Pediatric Dentistry: You Want to Do What? & The 4 Ps (make that 5)!

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Greetings from San Francisco

Affirmation and Disclosures

- No financial ties to drug or equipment companies to disclose
- No direct payments from manufacturers
  - Have received supplies for workshops and products to test from manufacturers

How Kids See Us

The average attention span today is 8 seconds

- Microsoft Corporation/Canadian researchers 2015
  - Dropped from 12 seconds in 2000
  - The younger you are the shorter the span
  - Goldfish have a 9 second attention span

Ralph At the Dentist

David I. Rothman DDS 2021

You do what you were taught in dental school despite life and research passing you by

- Journals
- Throwaways
  - Check for the ads next to the articles
- Lay publications
- Internet
- Peer reviewed?
- Bias?

Evidence Based Medicine
Evidence Based Dentistry

- … an approach to medical practice intended to optimize decision-making by emphasizing the use of evidence from well-designed and well-conducted research.
  - Wikipedia
- …conscientious, explicit, judicious and reasonable use of modern, best *evidence* in making decisions about the care of individual patients. EBM integrates clinical experience and patient values with the best available research information.
  - Swanson et al. Plast Reconstr Surg 2010 Jul; 126(1):286-294
- All in the name of creating practice guidelines

Rules of the Road

- Kids aren't scary but PARENTS are
- You are bigger/smarter/wilier/more manipulative th
- Learn their language
- Learn their "heroes"
- Compliment them and their clothing
- Talk continuously/ Sing Often
- BE YOURSELF!

A Little Prevention Goes a Long Way

Trying to change parents and kids behavior (while keeping your sanity)

The Ten Killer Questions

- "What do you mean that I should have brought my child in between 18 and 24 months?"
- or: "My pediatrician didn't tell me that."

The Answers

- The AAPD recommends the first visit when the first tooth erupts or sooner
- Provide counseling via risk assessment
- Nutrition and diet review
- Safety check
- Note that the pediatrician may see a child 15 times before the child visits the dentist

The Answers

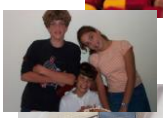
- General Dentists and Pediatricians need to be trained in identifying and diagnosing oral diseases including hard and soft tissue pathoses
- They are part of the team responsible for the "Dental Home" and fluoride applications
- See www.AAP.org/oralhealth

Candida

Riga-Fede

Caries Risk Assessment

- History
  - medical
  - dental
  - social
  - fluoride
- CAT: caries assessment tool; AAPD
  - Minimum, moderate, severe

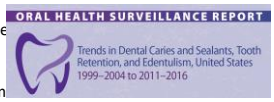


Caries Risk Assessment

- Many available
  - AAPD www.aapd.org
  - CDA CAMBRA www.cda.org
  - ISDAS
  - Even the pediatricians are claiming this area
    - www.aap.org/oralhealth/cme
- All provide a systematic approach and a pathway for diagnosis and treatment
  - Decide how complicated you want to be
  - Must be recorded!

CDC Report on Oral Health

- 2019
- Increase in caries rates in preschoole
  - 28% will demonstrate ECC
  - Up 5 percentage points from 2014
- Stabilized rates in elementary and m
- Increased rate in high schoolers
- https://www.cdc.gov/oralhealth/publications/OHSR-2019



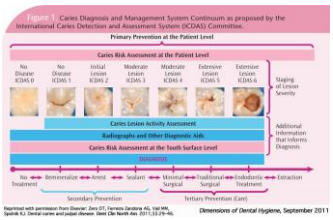
Definitions

- Cavity: a hole in a tooth; may be developmental or bacterial
  - +/- surface cavitation
- Caries: a biofilm mediated transmissible, bacterial disease
- Early Childhood Caries: caries of infants, toddlers, and young children affecting one or more teeth

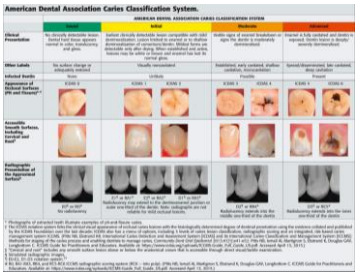
Early Childhood Caries

- Early childhood caries (ECC) is the presence of 1 or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger.
- In children younger than 3 years of age, any sign of smooth-surface caries is indicative of severe early childhood caries (S-ECC).
- From ages 3 through 5, 1 or more cavitated, missing (due to caries), or filled smooth surfaces in primary maxillary anterior teeth, or a decayed, missing, or filled score of >4 (age 3), >5 (age 4), or >6 (age 5) surfaces constitutes S-ECC.

International Caries Detection and Assessment System (ICDAS)



ADA Caries Classification System



Sugar doesn't cause cavities- acid does!

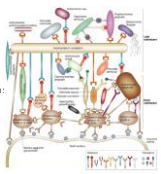
- Mutans strep and Lactobacillus make acid
- 5 fruits to an 8oz. glass of juice
- Approx. 1 tsp = 5 g sugar
- 12oz. Soda=39g. of sugar
- 12oz. JuiceBlast=40g. of sugar
- Carbonic acid/Phosphoric acid/Citric acid
- The two hour rule

The Y2K Bugs

- Over 800 oral strains
- Mutans streptococci
- Lactobacillus
- Candida albicans
- Other acidogenic strains that may break down sucrose
- Virulence!
- Produce acid for 1.5hr
  - In plaque
  - Between teeth

Biofilms!

- 80% of infectious diseases are biofilm mediated
- Multiple organisms interacting
  - Can be benign individually; together wreak havoc
    - P. gingivalis
- Traditional treatment
  - Antibiotics
  - Mechanically debride
  - Opens up avenues to other potentially pathogenic strains that live in
- New treatment
  - Change environment and ecology
    - Unfermentable sweeteners
    - Prevent adhesion of biofilms
      - Xylitol
      - Honey from tea tree pollen (Manuka honey)
    - Change pH
      - Arginine to NH_3
      - Huang, X et al, Effect of arginine on the growth and biofilm formation of oral bacteria. Archives of Oral Biology Volume 81 October 2017, Pages 256-262



And Where Do Those Germs Come From?

- Getting tooth decay is an infectious di[illegible]
- Mom is vector between 13 and 29-39 to 6
  - All bacteria, cariogenic and noncariog transmitted

Erosion v Decay

- Erosion
  - Demineralization or dissolution of the carbonated hydroxyapatite crystal of enamel/dentin of the tooth in an acidic environment reversed by a neutral or basic oral environment in which minerals redeposit on the tooth surface.
- Caries
  - A bacterial mediated demineralization of the enamel/dentin in which a sugar substrate is metabolized by various bacteria. Their metabolic waste product demineralizes the tooth in a localized area protected by plaque. Remineralization occurs at a rate slower than demineralization and the bacteria move into the cavitation that develops.

Attrition, Abrasion and Erosion

- Attrition: physiologic wear from mastication
  - Normal!
- Abrasion: pathologic wear of teeth from mechanical rubbing
  - Bruxing, toothbrush and toothpaste wear
  - Brush lightly not hard- bristles don't move!
- Erosion: pathologic wear from chemical dissolution
  - Acidic foods/drinks, GERD

Table. Eccles and Jenkins erosion scale. Each exposed tooth surface (buccal, lingual, occlusal, or incisal) is scored.[1]

Grade 0	No erosion
Grade 1	Erosion into enamel only; no exposure of dentin
Grade 2	Less than one-third of surface has dentin exposed
Grade 3	One-third or more of surface has dentin exposed

pH of Common Foods

- Beverages
  - Coffee 2.4-3.3
  - Tea 4.2
  - Beer 4.0-5.0
  - Wine 2.3-3.8
  - Soda (sweetened or non-sweetened) 2.7-3.5
  - Sports drinks 2.3-4.4
  - Saliva 7.4

pH of Common Foods

- Fruits and Vegetables
  - Tomatoes 3.7-4.7
  - Apples 3.5-3.9
  - Plums 2.8-4.6
  - Strawberries 3.0-4.2
  - Vegetables 3.9-5.1 (+ sand/soil for an added measure of abrasion)

www.sciencedaily.com

Soda: the tooth killer

- liquid candy
- high fructose corn syrup
- +/- caffeine
- Carbonic acid from CO_2
- Phosphoric acid
- prolonged exposure
- even non-sweetened, diet products
- Causes erosion and if sugar present, decay

Soda: the tooth killer

- And we're not done yet!
  - Sweet soft drinks, fructose linked to gout
  - Children's salt intake is reduced when soda is out of their diet
  - Weight gain is recorded on people who drink diet sodas
- But, thankfully, sales are on the decline!?!?
  - Juice sales are up
  - Sports drink sales are up

And You Thought Soda Was Bad…

- Juice
  - Liquid candy- no nutritional value other than what's added
  - 5 fruits to make 8oz.
  - Soda=39g sugar/12oz.
  - Juice esp. boxes=40g/12oz.
  - Fructose and high fructose corn syrup 3-5X sweet as table sugar
    - Breakdown to glycogen and stored as fat
  - Natural v unnatural sugar? Bacteria care?
  - May be a source of high levels of F^-
  - Just give a glass of water and a multivitamin

Saliva: the wonder drug

- Neutralizes acid with phosphate buffer returning oral cavity to basic environment
  - Stops demineralization
  - Promotes remineralization
- Contains Ca^{++}, PO_4^{-}, OH^{-} and F^{-} (exogenous)
  - Remineralizes early decalcification in a basic environment
- Antibiotic/antiviral
- Enzyme system that breaks down food especially carbs to simple sugars!
- Washes away food substances
- The more the better!!!!!

Sports Drinks and Soda

- A. Milosevic, Brit J Sports Med, 3/97
- pH4.46-2.38
  - demineralization occurs at 5.5 or below
- High sugar and fructose corn syrup
- Citric acid
- Viscosity
- Temperature (cold is better)

Sports Drinks v Energy Drinks

- Energy Drinks
  - Sports drinks + caffeine (methylxanthines) + Vit B +herbs +/- carbonated water, guarana, yerba mate, acai + taurine, ginseng, maltodextrin, inositol, carnitene, creatine, glucuronolactone and gingko biloba
    - Ginseng and guarine increase risk of intraoperative bleeding through decreased platelet aggregation
      - J Oral Maxillofac Surg 70:1439-1441, 2012
  - Others may contain alcohol
  - Highly toxic
  - Have caused hospitalization and death in children and adults
  - http://pediatrics.aappublications.org/content/early/2011/05/25/peds.2011-0965

Sports Drinks v Chocolate Milk

- Chocolate Milk
  - Low fat or non fat
  - Better hydration
  - Less salty
  - Correct mineral balance
  - Like drinking a glass of milk and 2 oreo cookies
  - Similar to "energy milks"
  - http://www.acsm.org/AM/Template.cfm?Section=About_ACSM&TEMPLATE=/CM/HTMLDisplay.cfm&CONTENTID=14752

Carbohydrates

- Very cariogenic (more so than sucrose)
  - 4X daily
  - >60 g per day
- Break down to simple sugars by salivary enzymes
- Adhere to teeth and gums
  - Glycans (a polysaccharide)

What About the Milk Substitutes?

