the dose until symptoms are controlled (scores less than or equal to 8), wait 48 hours, then proceed to the weaning protocol.

**Morphine is a standing dose and IS NOT WEIGHT BASED**

- **On Morphine**
  - Scores less than or equal to 8 for 48 hours
  - Wean Morphine by 0.02mg every 24 hours
  - Observe minimum of 24 hours once off Morphine
  - **Discharge**

- **Symptoms escalate**
  - 2 consecutive scores between 9-12
  - Increase Morphine by 0.01mg
  - **ESCALATE**

  - 2 consecutive scores between 13-16
  - Increase Morphine by 0.02mg
  - **ESCALATE**

  - 2 consecutive scores between 17-20
  - Increase Morphine by 0.03mg
  - **ESCALATE**

  - 2 consecutive scores between 21-24
  - Increase Morphine by 0.04mg
  - **ESCALATE**

- **Scores less than or equal to 8 for 48 hours**
DISCHARGE

• MOM- bottle or breast fding successfully
  – ? -BREAST FDING: SSRI, USE OF POLY DRUGS

• ENROLLMENT IN APPROPRIATE TREAMENT PROGRAM

• NB- TAKING ORAL FDS AND GAINING WT
  – PHYSIOLOGICALLY STABLE
  – CAN BE CONSOLED & SHOWING NEURO RECOV.
  – ALL ASSESSMENTS COMPLETED- ?COMPLIANCE
  – PARENT GUIDIANCE ED COMPLETED SUCCESSFULLY
  – EARLY INTERVENTION AND CLOSE F/U ARRANGED
  – SHORT&LONGTERM OUTCOME- MJ & DEPRESSION 7...
QUESTIONS

SEIZURES BY THEMSELVES DO NOT APPEAR TO CAUSE PERMANENT EFFECTS ON NEURODEVELOPMENT

• SEE DR CHEVITZ..., LINDA HICKMAN, ET AL
• EMAILED AAP GUIDELINES FROM COD & CON
• MUCH WORK TO BE DONE, UMB CORDS, DRUG, DOSE, NEED, OUTCOME ETC ETC ETC, SUBOXONE AND NAS, TREATMENT OF NAS AND BREAST FDING ETC ETC ETC
RESIDENT QUESTIONS

• THE SIGNS AND SYMTPMS OF WITHDRAWAL INCLUDE
  — A. SEIZURES
  — B. EXAGERATED MORO
  — C. DIARRHEA
  — D. TACHYPNEA
  — E. ABC ABOVE
  — F. ALL ABOVE

• 2. WHAT ARE THE PREFERRED DRUGS TO USE IN NAS OPIATE W/D? —A. MORPHINE SULFATE OR B. PHENOBARB
QUESTIONS

• SEIZURES CAUSED BY NAS RESULT IN PERMANENT NEUROBEHAVIORAL DIASBLITY- yes or no

• LIST 5 OTHER DIAGNOSIS THAT SHOULD BE CONSIDERED IN THE DIFFERENTIAL DIAGNOSIS OF NAS

• THE NICU NETWORK SCALE IS THE MOST COMMONLY USED NAS SCORING METHOD? YES/NO

• THE MS DOSE IS BASED ON WT@RWJUH?YES/NO

• CONSIDER PHARM INTERVENTION IF SCORING SCALE IS 7 OR ABOVE? YES OR NO