A Decision Framework for the Diagnosis and Treatment of Dental Patients for Office Based Anesthetics

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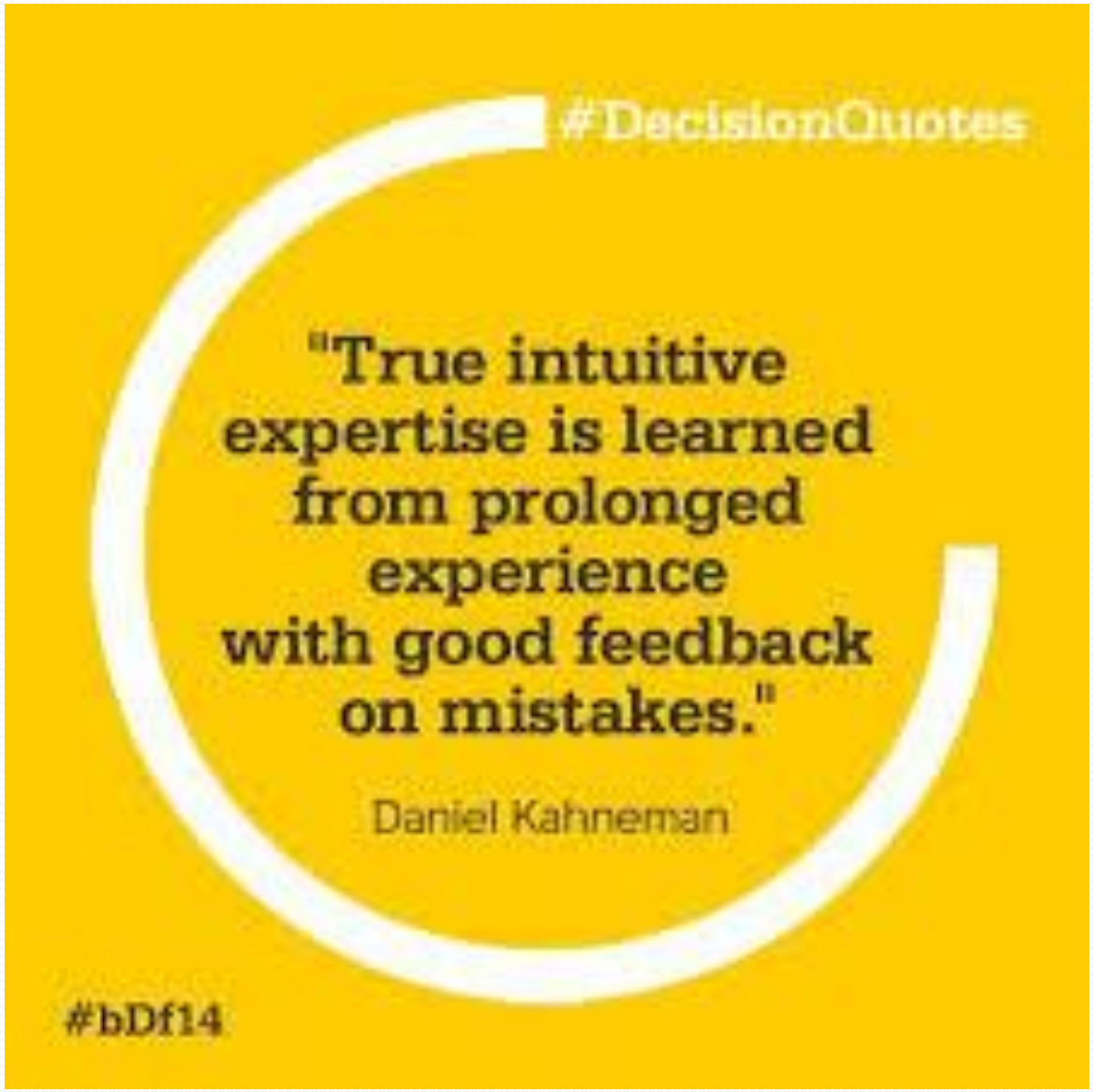
Definition

Decision Making:

The process of examining your possibilities options, comparing them, and choosing a course of action.