- Soy Milk (100 calories)
  - Isoflavones
    - Phytoestrogens
    - Hemaglutenin (promotes blod clots)
    - Goitrogens which mimic purines
  - Brown rice syrup or evaporated ca[illegible]
    - At least 9g sugar/8 oz. for vanilla/ 19[illegible] chocolate
- Rice Milk (140 calories)
  - Brown rice syrup
  - Total carbs 25 g (0 sugars)
- Almond Milk (40 calories)
  - Omega 3 fatty acids
  - Antioxidant Vit E
  - Total carbs 2 g (0 sugars)
  - 1 g of protein

- Coconut Water (60 cal/11oz)
  - 61mg K (>4 bananas)
  - 5.45 mg Na
  - Not a good sports drink for rehydration
  - No clinical studies support the claims
- Yellow Pea Protein Milk
  - 10 g of protein
- Oat Milk
  - 19-29 g of carbs
  - 4.5-5 g of fat
- www.healthline.com/nutrition/[illegible] substitutes#section5Healthline

Brand	PH	Water Source & Treatment Notes
Vitaminwater	3.4	Demineralized with Minerals & Flavor Added
Propel Zero -Gatorade	3.5	Demineralized with Minerals & Flavor Added
Propel Fitness Water	3.6	Demineralized with Minerals & Flavor Added
Penta	4.0	Deionized, Demineralized & Further Processed
Dasani	4.5	Filtered, RO, Minerals Added, Ozonated
Function	5.0	Distilled with Minerals Added
Perrier	5.5	Filtered, Carbonated Water Derived from Wells
Poland Spring	5.8	Derived from Springs & Distilled Water
Voss	6.0	Well Water from Norway
Ice Mountain	6.0	Demineralized, Filtered, Ozonated
Crystal Geyser	6.0	Filtered Municipal Water
Deer Park	6.3	Derived from Springs & Distilled City Water
Smart Water	6.5	Filtered, Distilled & Remineralized
Great Value Walmart	6.5	Filtered, RO, Minerals Added, Ozonated
Gerber Pure Water	6.5	Demineralized with Minerals Added
Arrowhead	6.83	Derived from Springs & Distilled City Water
Evian	7.0	Derived from Springs in France
Eternal	7.0	Filtered, Treated Spring Water
Volvic	7.0	Filtered, Treated Spring Water
Zephyrhills	7.5	Filtered, Treated Spring Water
Aquapure	7.5	Filtered, Treated Spring Water
Fiji	7.5	Derived from Springs in Fiji
Super Chill	7.5	Filtered, Treated Spring Water
Essmor	8.0	Filtered Well Water
Real Water	8.0	Filtered Ionized Water
Essentia	9.0	RO Filtered, Minerals Added, Ionized Water

https://www.alkalinewaterplus.com/analyzing-comparing-brands-of-bottled-water/

Good Plaque v Bad Plaque

- Good Plaque
  - Basic pH
  - Ca++, PO4-, F-
  - Casein (a protein which helps bond the minerals to the tooth) in CPP-ACP and CPP ACPF products
- Bad Plaque
  - Fermentable Carbs
  - Sucrose
  - No proteins
  - Lots of bacteria

The Miracle Sugar: Xylitol?

- Low calorie, sugar-alcohol that is not metabolized by bacteria (5 carbon v 6 carbon)
- Inhibits biofilm adhesion
- Short term use decreases S. mutans in saliva
- When used in place of sugar, stops caries progression by up to 70%
- Ablation therapy: Decreases transmission of S. mutans from mother to child
- Commercially available as gum, candy, toothpaste, energy bars
- Higher doses cause severe diarrhea (similar to fructose)

Xylitol Gum Studies

- Finland
  - Original studies in '80s at Turku University
- Caries in 4 year old children after maternal chewing of gums containing combinations of xylitol, sorbitol, chlorhexedine and fluoride
  - EAPD, 2006
  - Fewer caries were observed in children whose mothers chewed xylitol only gum at the time of the eruption of the first primary teeth.
- New studies (2015) show effective only with F-

Xylitol: Hype and Reality

- Must have >1.55g/serving TID
  - Should be listed as first ingredient
  - Sorbitol may also be effective
- Commercial and specialty availability
  - Gums: Altoids cinnamon, Koolerz, Starbucks peppermint and cinnamon, xylitol Beechies, TheraGum, Spry, Xylifresh, Xylichew
  - Toothpastes: Tom's mint with fluoride and apricot with fluoride, Crest multicare (sorbitol), Xylifresh, XyliWhite, Squigle
  - Mints: TheraMint, Xlear, Xylichew, Clen-Dent

The Ten Killer Questions

- "But do I really have to brush their teeth?"
  - Or "Johnny won't let me brush his teeth"
  - Or "He doesn't like the taste of toothpaste"

The Answers

- Commonly known as the "who's the parent?" question
- Set up home routines
  - one person/two people
- Toothbrushing probably doesn't stop tooth decay, fluoride does
  - Tb decreases plaque and gingivitis
- Stress diet/frequency issues/fluoride
- Make it a science fair experiment

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BUZZ, WIGGLE . . . AND RINSE

'Round and 'round is so square. Now electric toothbrushes oscillate, wiggle, and buzz. Many such electrics cost about $50 to $150, but Colgate, Crest, and Oral-B have introduced models that cost far less.

A dozen staffers who brush with nonelectric brushes volunteered to test each of four electric brushes—three inexpensive ones and a much pricier model that is widely advertised—plus their usual brush. All four electrics are advertised as able to clean teeth better than a regular brush does.

Our volunteers used each brush for about a week (to get used to it), left their teeth unbrushed for a day (to let plaque build up), then let a dentist we hired as a consultant examine their teeth. He scored the amount of plaque on specific teeth, asked each staffer to brush, then rescored those teeth to gauge a brush's plaque-removal prowess (plaque removal is central to preventing cavities and gum disease).

The bottom line. Even the most effective (and expensive) electric brush in our tests, the Sonicare Elite 7500, $140, proved no better than a regular brush costing $2 or $3. And every brush garnered at least one complaint about noise and annoying vibration.

What matters most, it turns out, is your technique and how long you brush. Toothbrush makers usually recommend two minutes. Therein lies one potential advantage of electric brushes: Our volunteers, who brushed for as long as they thought necessary, tended to brush longer when using electrics. In fact, all but one staffer liked power brushing enough to consider switching from regular. Electric toothbrushes are also a boon for people with weak hands or limited dexterity.

If you think the fun factor will keep you or your kids brushing longer, try the Colgate Actibrush. It costs only $10, and staffers liked using it more than others.

The Ratings indicate each brush's features. The Sonicare is rechargable and comes with a storage/charger stand and a timer that indicates brushing time. Two models offer a choice of soft or medium bristles; the others have only soft.

WHAT WORKS? The Sonicare Elite, below left, and regular nonelectric brushes edged out three low-priced electrics, from Oral-B, Colgate, and Crest.

Quick Ratings Electric toothbrushes

Product	Price	Effectiveness	Ease of use	Extra features
MOST EFFECTIVE *Comparable to nonelectric brushes; removed more than 80% of plaque*				
Sonicare Elite 7500	$140	$$$$	•	•
EFFECTIVE *Removed about 75% of plaque*				
Colgate Actibrush	10	$30		•
Oral-B CrossAction Power	7	$50	•	•
LEAST EFFECTIVE *Removed about 65% of plaque*				
Oral-B CrossAction Power	7	$50	•	•

And When Should You Brush?

- NOT AFTER MEALS!!!
  - Especially if acidic food eaten or drunk and demineralization is occurring
  - Will remove outer layer of enamel promoting erosion
  - Wait at least .5-1 hour
    - Let saliva do its work
  - Now is controversial
    - Not enough remin up to 4 hours after eating

And How Hard?

- Very light pressure
- Bristles should barely flex
- Toothbrush trauma
  - Resorption
  - Abrasion and laceration
- Electric v Manual
  - No Difference!!!
    - 2020

And While We're At it… How Often?

- Recent studies show that once a day with fluoride toothpaste is not as effective as twice a day
- The differences are not additive but are exponential

And, of course, how long?

- 2 minutes?
  - Brushing less than 2 min associated with higher caries
    - JDR, 2016, systematic review 33 articles
  - Brushing for 1 minute removes 27% of plaque, 2 minutes removed 41% of plaque
    - IJDH, 2012, systematic review of 59 articles

The Ten Killer Questions

- "And now I suppose you're gonna want me to floss…?"
  - Or "You must be joking?"

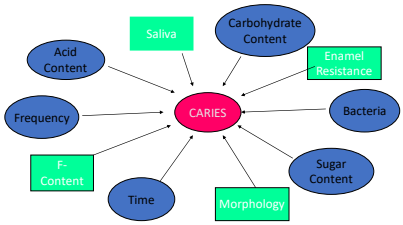
The Answers

- Cavities form either on top of or between the teeth
- Germs live between and the teeth and they and their food need to be removed
- If there is space between the teeth, the toothbrush and saliva work well
- If the teeth are touching, there is no way to clean between the teeth without floss- ***the in-between brush***
  - Use the hand washing analogy between fingers
- Recommend alternatives to holding the floss
  - Disposable/reusable flossers

The New Shape of Dental Caries

- Resistant enamel because of fluoride
- Weaker, nonfluoridated dentin
- Ballooning out under the enamel surface with extensive spread
- Poor diagnostic techniques
  - explorer
  - radiograph
  - Laser/Diagnodent (Kavo)

Caries is Multifactorial!



Treatment Modalities

- Habit/Diet/Frequency of eating
- Decrease fermentable carbohydrate and sugar content
- Remove/disrupt biofilm
- Alternative Medicine Therapies- not tested/approved
  - Ozone
  - Oil Pulling (coconut oil)
- Chemotherapy
  - Xylitol topical application
    - Gums/candy/wipes
  - Topical fluoride use
    - Gels/pastes/varnish
  - Chlorhexedine use does not decrease incidence of coronal caries
  - Silver diamine fluoride
  - Interim restorative/ART/ITR/palliative
    - Glass ionomers (fluoride releasing)
  - Liquorice pops
- Definitive treatment

Oh No!!!

- Proceedings of the Symposium on Innovations in the Prevention and Management of Early Childhood Caries
  - Oct. 23-24, 2015 Ellicott, Md
- Evidence of Effectiveness of Current Therapies to Prevent and Treat Early Childhood Caries; S. Twetman, V. Dhar
  - 877 reports, 33 met criteria
  - Fluoride toothpaste and varnish: *limited evidence*
  - Fluoride tablets and drops: *insufficient evidence*
  - Silver Diamine Fluoride, Xylitol, Chlorhexidine varnish/gel, Povidine Iodine, Probiotic Bacteria, Remineralizing agents (ACP-CP): *insufficient evidence*
  - Sealants, restorations, regular restorations: *insufficient evidence*
- ***THERE IS NO EVIDENCE THAT ANYTHING WE DO WORKS!!!***

Habits and Teething

Pacifiers are OK to 3

(or maybe 2 or 5 or 6 or so or whenever the kid wants to give it up)
(really not beyond 1!)

Oral Growth and Development and Habit Risk Assessment

- Tooth Eruption
- Pacifier, Thumb, Bottle Habits
- Nursing and Breastfeeding
  - But never alone
  - Frequency, diet, carbs

What to expect…

- Your baby's teeth will make their grand, grumpy entrance between 3 and 12 months old or later. Here are some common signs your little one is teething, along with remedies that will ease baby's discomfort.
- When your baby's first tooth shows up, you might be taken by surprise ("Ow! Was that just a bite?"), or you might just finally understand what all those strange symptoms were about. Look out for these common signs your baby is teething:
- **Teething Symptoms**
  - Drooling
  - Rash
  - Coughing and/or gag reflex
  - Biting
  - Fussing
  - Irritability
  - Refusing to eat
  - Night waking
  - Ear pulling and cheek rubbing

- Every baby experiences the start of teething differently. Some have virtually no symptoms, while others are miserable for months. But if you know the signs to look out for, the timing of baby teething, and home remedies that work, it can make it easier for your baby (and you) to get through this particular milestone.
- **When Do Babies Start Teething?**
- Teething symptoms can precede the actual appearance of a tooth by as much as two or three months. Most babies get their first tooth around 6 months old, though when those first tiny pearly whites make their appearance can vary quite a bit from baby to baby. Some infants' first teeth arrive as early as 3 months, while others don't get theirs until after the first birthday. In other words, there's a wide range of normal in terms of when teething in babies starts.
- https://www.whattoexpect.com/first-year/teething/

Teething – A Gnawing Problem

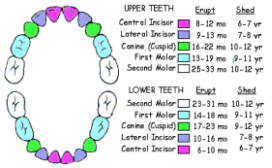
"Adam and Eve had many advantages, but the principal one was that they escaped teething."
Mark Twain

Teething

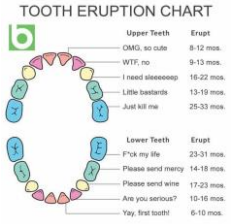
- Discussed for last 5000 years, mentioned in Sumerian and Hindu and ancient Greek writings.
- Hippocrates wrote: *'Teething children suffer from itching of the gums, fevers, convulsions and diarrhea, especially when they cut their eye teeth and when they are very corpulent and costive'.* (25th Aphorism, 3rd book, 4th c. bc)
- Long thought to be associated with infant illness.

Eruption chart

Rough rule of thumb:
Age in months minus 6 = average number of teeth through 2 years



An Alternative Eruption Chart



Teething – timing from websites

- Eruption of primary teeth.
  - Generally, one tooth erupts monthly between 6 to 24 months
  - Onset of teething symptoms: 3-4 days before eruption
  - End of teething symptoms – 2-3 days after tooth eruption
  - Rough rule of thumb: Age in months minus 6 = average number of teeth through 2 years
  - Premies get 1st teeth at same corrected age as term infants
  - Delayed eruption: hypothyroid, hypopit, Down's, among other conditions
  - May appear as early 4 months and as late as 15 months. Natal teeth 1/3000.

Symptoms associated with tooth emergence

Macknin, et al, *Pediatrics* 2000; 105; 747-752 – Prospective cohort study, 111 children)

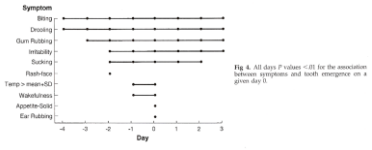


Fig 4. All days P values <.01 for the association between symptoms and tooth emergence on a given day 0.

Symptoms associated with tooth emergence

- Another smaller study (prospective cohort, 21 children) the same year in *Pediatrics* showed teething was found not to be significantly associated with mood disturbance, sleep disturbance, drooling, or diarrhea– Wake, M et al. *Pediatrics* 2000;106;1374-1379
- This study was fraught with self-confessed methodological flaws and limitations.

Teething – Remedies and Potions
Poetic summary of ancient cures

'Now when your baby's teeth appear, you must of these take prudent care.
For teething comes with grievous pain, so to my word take heed again.
When now the teeth are pushing through, to rub the gums thou thus shall do.
Take fat from chicken, brain from hare, and these full oft on gums shall smear.
If ulcers sore thereon should come, then thou shalt rub upon the gum.
Honey and salt and oil thereto. But one thing more I counsel you,
A salve of oil of violet, for neck and throat and gums to get.
And also bathe his head a while, with water boiled with camomile.'

1429, Von Louffenberg (German priest)

Tooth Eruption

- Early v. late
- Chance of trauma
- There is no such thing as teething!!!
  - Look for concurrent medical problems or physiologic growth changes
  - Associative not causative
  - Don't mistake a fever for getting teeth

Remedies –Careful with:

- Orajel – Contains Benzocaine 10% and FD&C Red 40, Flavor, Glycerin, Polyethylene Glycols, Water Purified, Sodium Saccharin, Sorbic Acid, Sorbitol ; rare cases of benzocaine toxicity with overuse.
- Teething biscuits – may contain unnecessary sugar – dentists warn against caries promotion
- Frozen min-bagel halves – popular, but same caveat as above.
- Hyland's Homeopathic Teething Tablets
  - Off the market?
    - Contain:
      - Calcarea Phosphorica (Calcium Phosphate), 3X HPUSChamomilla (Chamomile) 3X HPUSCoffea Cruda (Caffeine) 3X HPUSBelladonna 3X HPUS (Alkaloids 0.0003%).
      - Almost imperceptable amounts of these toxins, but drug is not regulated, potential toxicity with overdose from the belladonna alkaloids
      - In common use – ask if being used – many parents swear by them!

References

- Shusterman, S. Pediatric Dental Update. *Pediatr. Rev.* 1994; 15:311-318.
- Macknin, ML et al. Symptoms Associated with Infant Teething, *Pediatrics* 2000;105:747-752.
- Ashley, MP. It's Only Teething – A Report of the myths and modern approaches to teething. *British Dental Journal* 2001;191:4-8.
- Wake, M. Teething and Tooth Eruption in Infants. *Pediatrics* 2000;106(6):1374-9.

Bennet, HJ, et al. The Teething Virus. *Pediatr Infect Dis. 5:399-401, 1986.*

- Method: prospective study, 500 teething infants to see if new "human teething virus, or HTV" could isolated from baby's saliva.
- Triple blinded study – patients weren't sure why they were in study, technicians did not know what was being tested, and authors didn't care – but hoped to get published anyway.

Pacifier, Thumb and Bottle Habits

- Change the shape of the maxilla, alveolus and palate
- Cause tongue thrust speech and swallowing
- Displace teeth and change eruption patterns
- Breastfed infants have better tooth alignment, facial musculature and jaw shape
  - Fewer open bites, crossbites, crowding
  - Squeezing milk vs. piston-like sucking

All Bone is not the Same!

- Skeletal or basal bone
  - Intramembraneous or Endochondral
  - Thick cortical plate
  - Vascular with marrow spaces
  - Unyielding
- Alveolar bone
  - Develops embryologically with cementum
  - Exists only for the teeth
  - Porous
  - Allows orthodontic movement

Pacifier, Thumb and Bottle Habits

- When to stop:
  - Pacifier: 12-18 mo.
  - Thumb: before eruption of permanent teeth
  - Bottle:
    - With juice or formula: when 1st tooth erupts
    - With water: 12-18 mo.
  - Recent research shows that permanent change can occur by 2-3 years

Pacifier, Thumb and Bottle Habits

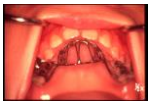
- Poyak J. **Effects of pacifiers on early oral development,.** Int J Orthod 2006 Winter, 17(4)13-16
- Zardetto CG[1], Rodrigues CR, Stefani FM. **Effects of different pacifiers on the primary dentition and oral myofunctional structures of preschool children.** Pediatr Dent. 2002 Nov-Dec;24(6):552-60.
- Melink S[1], Vagner MV, Hocevar-Boltezar I, Ovsenik M. **Posterior crossbite in the deciduous dentition period, its relation with sucking habits, irregular orofacial functions, and otolaryngological findings.** Am J Orthod Dentofacial Orthop. 2010 Jul;138(1):32-40. doi: 10.1016/j.ajodo.2008.09.029.

Pacifier, Thumb and Bottle Habits

- How to stop
  - Cold Turkey
  - Trim the tip/ Open the crosshatch
  - Bury the thing
  - Make a star for the Tooth Fairy

Pacifier, Thumb and Bottle Habits

- Appliance therapy
  - Intraoral
  - Thumb splint
- Behavior modification therapy
  - David Decides by Susan Heitler, Ph.D.
    - Reading Matters 303.757.3506
  - Modified Behavior Modification
- Reevaluate in 6 mo.
  - Stopped because of parent's attention, growing up, or your intervention?



My Baby Can't Feed:
Let's do a Frenectomy!
or
Maybe a Frenotomy
or
???

Frenotomy for Tongue-tie in Newborn Infants Cochrane Review

- Tongue-tie, or ankyloglossia, is a condition whereby the lingual frenulum attaches near the tip of the tongue and may be short, tight and thick.
- Tongue-tie is present in 4% to 11% of newborns.
- Tongue-tie has been cited as a cause of poor breastfeeding and maternal pain.
- Frenotomy, which is commonly performed, may correct the restriction to tongue movement and allow more effective breastfeeding with less maternal nipple pain.

Cochrane: Why it is important to do this review

- Diagnosis and management of tongue-tie remain controversial. It is uncertain whether ankyloglossia is a congenital oral anomaly requiring treatment or a normal variant.
- One survey (Messner 2000b) found that most lactation consultants believe tongue-tie to be a frequent cause of infant breastfeeding difficulties that could be solved by frenotomy.
- In marked contrast, 90% of paediatricians and 70% of otolaryngologists believe that tongue-tie never, or rarely, causes a feeding problem (Messner 2000a).
- Medical organisations such as the American Academy of Pediatrics(Coryllos 2004) and the National Institute for Health and Care Excellence (NICE 2005) now acknowledge that tongue-tie, orankyloglossia, is a significant clinical entity that should be treated as early as possible to minimise breastfeeding problems.
- Given that breastfeeding benefits both infants and mothers, it is important for the clinician to address any condition that may impair breastfeeding(Edmunds 2011).

Do these actually cause a feeding problem or just look funky?
What's normal? What about in functional not photographic state?

Cochrane Review on Tongue Tie
The Conclusions

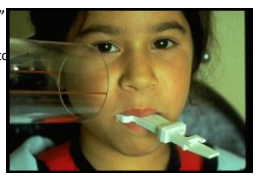
- The effect of frenotomy on tongue-tied preterm infants has yet to be studied.
- The optimal age to perform frenotomy in infants remains uncle
- The effect of tongue-tie on early infant weight gain and on mate difficulties in establishing a breast milk supply remains to be cla
- It has yet to be demonstrated whether frenotomy in breastfeeding infants with tongue-tie and feeding difficulty leads to a longer duration of breastfeeding.
- Whether frenotomy is a painful procedure that requires analgesia or anaesthesia has yet to be established, as no study to date has quantified infant pain during and after frenotomy.

Cochrane Review
Implications for practice

- Frenotomy causes a short-term reduction in nipple pain among breastfeeding mothers and an inconsistent positive effect on infant breastfeeding. Owing to the small number of studies and the high incidence of methodological issues, definitive benefit has not been proven.


The Ten Killer Questions

- "Why do you have to take x-rays?"
  - Or "Don't x-rays cause cancer?"
  - Or "My other dentist said Johnny's to rays taken"



The Answers

- Radiography is a necessary adjunct to a clinical examination
- Decay located between teeth is not seen with the naked eye if the teeth are in contact
- Snapshot of a motion picture
  - Allows monitoring
- Risk/benefit ratio
- If M.D. recommended x-rays would you question that?