#DecisionQuotes
"True intuitive expertise is learned from prolonged experience with good feedback on mistakes."
Daniel Kahneman
#bDf14

"TRULY SUCCESSFUL DECISION-MAKING RELIES ON A BALANCE BETWEEN DELIBERATE AND INSTINCTIVE THINKING.

~ Malcolm Gladwell


Don't base your
decisions
on the advice of
people who
don't have to deal
with the result...!

Bring Your Team
Anesthesia is a Team Sport!!!!!!

- Excellence is anesthesia is related to operational and managerial competence
  - You can't be the "great doctor' unless you can manage and control your environment
- To continuing education
- Every procedure
- Forming a team
  - Emotional Intelligence
  - Drive
  - Coaching
    - Teachable moments

All Anesthetics Are Context Sensitive

- Patient
  - Peds
  - Special needs; broadly defined
    - Autistic spectrum
    - Dementia
- Procedure
- Capability training and comfort zone of the doctor and team members
- Physical Plant
  - Equipment
  - Space
  - Design

Treatment Planning Algorithm
What are we treating?
Make the Diagnosis Using The Consultation Process

- Pain
  - Peripheral
    - Local anesthetics are ineffective
    - Severe acute pain
  - Neuropathic
    - Trigeminal neuralgia
    - Complex regional pain syndrome
    - Wind up phenomena
  - Acute versus Chronic Pain

Treatment Planning Algorithm What are we treating?

- Anxiety
  - Generalized anxiety disorder
  - Specific to the dental environment
  - Co-morbid mental health issues
- Sensory Integration/Awareness
  - May or may not relate to autistic spectrum
  - Sounds, sights, smells, tastes, tactile sensations

Effective Local Anesthesia Is The Basis For Good Sedation

https://www.youtube.com/watch?v=LXm1cJFQGZ8&feature=youtu.be

Onset

Anutra

Buffering Local Anesthetics in Dentistry; Stanley Malamed. ADSA Pulse 2011

- Increases pH to less acidic and more neutral
  - pH of LA with epi is 3.5
  - pH of plain LA is 5.9
- More effective in areas of infection, inflammation
- Rapid onset
- Less painful injection
  - Less tissue damage from acid

Buffering Local Anesthetics in Dentistry; Stanley Malamed. ADSA Pulse 2011

- Buffering/raising the pH of the LA raises the proportion of the de-ionized molecules
- Only the lipid soluble de-ionized can cross the cell membrane
- The body naturally buffers injected local anesthetics closer to the body's pH of 7.35-7.45 over time.
  - This process is responsible for anesthetic latency.
- Raising the pH from 3.5 to 7, increases the number of de-ionized molecules 6000-fold

Buffering Local Anesthetics in Dentistry; Stanley Malamed. ADSA Pulse 2011

- Average time for onset of pulpal anesthesia for a mandibular block was 7:29 for an unbuffered local anesthetic (lidocaine with epinephrine) versus 1:51 for buffered LA

Pre-Anesthetic Evaluation

Where is the risk and how can it be avoided?

- Risk Assessment-Past Surgical and Medical History
  - Cardiopulmonary
    - How much of a vasculopath is the patient
    - Risk of adverse events, like stroke/MI
    - Exercise Tolerance
    - Shortness of Breath
    - Dyspnea on exertion
    - Blood pressure
    - Diabetes Type I or II
    - Perfusion

Cardiopulmonary Optimization

- Control of Blood Pressure and Arrhythmias
  - Patients are taking their meds
    - Diabetic control
  - All studies have been completed
  - Medical clearance
  - Scheduled for AM anesthetic
  - Adequate hydration
    - NPO liquids up to two hours pre-op
  - Adequate ventilation

Pre-Anesthetic Evaluation

- Airway
  - OSA
    - Appropriate technique and equipment
      - Sedation level
      - Rescue methods
      - Home care
  - Anatomy; Tooth to trachea
- COPD
  - Asthma
  - Emphysema
  - Bronchitis
- Allergies
- Drug interactions