The Answers

- We do many things to minimize exposure
  - ALARA (as low as reasonably achievable)
- Don't have routine
  - Customized for the child
  - If I've determined they're necessary for complete diagnosis and treatment planning and you refuse, I am unable to treat your child

The Subquestion

- "But what if I sign a waiver?"
  - Or "Just go ahead without the x-rays, I know my kid doesn't have cavities."

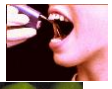
The Subanswer

- Parents may not sign away their child's r
  appropriate health care
- If disease occurs and you failed to diagn
  liable
- You may choose to postpone because of
  or uncooperative behavior but *documen*
  document

Radiography in Children

- Imaging in children
  - Clinical exam
  - Intraoral photos/ intraoral camera
  - Light transmission
  - Diagnodent/ laser light uptake
  - Digital radiographs
  - Conventional radiographs
  - Cone Beam 3D imaging

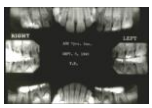
Adjunctive Diagnostic Aids

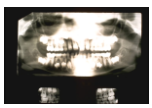


- Laser Caries Detectors
  - Diagnodent -non quantifiable, user determined sensitivity for incipient lesions
- FOTI /DIFOTI
  - Fiber optic trans illumination- light and camera ("DI"gital)- not quantifiable
- QLF
  - Quantitative light-induced fluorescence- varying absorption of wavelengths by enamel allows quantifying of demin. v min. enamel

Radiography in Children

- NO set series
- NO set frequency
- Dependent on risk assessment
  - Age and dental development
  - Tooth morphology
  - Fluoride exposure
  - Diet
  - Caries experience
  - Trauma and anomalies
- NOT FOR RECORD KEEPING: RISK/TREATMENT BASED!





Radiography in Children

- Minimum number of radiographs giving maximum information
  - ALARA
- For diagnosis only, not for record keeping
  - Clinical exam must come first
    - Open contacts=no radiographs
- Growth and development series is the exception
  - 6,12,18 yr.
- Snapshot of a motion picture

Image Gently Alliance

- Pledge to restrict radiation exposure in children and adults
- Use highest speed/minimal dose/least number of images/collimnation
- Refers to FDA for many questions especially about CBCT exposure in young patients
- Many resources on website including dose records recommended by FDA

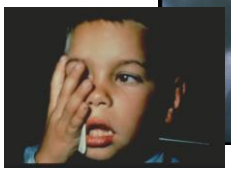
The Image Gently Alliance

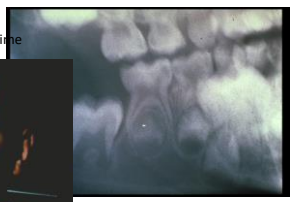
Use a "Snap-a-Ray" for bitewings

- Useful for both PA's and BWX
- Bigger target to bite
- Helps center film
- Easier aim
- #2 = #0

Radiographs for the Gagger

- #4 film extraorally
  - Double exposure time





Radiographs for the Gagger

- Distraction

- N_2O/Sedation
- Topical lidocaine

And All Is Peaceful in the Land of Oz

The 5 Ps: Pharmacology, Psychology, Physiology, Phamily and Phun!

Health Statistics for Children

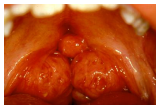
- Percent of school-aged children 5-11 years of age who are in excellent or very good health: 82%
- Percent of school-aged children 5-11 years of age who missed 11 or more days of school in the past 12 months because of illness or injury: 5.1%
- Percent of children 6-11 years of age who are overweight: 17% (2003-2006)
- Percent of children under 18 years of age without health insurance: 8.9% (2008)
- Percent of children under 18 years of age without a usual source of health care: 5.2%
- Source: CDC

Diseases of Childhood (5-17)

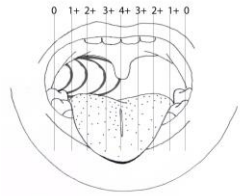
- Untreated tooth decay
  - Between 20 and 30%
- Learning Difficulties/ADHD
  - Between 8.5 and 13%
- Allergies
  - Hay fever 11.6%
  - Food 4.1%
  - Skin 9.4%
- Asthma
  - 10.5 to 15%
- Obesity
  - 17%
  - Overwt+obese+grossly obese>30%
- Activity limitation due to one or more chronic health problems
  - 8-10%
- Depression
  - 8-12%
- Autism
  - 1 out of ~65 live births

Airway Anatomy and Physiology

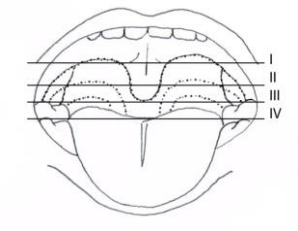
- Brodsky Classification of Tonsil Size
  - 0,+1,+2: OK to sedate
  - +3,+4: Sedate with caution
    - CO_2 retention
    - Difficult emergency intubation
- Mallampati
  - 1,2,3,4,
  - Can you intubate?



Brodsky

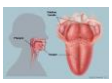


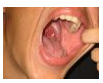
Mallampati



Airway Anatomy and Physiology

- What are tonsils???
  - Important component of immune defense system especially ages 3-6
  - Lymphoid tissue in naso and oropharynx
  - Waldeyer's ring: adenoids, palatine tonsils, lingual tonsils
  - Fight infection
  - Highly sensitive to irritants like infection, allergies and gastric acid
    - Swell easily and quickly to narrow and obstruct airway
  - Produce T cells outside of the thymus
  - May develop tonsiliths or tonsil stones in the crypts





Sleep Behavior

- Does the child snore?
- Is sleep peaceful or restless?
- Bedwetting?
- Sleep apnea?
- Frequently awakens?
- Nightmares?

- Positive answers to two or more questions indicates increased risk for airway obstruction during sleep, treatment and sedation!

- International Classification of Sleep Disorders (ICSD) 2nd ed. Chicago, IL; American Academy of Sleep Medicine; 2005

Obstructive Sleep Apnea - Resources

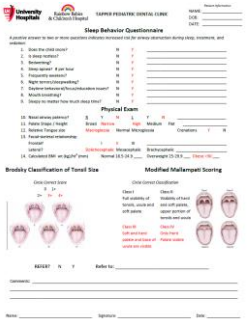
- AAP Clinical Practice Guideline
  - Diagnosis and management of childhood obstructive sleep apnea **PEDIATRICS** 2002;109:704-712
  - Clinical Guidelines for treatment of Sleep Apnea
    - AAP.org/clinicalguidelines
- Chan J, Edman J, Koltai P:
  - Obstructive sleep apnea in children. **Am. Fam**. **Physician** 2004;69:1147-54
- American Academy of Otolaryngology
  - Pediatric Obstructive Sleep Apnea
  - www.wntnet.org/kidsENT

Stages of Sleep

- Awake
- Light Sleep
  - NREM Stage 1 (AKA Stage 1)
    - 1-10 min/hypnic jerks
  - NREM Stage 2 (AKA Stage 2)
    - 10-30 min/ slowing heart rate/decrease temp/decrease bp
- Deep Sleep
  - NREM Stage 3 (AKA Stage 3 and Stage 4) (slow wave sleep/delta wave sleep)
    - 30-45 min/ disorientation/sleeps through disturbances
- REM Stage 4 (AKA REM Sleep)
  - Occurs at 90 min for approx. 10 min
  - Sleepwalking and dreaming
  - Bedwetting if ADH not made
  - Increase length as night goes on
  - Active brain waves

Sleep Disordered Breathing

- Spectrum Disorder of sleep-related breathing disorders
  - Snoring
  - Upper Airway Resistance Syndrome (UARS)
  - Obstructive Sleep Apnea-Hypopnea Syndrome (OSAHS)
- No longer considered benign or social nuisance
- Increase work of breathing with fatigue/inattention/hyperactivity
- Disordered REM sleep with frequent repositioning to open airway
- Predisposing factors include
  - Obesity
  - Retrognathia
  - Body posture
  - Use of alcohol or sleep sedatives
  - Nasal blockage


Sleep Behavior Questionnaire

Physical Exam

Modified Mallampati Scoring

Sleep Disordered Breathing

- Snoring
  - Multiple assessments necessary
  - History of noisy or disrupted sleep
  - No drop in oxygen saturation
  - Epworth Sleepiness Scale- situation related
    - 0 = Would never doze
    - 1 = Slight chance of dozing
    - 2 = Moderate chance of dozing
    - 3 = High chance of dozing

Epworth Sleepiness Scale (ESS)

Situation	Chance of dozing (0–3)			
Sitting and reading	0	1	2	3
Watching television	0	1	2	3
Sitting inactive in a public place—for example, a theater or meeting	0	1	2	3
As a passenger in a car for an hour without a break	0	1	2	3
Lying down to rest in the afternoon	0	1	2	3
Sitting and talking to someone	0	1	2	3
Sitting quietly after lunch (when you've had no alcohol)	0	1	2	3
In a car, while stopped in traffic	0	1	2	3
Total Score				

Sleep Disordered Breathing

- Upper Airway Resistance Syndrome
  - Crescendo snoring
  - Repeated arousals lead to excessive daytime sleepiness and fatigue
  - Arousal leads to airway opening and decrease in upper airway resistance
  - Usually one to three breaths in duration
  - No evidence of oxygen desaturation
  - Final dx may be made by polysomnography

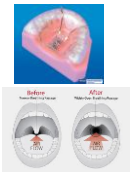
Sleep Disordered Breathing

- Obstructive Sleep Apnea-Hypopnea Syndrome
  - Partial or complete episodes of airway obstruction
    - Repetitive collapse of the pharynx
  - Reduction of airflow leads to hypopnea or complete closure apnea
  - Hypopnea- reduction in airflow and baseline ventilation reduced by 50% for 10 seconds
  - Apnea-cessation of airflow with continued respiratory effort for 10 seconds
    - Central apnea has no respiratory effort
  - Patient must demonstrate 5 obstructed breathing events per hour during polysomnography

Sleep Disordered Breathing

- Obstructive Sleep Apnea-Hypopnea Syndrome
  - RDI (respiratory disturbance index) = number of sleep apneas + hypopneas/hour of sleep
    - >15/hour indicates possible OSAHS
  - Epworth Scale between 12 and 24
  - Physical Findings
    - Enlarged tonsils
    - Nasal obstruction
    - Retrognathia
    - Macroglossia
    - GERD
    - Anemia
    - (in adults hypertension and cor pulmonale)
  - Social findings
    - Lack of attentiveness and focus
    - Fatigue
    - Nocturia

Sleep Disordered Breathing



- Treatment Options
  - Tonsillectomy and/or adenoidectomy
  - RPE to increase size of nasal base
  - Tongue repositioning appliances
  - Mandibular surgery and advancement
- Treatment outcomes
  - Weight gain
  - Height increase
  - Improved focus, concentration and attentiveness
  - Decreased ADHD-type symptoms
- http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/pulmonary/sleep-disordered-breathing/

Obesity as an Underlying Cause of Sleep Disorders

Obesity and Sedation

- Multi-system problem
- Significant health and sedation risk factor
- Changes metabolism of lipid soluble drugs
  - Delayed onset
  - Delayed emergence
- Difficult positioning to keep airway open
  - Neck roll
  - Chair tilt

BMI Classification

- Make a weight diagnosis using BMI percentile
  - < 5%ile Underweight
  - 5-84%ile Healthy Weight
  - 85-94%ile Overweight
  - 95-98%ile Obesity
  - >=99%ile Gross Obesity

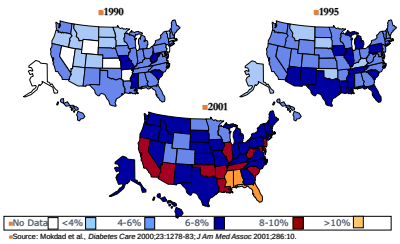
For Patient Communication...