Airway Analysis and Optimization

- Airway Evaluation
  - Malampati Classification
  - Brodsky Classification
  - Obesity
  - Neck Mobility
    - Cervical spine stability
    - Hypermobilty
    - Limited flexion and extension
  - Tooth position
  - Degree of mandibular opening
  - Size of the tongue
  - Presence of infection
  - Bleeding in the airway
  - Integrity of nose and nasal passages
  - Presence and health of tonsils and adenoids
  - Length of neck
  - Mandibular space
  - Position of larynx
  - Tracheal history
    - Prior intubations

Blended Treatment Modalities Filtered through the lens of dental phobia

- Oral Sedation
  - Pharmacologic
  - Non-Pharmacologic
    - Visual; art, lighting
    - Tactile/Sensory; blankets, music
- Deep Sedation/General Anesthesia
  - Induction
    - Oral
    - IV
    - IM
    - Inhalation

The PTSD, Panic and Anxiety Perspective

"Any state in which people can safely experience images, feelings and emotions that are associated with dread, and helplessness is likely to create fresh potential, and a wider perspective"

Bessel Van Der Kolk, MD, author of The Body Keeps the Score

Oral Sedation

- Increased use since Michael Jackson and Joan Rivers and the Great Recession
- Perception of being less invasive
  - “Minimally Invasive”
  - Less facelifts, breast implants, porcelain veneers
- Patients not looking to be intubated
  - General anesthesia had the lowest long term effects for the reduction of dental fear when compared to behavioral management, and oral premedication. Hakeberg, Berggren 1993

Oral Sedation examples and dosages

- Midazolam 10—20mg/Tizanidine 2-4mg
- Midazolam 10-20mg/Hydrocodone 5-10mg/Ondansetron 4-8mg
- Midazolam 10-20mg/Triazolam .25-.375mg

Oral Midazolam

- In clinical studies involving more than 480 patients, Versed Syrup was shown to be a **safe and effective** sedative. Additional safety data are provided in approximately 200 publications that describe the experiences of more than 3,000 patients who received Versed Syrup in different clinical settings.

Oral Midazolam

- Versed Syrup has been associated with respiratory depression and respiratory arrest, especially when used for sedation in noncritical care settings. Versed Syrup has been associated with reports of respiratory depression, airway obstruction, desaturation, hypoxia and apnea, most often when used concomitantly with other central nervous system depressants (for example opioids). When Versed Syrup is given **as the sole agent at recommended dosages, these adverse respiratory events occur infrequently.**

Oral Midazolam

- Versed Syrup should be used only in hospital or ambulatory care settings (including physicians' and dentists' offices) that can provide for **continuous monitoring of respiratory and cardiac function**. Immediate availability of resuscitative drugs and age- and size-appropriate equipment for ventilation and intubation, and personnel trained in their use and skilled in airway management, should be assured. For deeply sedated patients, a dedicated individual, other than the practitioner performing the procedure, should monitor the patient throughout the procedure.

Oral Midazolam

- Benzodiazepine that produces sedation, amnesia, and relief of anxiety.
- Versed Syrup, a clear, purplish-red, cherry flavored liquid that contains an artificial bitterness modifier.
- **Acceptance rate by children about 90%**
- The syrup contains 2 mg midazolam per 1 ml.

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Oral Midazolam Dosage

- The recommended dose for children is a single dose of 0.25 to 0.5 mg/kg to a maximum dose of 20 mg.
- Younger children (6 months to less than 6 years of age) and less cooperative children may require a higher dose of **up to 1 mg/kg**.
- In obese children, the dose should be calculated based on ideal body weight.
- The dose should be individualized for the patient's age, level of anxiety, and medical need.
- The time to **onset is usually within 10 to 20 minutes**.

Flumazenil

- .2 mg IV qmin x 1-5 doses
- 3 mg/hour
- Repeat q 20 minutes for resedation

Flumazenil Administration

- Inappropriate in the floor of the mouth
- IV or IM (if no IV available) is acceptable
- 1997- Heniff et al. presented an analysis of flumazenil
  - Intramuscular – 5.17 minutes
  - Sublingual – 4.37 minutes
  - Intravenous – 120 seconds

Oral Triazolam: Prolonged Amnestic Effect

- Oral
- Sublingual
  - Faster Onset
  - Less First Pass Metabolism
- Pulverized/Jell-O