- Weight or Excess Weight
- Body Mass Index (BMI)
- Risk for Diabetes & Heart Disease

Pediatrics 2009; 124: Supplement on Issues and Implications of Screening, Surveillance & Reporting of Children's BMI

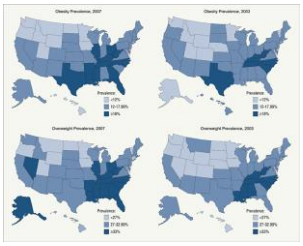
Diabetes Trends Among US Adults

BRFSS, 1990,1995 and 2001



Source: Mokdad et al., *Diabetes Care* 2000;23:1278-83; *J Am Med Assoc* 2001;286:10.

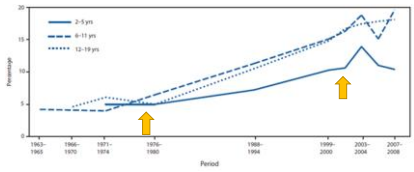
Obesity & Overweight Rates among US Children & Adolescents [aged 10 to 17 years, 2003 and 2007]



Singh, G. K. et al. Arch Pediatr Adolesc Med 2010;0:2010.84-10.

ARCHIVES OF PEDIATRICS & ADOLESCENT MEDICINE

Pediatric Obesity Over Time: National



Multi-System Effect of Obesity

Pulmonary	Cardiovascular	Gastrointestinal
Chest wall mass ↑	Cardiac output ↑	Intra-abdominal pressure ↑
CO_2 production ↑	Hypertension	Intra-gastric pressure ↑
Functional reserve ↓↓	Stroke volume ↑	Risk of aspiration ↑
Pulmonary compliance ↓		
Total O_2 consumption ↑		

Obesity+Sleep Apnea+Sedation=DISASTER!

- Airway, airway, airway
  - Increased chest mass
  - Decreased chest movement
  - Increased work of breathing
  - Partially reclining not supine
- Full stomach or slow gastric emptying
  - High intragastric pressures
  - Increased chance of regurgitation and aspiration
- Post sedation recovery
  - Obstruction

Type 1 (Juvenile) Diabetes

- Significant increase in numbers
- Inability to produce insulin
  - Autoimmune reaction to pancreas
  - Requires monitored insulin dose
  - Type 2 is inability to respond to insulin- increasing exponentially- 16-30%
    - Metabolic syndrome is diagnosed in people who have at least three of these five criteria: high blood pressure, insulin resistance, high triglycerides, a large waist and low levels of HDL ("good") cholesterol.
    - Learning disabilities/ brain development occurs if onset <5y.o. possibly b/c glucose defecit

Type 1 Diabetes

- Diagnosis
  - Extreme thirst
  - Frequent urination
  - Drowsiness, lethargy
  - Sugar in urine
    - hypoglycemia
  - Sudden vision changes
  - Increased appetite
  - Sudden weight loss
  - Fruity, sweet, or wine-like odor on breath
    - ketoacidosis
  - Heavy, labored breathing
  - Stupor, unconsciousness

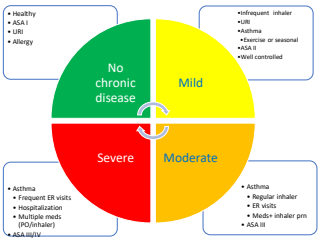
Type 1 (Juvenile) Diabetes

- Multisystem effect
  - Diabetic triopathy:
    - Retinopathy
    - Neuropathy
    - Nephropathy
  - Oral
    - Increased plaque/ decreased saliva
    - Elevated glucose levels/increased bacteria counts
    - Loss of collagen in gingiva
    - Vascular disorder/reduced circ. in gingiva
    - Poor healing

Type 1 (Juvenile) Diabetes

- Controlled by
  - Diet
  - Exercise
  - Insulin
- May be at risk for hypoglycemia and insulin shock if NPO orders followed
  - Individual case consultation
- Monitor by HbA1c
  - Should be less than<6% (BS 120)
  - >8.5% (BS>210) poor with significant complications
- For sedation
  - NPO rules
  - First appointment
  - Insulin when patient able to resume normal food intake

Pulmonary Disease

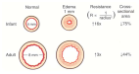


Upper Respiratory Tract Infections

- Allergic rhinitis
  - Clear nasal discharge
  - Symptoms relieved by antihistamine
- URI:
  - Yellow or green nasal discharge
    - Old wives' tale/ not indicative of bacterial or viral infection
  - Nasal passages not patent
  - Fever
  - Cough
  - Symptoms relieved by antibiotic if bacterial

Upper Respiratory Tract Infections

- Frequent respiratory tract infections result in:
  - aspiration of secretions
  - decreased airway radius
  - increased airway resistance
  - uneven ventilation and perfusion
  - modest hypoxemia
  - pediatric airway is more reactive than adult
- Pediatric airway smooth muscle is more responsive to stimulation with acetylcholine
  - due to delayed development of degrading enzymes
- Pediatric lungs are like asthmatic lungs
  - Limited FRC
  - Limited elasticity

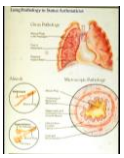


Upper Respiratory Tract Infections

- Potential infection of the dental team
- Cough: irritation of airway more likely
- If nasal passages not patent
  - Unable to use nitrous oxide/oxygen
  - Will not be able to breathe with a rubber dam in place
  - Irritation of airways from post nasal drip when patient is supine
- 6 week rule for infection if lungs involved and reactive

Pulmonary Disease

- Asthma
  - Small increases in edema of periphery significantly decrease the size of the airway and increase resistance
  - Increased responsiveness of trachea and bronchi to stimuli causing narrowing of the airways
  - Effects 1 of 7 children in the United States
  - Cause of most pediatric hospital admissions
  - Characterized by smooth muscle spasm, airway inflammation with edema and mucus hyper-secretion
  - Higher risk of dental caries



Severity Classification of Asthma after Institution of Therapy

- Mild
  - Spasmodic or seasonal
  - Symptoms 1-2 X /month
- Moderate
  - Symptoms >2 X /week
  - Nocturnal symptoms 4-5 X /month
  - Symptoms may persist for several days
- Severe
  - Symptoms each day and night
  - ER or medical visits 3 or more times per month
  - Activity limited

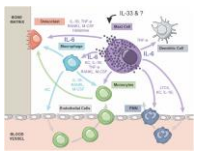
From A. Milnes

Asthma and Sedation

- Higher risk of complications up to 2 weeks following attack – bronchospasm
  - 9-11x
  - Barash, P. (2009). Clinical anesthesia (6th ed.). Philadelphia: Lippincott Williams & Wilkins.
- Preoperative optimization of medical care
  - If PRN inhaled β agonists or oral meds
    - daily administration for 3-5 days prior to appointment
  - If chronic oral or inhaled meds
    - Consult with pMD re addition of oral steroids
    - Consider GA rather than oral sedation
- Recent exacerbation requiring hospitalization or emergency treatment within 6 weeks of treatment date precludes elective treatment
- Postpone elective treatment for 6 weeks even if no wheezing if URI present
  - 11 fold increase in respiratory complications

Asthma and Sedation

- Not all asthma meds are alike
  - Bronchodilators open the airway acutely
    - β_2 Agonist , long and short acting
      - Metaproteranol, salbutamol (albuterol)
    - Adrenergic and anticholinergics
      - epinephrine
  - Inflammation counteractors
    - Leukotriene antagonists (against inflammation byproducts)
      - singulaire
    - Mast cell stabilizers (prevent release of histamine)
      - chromalin
    - Steroids (stabilize cell membranes)
  - IgE blockers
    - Omalizumab injection



Covid-19 and Children

- Hospital and ICU admissions increased with Delta variant
- Vaccines for 5-12 years old- Pfizer
- 4% will show long term effects "long termers"
  - Fatigue
  - Fog
  - Respiratory issues
- Covid mouth
  - Exfoliative lesions on attached mucosa
- Multisystem Immunodeficiency Syndrome-
  - Autoimmune rapid progressive disease

Magna Cum Measles

U.S. Population

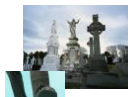
- Total US Population: 309,160,890
  - 1 birth q8 sec
  - 1 death q12 sec
- US Children: 73,000,000
  - ~25% of population
- US Senior citizens: 39,000,00
  - ~13% of population
  - Source: CIA

U.S. Birthrate

- 2009
  - 13.2 per 1000 population (CIA World Factbook)
  - 13.4 per 1000 population (U.N.)
- 2002
  - 13.9/ 1000
- 2001
  - 14.1/ 1000
- 1990
  - 16.7/1000
- Teen rates dropped to approx <40/1000 girls
  - 2010 lowest on record
- Low birth weight babies increased to 7.9%
  - Preterm babies <37 weeks increased to 12%

Mortality

- **1-4 years of age**
  - Number of deaths: 4,631
  - Deaths per 100,000 population: 28.4
  - Leading causes of death
    - Accidents (unintentional injuries)
    - Congenital malformations
- **5-14 years of age**
  - Number of deaths: 6,149
  - Deaths per 100,000 population: 15.2
  - Leading causes of death
    - Accidents (unintentional injuries)
    - Cancer



Life Expectancy

- Life expectancy of adult 10 years ago: 78 years
- Life expectancy of adult today: 77 years
  - Opioids, Covid 19
- Life expectancy of child today: 72-73 years (NEJM 2007)
  - Obesity + diabetes + heart disease + stroke + amputations + blindness
  - Life expectancy of child with cerebral palsy
    - ~degree of disability
    - Approximately 85-99% alive at 20 years
- This is the first generation of children who will have a shorter life expectancy than their parents

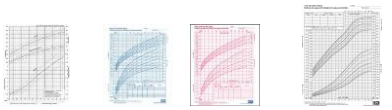
"I Yarn What I Yarn…"

- **Scientific classification**
- Kingdom: Animalia
- Phylum: Chordata
- Class: Mammalia
- Order: Primates
- Family: Hominidae
- Subfamily: Homininae
- Tribe: Hominini
- Genus: *Homo*
- Species: ***H. sapiens***

Shaun White et moi

Defining the Pediatric Patient

- Growth Charts
  - Function of height, weight, BMI and age
  - Recent changes because of development and obesity
    - Specific for secular populations



Preterm | Birth to 3 years | 2 to 20 years

Easy Definitions

- Premie (preterm): born before 40 weeks after gestation (<37 weeks)
- Neonate (newborn): first 28 days after birth
- Infant: between 1 month and 1 year (alternative 3 years)
- Childhood: includes toddlerhood and preadolescence
  - Toddlerhood: between 1 and 3 years
  - Childhood: between 3 and 10 years
- Adolescence: begins at puberty
  - Ends at maturity between 17-19
  - Never ends in males!

The Anesthesiologist's Definition of Pediatric Patient

Defining the Pediatric Patient

- Puberty
  - the condition of being or the period of becoming first capable of reproducing sexually marked by maturing of the genital organs, development of secondary sex characteristics, and in the human and in higher primates by the first occurrence of menstruation in the female (Merriam Webster 2010)
    - Females <males
  - Now 1.5-2 years earlier than in 1980- Danish (2009) and American (2005) studies
    - Possibly related to nutrition, exposure through plastics to hormone like substances, exposure through food to Bovine Growth Hormone (BGH) and other animal growth stimulants
- Ethnic differences
  - 14% of 7 yo African American females show the beginning signs of 2^{ndary} sexual characteristics
- Weight
  - Obese females (>90 BMI) reach puberty younger
  - Obese males (>90BMI) reach puberty later

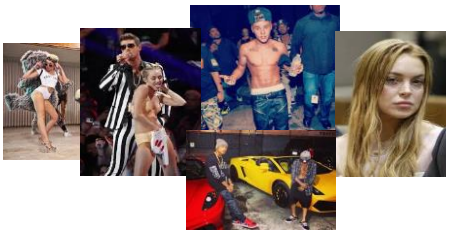
Defining the Pediatric Patient

- Chronological Age
  - Time counted from birth
- Physiological age
  - A person's age as estimated by his or her body's health and probably life expectancy.
  - A person's age estimated in terms of function.
  - The age of an individual expressed in terms of the chronological age of a normal individual showing the same degree of anatomical and physiological development. *(about.com)*
- Mental age
  - An intelligence test score (I.Q.), expressed as the chronological age for which a given level of performance is average or typical.
- Developmental age
  - Pioneered by Freud and Erikson
  - Developmental milestones are a set of functional skills
    - Gross motor
    - Fine motor
    - Language
    - Cognitive
    - Social

Defining the Pediatric Patient

- Minor
  - The legal definition of "child" generally refers to a minor, otherwise known as a person younger than the age of majority
    - (DBC: Oral Conscious Sedation Permit for Minors: 13 and under)

Post Minor!



Defining the Generations

- Lost Generation
  - Fought in WWI
- Greatest Generation (GI Generation)
  - Veterans who fought in WWII
- Silent Generation
  - Born between 1925 and 1945
  - Too young to fight in WWII
  - "Children of the Great Depression"
- Baby Boom Generation
  - 1946-1964
  - Born after WWII marked by increase in birth rates
  - Remodeled society; rejected or redefined social and traditional value
  - Returned to the values later in life
  - Rock and Soul

Defining the Generations

- Generation X
  - 1964-1982
  - MTV Generation
  - Baby Buster or Boom Shadow
    - Decrease in birth rates
  - Intro of home computers, video games, cable television, the internet and the DotCom Bubble
  - AIDS epidemic
  - Iraq War
  - Highest education levels of any generation
  - Lower overall income- men 12% less than fathers
  - Grunge and hip hop

Defining the Generations

- Xennials
  - 1977-1983
  - Analog Childhood
  - Digital Adulthood

Defining the Generations

- Generation Y: The Millennials
  - ~1982- 1993 (up to 2000)
  - Echo Boomers
    - Children of Baby Boomers
    - Significantly increased birth rate but still not as great as Baby Boomers
  - Generation Me
    - Narcissistic (military enrollments decreased during war)
    - Entitlement and rejection of social conventions
    - Dr. Fred Bonner: "white, affluent teenagers who accomplish great things as they grow up in the suburbs, who confront anxiety when applying to super-selective colleges, and who multitask with ease as their helicopter parents hover reassuringly above them."
  - Trophy Kids
    - They get a trophy for everything they do

Defining the Generations

- Generation Y: The Millennials
  - Boomerang Generation/Peter Pan Generation
    - Delay rites of passage into adulthood and move home after college
  - Economic prospects falter
  - College completion rates decrease especially boys
  - Frequently switching jobs without loyalty or concern for future
  - No brand loyalty
  - Facebook, MySpace, Twitter: media driven
  - Electropop and hiphop / indie Rock

The Millennials

Defining the Generations

- Generation Z
  - Zoomers, Homelanders, Digital Natives
  - Mid 1990s – 2010
  - Generation M (multitasking)
  - Net Generation
  - Internet Generation
    - Lifelong use of world wide web and internet
    - Mobile phones as a right of passage
    - Instant messaging and social media
    - MP3 players (forget tapes, CDs, DVDs, records)
    - Inability to concentrate/focus
    - Overscheduled and underdisciplined

Defining the Generations

- Generation Z
  - National Center for Education Statistics
    - 17 million enrolled in undergrad higher education
      - 1 in 5 at least 30 y.o.
      - ½ financially independent
      - 1 in 4 caring for a child
      - 47% part time
      - ¼ take gap year before college
      - 2/5 attend community college
      - 44% have parents who don't have a bachelor's degree
  - Summary: we have to change how we look at this generation
    - Redefine traditional v nontraditional student

Defining the Generations

- Generation Aught
  - 2000-present
  - Double zeros?
  - Zeros?
  - Zips?
  - Nadas?
  - Naughties?

Cognition and Communication

- Patient
  - Age and cognitive development
    - <36 mo. Precommunicative/unlikely to respond to standard behavior modification techniques
      - Will exhibit sleep deprived behavior including crying, thrashing, inconsolable crying with mild to moderate sedation
    - >36 mo. Communicative/may respond to combination of anxio behavior modification techniques
  - Attachment and temperament
    - Temperament appears to correlate with sedation need
    - "Easy, slow to warm up, difficult" affects sedation choice

Defining the Pediatric Patient

- Developmental stages
  - Physiological
    - Determined by growth characteristics
  - Developmental
    - Milestones in learning
    - Interpersonal skills
    - Fine motor and gross motor skills
    - Development of self

Defining the Pediatric Patient

- Developmental Stages
  - Early Childhood (Birth to 8)
    - Physiologic
      - Between birth and 3
        - Doubles in height
        - Quadruples in weight
      - Rate of growth slows between 5 and 8
    - Developmental
      - Peer relationships
        - Birth to 5: parallel play
        - 5 to 8: friendships develop
      - Gender identity
      - Sense of right and wrong
      - "The Plastic Brain"
        - Malleable and reformative links

Developmental Milestones

- 12-Month Old Developmental Milestones
  - Vocalize/gestures or speaks words to communicate
  - Crawls, cruises, or walks
  - Responsive, affectionate or aggressive towards others
  - Finger feeds, uses cup and spoon independently
  - Has precise pincer grasp
  - Imitates, shakes, bangs and throws objects
  - Waves bye-bye
  - Tests permanence (and your nerves)

Developmental Milestones

- 24-Month Old Developmental Milestones
  - Has vocabulary of at least 20 words
  - Uses two-word phrases
  - Can go up and down steps one step at a time
  - Can kick a ball
  - Stacks 5-6 blocks
  - Imitates adults
  - Can follow 2 step commands

Developmental Milestones

- 3-4 Year Old Developmental Milestones
  - Goes up and down stairs without support
  - Kicks ball / jumps in place
  - Rides tricycle
  - Has self-care skills
  - Knows name, age, and gender
  - Shows early imaginative behavior

Developmental Milestones

- 5 Year Old Developmental Milestones
  - Dresses self without help
  - Draws person with head/body/arms/legs
  - Recognizes letters of alphabet
  - Copies triangle/square
  - Plays make believe and dress up
  - Plays interactive games with peers
  - Follows rules of games

Defining the Pediatric Patient

- Developmental Stages
  - Middle Childhood (8 to 12 years)
    - Physiologic
      - Latency period
      - Growth slow and steady until puberty
    - Developmental
      - Rule based learning

Defining the Pediatric Patient

- Developmental Stages
  - Adolescence (12-18 yrs approx.)
    - Culturally
      - Identity Formation
        - Begins with Sexual Maturity; Ends with established identity in com
        - Social Context is culturally based
        - Adolescence may not exist or may be short
          - Onset is puberty = adulthood
          - US may extend into 20s

Defining the Pediatric Patient

- Developmental Stages
  - Adolescence (12-18 yo approx.)
    - Physiologically
      - 2 years rapid followed by 3 years slow and steady
      - Unpredictabel
      - Sexual development

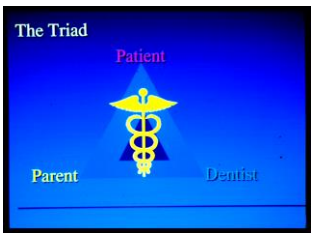
Defining the Pediatric Patient

- Developmental Stages
  - Adolescence (12-18 yo approx.)
    - Cognitive
      - Early
        - Classify and order objects
        - Reverse process
        - Logic
      - Late
        - Abstract reasoning
        - Hypothesis testing

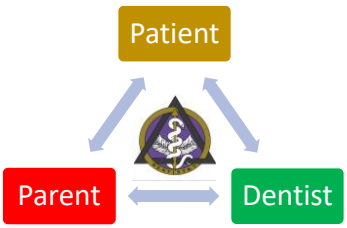
It is human to have a long childhood; it is civilized to have an even longer childhood. Long childhood makes a technical and mental virtuoso out of man, but it also leaves a life-long residue of emotional immaturity in him.

— Erik Homburger Erikson (1902-1994)

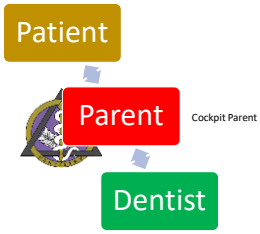
Child Behavior and Parent Management



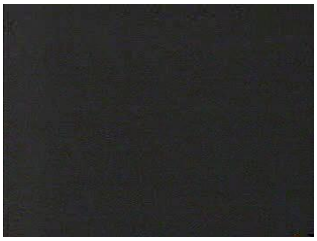
Parenting, Psychology and the Family



Parenting, Psychology and the Family



If only it was this simple!



Parents ask more questions today

- buying your time and expertise
- informed consumer
- lay publications
- internet
- don't want to be taken by surprise
- want you to think of them as intelligent

Parenting Today

- It's not the lives they've led

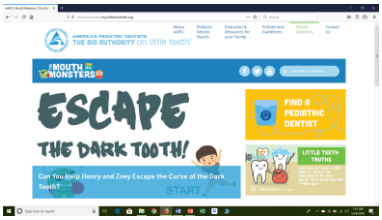
Parenting Today

- It's the books (Internet) they've read!
  - Google University
    - PhD in Googleology

Mouthhealthykids.org

2min2x.org

mouthmonsters.mychildrensteeth.org



Preparing the Office

- Staff meetings
- Office sop's
- Many handouts
- Practice

Rule # 1

- Children are the most important thing to parents

Rule # 2

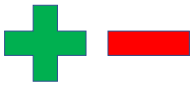
- Treat parents' questions with respect

Rule # 3

- Parents bring their own anxieties into the office

Rule # 4

- Never answer a negative question or answer a question while on the defensive
- Always answer in the positive



Rule # 5

- Remember that the questions are not personal assaults on you

Rule # 6

- Remember that you are representing the office

Rule # 7

- Never argue

Rule # 8

- Never assume the parent understands dental or medical terminology

Rule # 9

- Speak at the parent's comprehension level

Rule # 10

- Big words don't mean you're smarter

Rule # 11

- Open body posture and make eye contact

Rule # 12

- Believe in what you're saying

Rule # 13

- Get confirmation of understanding

Rule # 14

- Always talk with an incensed parent in private and out of view

Rule # 15

- Try not to instill guilt or blame

Rule # 16

- Thank the person for asking the questions

Rule # 17

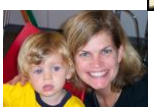
- Take time to formulate a good answer

Rule # 18

- Try to answer the question the parent is really asking

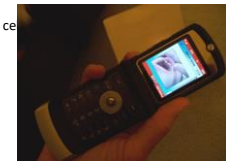
Rule # 19

- Always remember that you are treating the parents as much as the child!



Be Available for Calls and Emergencies

- You don't always have to be in the office
- Gen x-ers and Millennials love e-mail and ce phones



The Changing American Family

The New York Times

- American households have never been more diverse, more surprising, more baffling. In this special issue of Science Times [11/27/2013], NATALIE ANGIE stock of our changing definition of family.
  - Birth rates are down
    - 1/2 of 1960
    - Children are 23.5% of the population
    - 2children/family in 2012, v 3 in 1970s
  - Middle Class families spend $241,080 to age 18 not counting college or grad schools
  - Marriage rate declined
    - 41% of babies born out of wedlock
    - Less education, greater chance of child out of wedlock
    - Cohabitating couples increased
  - Divorce rates have dropped!
    - 40% for first time marriages
    - 30% for in middle and upper middle class
    - Baby boomers 50%

The Baby Bulge as Bling!

Raising children has rated very near to sex - and to success - as an American fixation.
Raising America by Ann Hulbert, 2003

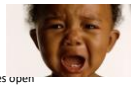
Should Children Cry?
(or should we *ALLOW* them to cry?)

- Normal human babies cry 2 hours/day
- Physically, neurologically and primally intertwined with breathing
  - Linked by a cluster of cells in the hindbrain
  - Fast, active respiration
- Attracts adults to care for baby
  - All mammalian species respond
  - Cries are similar
  - Mammals that don't cry are ignored by parents
- Birchmeier, C, Hernandez-Miranda, L; Proceedings of the National Academy of Sciences 2017

NYTimes.com/ 2017/09/04/science/crying-babies-animals-html

And What About That Cry?
Or: What's my little darling saying?

- Related to the gene that controls stress reaction and cortisol release
  - Sheinkopf, S, Lester, B, Brown University
- Analyzed by Choliz, M, Spanish J of Psychology
  - Angry babies
    - Eyes half closed gazing off to the side
    - Crescendo
  - Frightened babies
    - Hesitation, tensing of facial muscles, explosive cry and eyes open
  - Pained babies
    - Cried out immediately, squeezed eyes shut



And Finally: How and Why Do You React?

- Babies cries change tone and falls and rises unpredictably
- Adults are wired to respond
  - Infants depend on adults for survival
  - Response comes from periaqueductal gray matter in midbrain
    - 2X faster than any other response
    - Do or die response
  - Motor areas fire for quick movement

Changes in Practitioner's Management of Patients

- Since beginning of practice
  - Casamassimo, Wilson & Gross, 2002

Management technique	Increased	No change	Decreased
Parents in operatory	64	28	6
Sedations	38	31	31
HOM	1	17	82
Medical Immobilization	7	40	53

Pediatric Dentists Believe Parenting Has Changed!

- Limit Setting diminished
- Less likely to use physical discipline
- Parents are unsure of their role as parents
  - CEO v consultant v best friend
- Too busy to spend time with children
- Too self absorbed/materialistic/outward oriented/concerned with status
- Overinvolved/ underinvolved/ controlling

The Helicopter Parents

AKA Velcro Parents

Lawnmower Parents

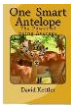
Millennials as Parents!

- Drone parenting
- Group parenting decisions
  - Forums
- Every action instagrammed
- Less scheduled/free child controlled play
- Democratic families/ consensus
- Electronic learning
- Change in standard parenting roles
  - Less likely to be married
  - Stay-at-home dads

Every Child is Above Average

Being Average is OK!

- One Smart Antelope: the Power of being Average
  - David Alan Kettler
  - Traveling through life in the middle of the pack
- In Defense of Being Average
  - Mark Manson
  - http://markmanson.net/being-average
  - Accepting mediocrity when there are comic book superheroes around
  - "Which leads to an important point: that mediocrity, as a goal, sucks. But mediocrity, as a result, is OK."
- The Benefit of Being Average
  - Time magazine 2015



Teacups

- Universities have adopted an informal "Dean of Parents"
- Parents are escorted off campus after freshman orientation
- The fragile, never say no, grade inflated child on a college campus is referred to by many Deans and College Presidents as "Teacups" because he/she is so fragile and can't accept failure
  - Universities have had to hire more counselors
- Failure is the best teacher

Why?

- Societal changes toward liberalism and breakdown of norms
- Divorce and multiple homes
- Working parents
- Hectic lifestyles
- Loss of extended families
- Increased stress of maintaining lifestyles
- Frequent relocation

From N. Long, PhD after Casamassimo et al

Parenting

- Behavioral/Genetics Theory
  - Genes and peers control behavior
  - Parents are unimportant in personality and character development
- Current Theory
  - Complex interplay of interactions and moderating effects of biological, environmental and social factors
    - Eg. Meanness is not psychopathic, it's behavioral (NYT 2/6/07)
    - Smithsonian Magazine Feb.2013

Parents Have the Power!

- They can influence:
  - Behavior at home
  - Leisure-time activities
  - Profession
  - Religion
  - Political preference
  - Child friendships (age limited)

From Harris, 1998

How Much Power?

- Moderated by other variables which affect child's behavior and adjustment
- Eleanor Maccoby , Stanford U., suggests parenting variables account for 20-40% of child outcome

The Power of No (Newsweek, 2004)

- Affluence yields
  - overindulgence
    - Can afford to say yes
    - Give kids advantage
  - Consumerism
  - Less responsibility at home
- Overindulgence yields
  - Self –centered child
  - Difficulty coping with life's disappointments
  - Sense of entitlement impacts success in workplace and relationships
  - Be vulnerable to anxiety and depression

Parenting Stress

- Inconsistent parenting
- Decreased monitoring and setting consistent limits
- Less proactive/more reactive
- Harsh discipline
- Decreased quality of parent-child relationships
- Less involvement between parent and child

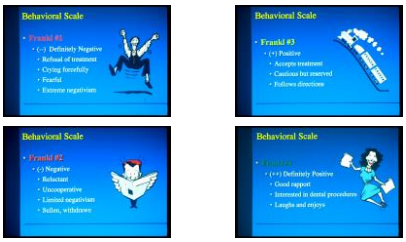
Specific Stressors

- Financial pressures
- Decreased time for parenting
- Daily hassles
- Sleep deprivation
- Increased choices

Too Many Choices!

- Simple processes become more complex
  - What's the BEST choice v what's good enough?
  - Analysis paralysis leads to increased stress and shutting down
  - High expectations with resultant failure
- As choices increase
  - Decisions require more effort
  - Mistakes are more likely: perceived or real
- Too many parenting choices of techniques
  - Increases inconsistency, anxiety and failure
- Decision Fatigue
  - Sheena Iyengar, Columbia University

Behavioral Scales



Behavior Management in Children and Especially Parents

Behavior Management in Children

- Non-pharmacologic
  - Exploration/Modeling
  - Tell/Show/Do
  - Desensitization
  - Distraction
  - Voice Modulation
  - Behavior Modification
  - Pedi-wrap/papoose/medical immobilization device

Behavior Management in Children

- Pharmacologic
  - Used in conjunction with non-pharmacologic
  - Inhalational
    - N_2O/O_2
  - Oral (Enteral) Sedation
    - Benzodiazepine/ Narcotic
  - Sedation (Parenteral)
  - General Anesthesia

Be yourself but keep talking

- Children hate silence
- Learn the current TV and pop stars
- Age appropriate banter
- Compliment clothing (no matter how despicable)

Choosing the Behavior Management Technique for Ma and Pa

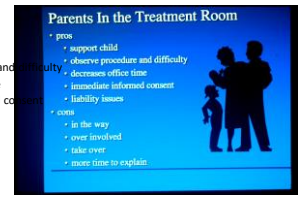
- Family
  - The "make it or break it" factor
  - Preconceived notions
    - child "needs" sedation
    - "won't do well"
    - "is anxious"
    - Don't want sedation, GA, restraints, etc…
  - Their past experience
    - Transferred or projected feelings
  - Requests
    - "no pain"
    - "don't want my child to remember.."
  - Their needs
    - One visit
    - Multiple visits

Parents Out of the Treatment Room

- Pros
  - No hindrance therefore faster
  - Only one explanation needed
  - Children may behave better without the parent
  - Behavior management is more immediate
  - Child doesn't perceive harmful situation "save me"
- Cons
  - Two explanations needed means more time
  - Return to parent for procedural change
  - Child lacks parental support
  - What do you do at the MD?

Parents In the Treatment Room

- Pros
  - Supports child
  - Observe procedure and difficulty
  - Decrease office time
  - Immediate informed consent
  - Liability issues
- Cons
  - In the way
  - Over involved
  - Take over
  - More time to explain



Parental Presence During Induction of Anesthesia (PPIA)

- PPIA
  - Predicting which child-parent pair will benefit from parental presence during induction of anesthesia: a decision making approach, Kain et al, Anes Analg 102:1, pp81-84, 2006
- CC+CP= NO CHANGE
- CC+AP=AC
- AC+CP=CC
- AC+AP= DISASTER!!!

Calm Child	**Calm Parent**
Anxious Child	**Anxious Parent**

Help Me!

Rules of the Continuum of Behavior Management

- It is not linear
- It is not one way
- It is okay to combine techniques
- On different days, the same child will need different techniques
- Be flexible/ give the child the benefit of the doubt
- Define or modify your definition of success

Communication

- Still possible!

Exploration/Modeling

Tell/Show/Do

- Tell once/show once/do once
  - Set limits on negotiations
  - Always have a mirror

Desensitization

- Expose by working up to the event
- Start on hand where the child can see and move towards mouth

Distraction

- Take attention away from proced[illegible] hypnosis
  - Visual
  - Auditory
  - Engaging activity
  - Storytelling
  - Singing
  - Counting
  - Deep breathing

iPads and Injections

- CHILD LIFE IPAD DISTRACTION: A PSYCHOSOCIAL TOOL FOR CHILDREN RECEIVING AN INJECTION. S Atencio, U. Alabama 2015
- "…children receiving distraction during the injection using a tablet reported higher pain, both observed and self-reported, and r negative emotions showing distress"
- "This finding suggests that children who received distraction tablet displayed less coping than those who received routine

Distraction

- Computer Tablet Distraction in Children Receiving an Injection
  - Sherwood Burns-Nader, PhD, CCLS, Stephanie Atencio, MS, CCLS, Magdalena Chavez; Pain Med (2016) 17 (3): 590-595.
- 41 children, randomized, received injection
- A significant difference was found for pain, both self-reported and observed, and observed emotions. Children receiving distraction using a tablet displayed significantly higher amounts of pain and negative emotions. Gender differences in pain and emotions were found with females having a significantly higher amount of pain and negative emotions.

Another iPad View

- The iPad provides effective distraction for induction of sedation/general anesthesia or reduction of injection pain.
- Also may be more effective than parental presence for reducing anxiety.
- McQueen A, Cress C, Tothy A. Using a tablet computer during pediatric procedures: A case series and review of the "Apps". Pediatr Emerg Care 2012;28:712-714.

Voice Modulation

- Raising or lowering volume, tone or inflection
- Not well accepted by parents
- May signal displeasure
- Follow by positive reinforcement

Behavior Modification

- Positive reinforcement
- Follows desirable behavior
- Work up to goal
- Positive or negative reinforcement may be use
  - Long term effects are eliminated
- The TOY is KING!
  - Remembered long after the visit is over

Medical Immobilization Device

- Papoose board, Restraining device, so wrist restraints, head immobilizers
- Mustn't be tightened such that it caus injury or restricts ventilatory moveme
- Must allow free access to monitors
- Office protocol for use (prevents accusations of assault or child abuse)
  - i.e.. 15 min in unsedated child except in emergency
- Consent for use
  - May have parent assist in placement of child
- Neck roll to open airway

CONSENT FOR THE USE OF PAPOOSE BOARD

It occasionally becomes necessary, in pediatric dentistry, to control excessive head, arm and leg movements in order to provide safe, comfortable and quality dental treatment. These patients are usually very young, fearful and may be moderately disabled.

A technique which we use for immobilizing these special children is the Papoose Board (sleeping bag) and one or more seat or safety belts. The child's ability to breathe is not affected by the use of this.

We will be happy to answer any questions you have. By signing below you state that you give permission to any and all faculty members of the Department of Pediatric Dentistry in conjunction with students of the University of the Pacific to use the Papoose Board and its accessories for treatment of your child. This agreement and consent shall remain in force, unless withdrawn in writing by the person who has signed below on behalf of the minor patient.

Thank you for taking the time to read and sign this document.

PRINT PATIENT'S NAME — YOUR SIGNATURE

PATIENT'S AGE — PRINT YOUR NAME

WITNESS' SIGNATURE — YOUR RELATIONSHIP TO PATIENT

PRINT WITNESS' NAME — TODAY'S DATE

White Copy: Patient — Yellow Copy: Chart

Liability

Pain Control in Children

- Necessary for successful treatment
- Poor pain control often misinterpreted for disruptive behavior
- Requires special understanding of physiology and psychology of children

Pain in Children

- The response to the sensation of pain is often confused for disruptive behaviors
- May be socialized but is real
- Must be recognized as an important entity
- Changes in physiologic parameters
- Difficult to assess in children under 6
  - Use observation
- Self reporting in children over 6
  - Pain scales
- *It is the key to a successful treatment (child and parent)!*

Pain Control in Children

- Necessary for successful treatment
- Poor pain control often misinterpreted for disruptive behavior
- Requires special understanding of physiology and psychology of children

Use topical and make it red

- Ester anesthetic
- Hides the color of blood
- Numbs mucosa but not much deeper
- Still requires distraction and clenching
- Optimum time 1-3 minutes
- Don't use too much
  - Risk of methemoglobinemia

Don't waste your money on expensive anesthetics

- 2% Lidocaine with 1:100000 epi
  - Wide margin of safety
  - Full mouth with two carpules
  - Lasts too long?
  - Amide anesthetic
    - Metabolized in the liver
  - High pKa therefore slower dissociation to free base
    - Infection has lower pH: limits free base
- 4% Articaine with 1:100000 epi
  - Amide/ester
  - Transient methemoglobinemia

Anesthetic Carpule Color Code

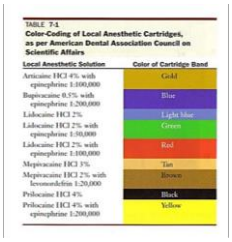


TABLE 7-1
Color-Coding of Local Anesthetic Cartridges, as per American Dental Association Council on Scientific Affairs

Local Anesthetic Solution	Color of Cartridge Band
Articaine HCl 4% with epinephrine 1:100,000	Gold
Bupivacaine 0.5% with epinephrine 1:200,000	Blue
Lidocaine HCl 2%	Light blue
Lidocaine HCl 2% with epinephrine 1:50,000	Green
Lidocaine HCl 2% with epinephrine 1:100,000	Red
Mepivacaine HCl 3%	Tan
Mepivacaine HCl 2% with levonordefrin 1:20,000	Brown
Prilocaine HCl 4%	Black
Prilocaine HCl 4% with epinephrine 1:200,000	Yellow

Commonly Used Local Anesthetic Agents
Dose Recommendations from AAP/AAPD

Drug	Maximum dose with epinephrine (mg/kg)	
	Medical Use	**Dental Use**
Lidocaine	**7.0**	**4.4**
Articaine	**7.0**	**7.0 (4.4)**

▪**Determined by relative vascularity of injection area**

Guideline for Monitoring and Managing Pediatric Patients During and After Sedation for Diagnostic and Therapeutic Procedures. AAPD Reference Manual 2006-2007

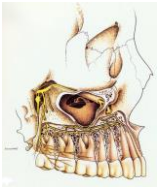
Moore's Rule of 25

- One cartridge/25 lbs(11 kg) body weight
- Any marketed local anesthetic used in dentistry
- Establishes a conservative dose
- Examples:
  - 50 lbs.(22 kg) 2 carpules
  - 75 lbs. (33 kg) 3 carpules
  - 100 lbs. (44 kg) 4 carpules
- May be too conservative in preschool child
  - More accurately 1 carpule/22 lbs (10 kg)
- mg/kg calculation provides greater accuracy

▪Moore P., Manual of Local Anesthesia. 4th ed. Eastman-Kodak Co., Rochester, NY, 1996

Maxillary Arch Innervation in Children

- Trigeminal Nerve Maxillary Branch (II)
  - Superior Dental Plexus
    - Posterior: 1st, 2nd and 3rd permanent molars
    - Middle: 1st and 2nd primary molars/ 1st and 2nd premolars
    - Anterior: cuspid, lateral and central
  - Nerves poorly myelinated
- Bone Density
  - Thin cortical plate
  - Large marrow spaces
  - Nerves just under bone



Mandibular Arch Innervation in Children

- Trigeminal Nerve Mandibular Branch (III)
  - Inferior alveolar nerve with long buccal and lingual branches
  - Travels within the bone from lingula to mandibular forame
  - Other auxiliary innervation
  - Poorly myelinated in children
- Bone Density
  - Thin cortical plate
  - Large marrow spaces
  - Nerves just under plate
- Lingula at or below occlusal plane when III enters

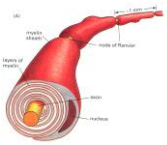
Patient Stabilization

- Head stabilization
- Hidden Syringe Technique

Don't block children under 8 or use a full carpule

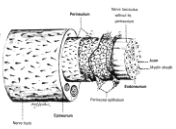
- Porous bone
- Teeth clenched
- Move needle along alveolar bone
- Interdental
- Never do a "long buccal"
- 1 hour anesthesia time
- Controlled by volume

Peripheral Sensory Nerve Conduction

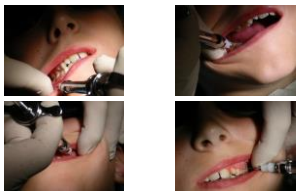


Anesthetic solution must cover 3 nodes (≅ 3 mm) to block nerve impulse.

Protein bound section active here blocking Na^{++} channels



Infiltration Technique



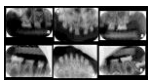
Choosing the Child for Sedation

- My reply:
  - "If I only had a magic wand…"
  - "Treatment is like changing a tire on a car moving at 30 mph…"
  - "In a healthy child, general anesthesia is as safe if not safer…"
  - "If you don't want your child to cry at all…"
  - "If your pediatrician said your child needed ear tubes…"

Changing a Tire at 50 mph

Choosing the Child for Sedation

- Severity of treatment/disease
  - Extent
  - Complexity
  - Time and number of visits required
  - Cost
    - Multiple sedations v. single GA
    - Time off from work
    - Time out of school
  - Is "monitored neglect" with "preventive intervention" an option?
    - Fluoride varnishes
    - SDF
    - Glass ionomers/ART



Choosing the Child for Sedation

- Medical status
  - ASA 1 or 2
  - Airway patency
  - Age: what is too young to sedate?
- Age
  - Cognitive v. physical
  - Delay?

The Ideal Sedative

- Reduces fear and anxiety in children
- Decreases inhibitory behavior
- Provides amnesia
- Maintains cardiovascular and respiratory tone
- Does not cause drowsiness or sleep

The Ideal Sedative

- Decrease patient treatment time by decreasing behavior management time
- Increase treatment efficiency
- Low cost to office
- Low cost to family
- Easily reversed agent/ for duration of treat

The Ideal Sedative

- Long shelf life
- No side effects or allergenicity
- Is safe
- Works all the time predictably
- Single agent

The Ideal Sedative

- DOES NOT EXIST

How we see children

The Simpsons
Season 4
Episode 17

Inhalation

- Safe
- Effective
- Quickly and easily reversible

Nitrous Oxide/Oxygen Analgesia

- Provides anxiolysis-GABA receptors
- Reduces gagging
- Works on opioid receptors and up regulation of pain
- Provides amnesia- NMDA receptors
- Provides distraction
  - Mask blocks sight lines
  - Covers smells
- Prolongs treatment times
- Potentiates the effects of other sedatives
- Improves behavior over sequential visits
- Decrease adverse incidents

Nitrous Oxide/Oxygen Analgesia

"A mixture of 93% nitrous oxide and 7% oxygen is inhaled until the third stage of anesthesia is attained (the pupils of the eyes turn up and become fixed) in about one minute. When too much nitrous oxide is given the patient usually becomes cyanotic and bridging may occur, which may be overcome quickly by the administration of a small portion of oxygen"

John Brauer, Dentistry for Children, 1947

Nitrous Oxide/Oxygen Analgesia

- Acceptable to parents
- Inhalation analgesia/anxiolytic/CNS depressant
- 40:60-50:50 concentration
- 2-4 min onset/ 5 min recovery
  - Diffusion hypoxia is theoretical
- Equipment costs
  - Initial setup
  - Maintenance and monitoring
- No electronic or mechanical monitors
- Allows decrease in L.A.
  - 40%=4mg MSO_4 in closed system
- Weak anesthetic
  - MAC>100 (the hypoxia kills them)

Does General Anesthesia Make My Kid Stupid?!?

- Exposure to virtually all drugs for sedation and anesthesia have been shown in studies to cause:
  - Neurotoxicity and neurodegeneration (failure of neuroapoptosis and prevention of neurogenesis)
  - Cognitive deficits/ learning and memory
  - Behavioral disorders
- Effects increase with number of agents used
  - N_2O, Isoflurane, Midazolam
  - Neither N_20 or midazolam alone caused neuroapoptosis
  - Effects especially notable in children under 3 yo
- What to do?
  - Decrease drug doses and combos
  - Increase use of behavior modification and non-pharmacological behavior therapy
  - Consent forms

And The Secret of Pediatric Dentistry Is Finally Revealed

Tips to Make It Through a Day

- Always give options but…
  - Never ask a question to which no is the unintended answer
- If a situation escalates to the point where you are getting uncomfortable…
  - Walk away for a few mor
- Always go home feeling …t you've done and whom you've treated

The End!?!

- Or is it just the beginning?