Triazolam Pharmacodynamics

- Absorption half-life (15 minutes),
- Equilibration half-life (14 minutes) and
- Elimination half-life (two-three hours).
- **Sublingual administration;28 percent greater bioavailability compared with oral administration, resulting in higher plasma concentrations at one to two hours after the drug is administered.**

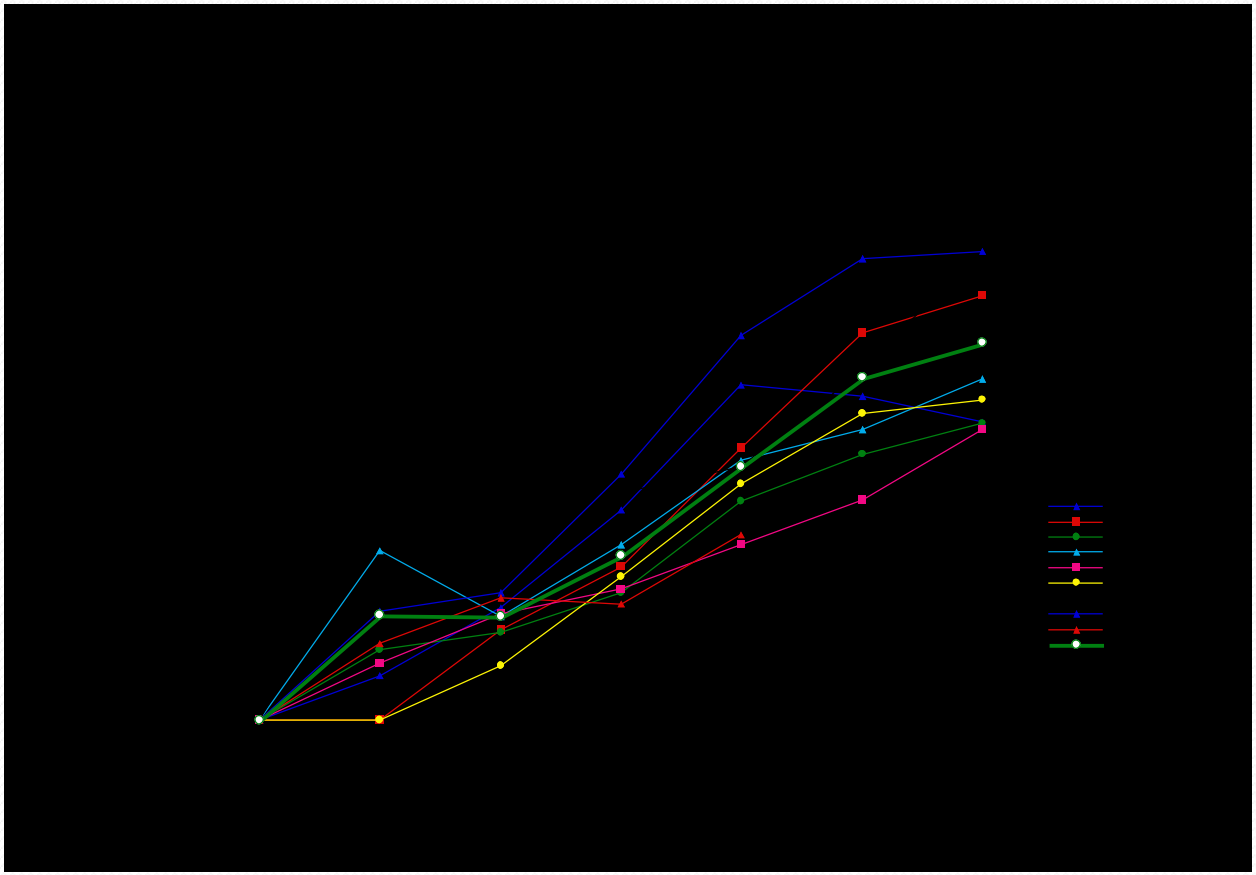
Triazolam/Midazolam/Alprazolam Interactions

- Combining CNS depressants may result in synergistic CNS, cardiovascular, or respiratory depression.
- Concomitant use with protease inhibitors (e.g., indinavir, ritonavir), or certain azole antifungals (itraconazole, ketoconazole), results in prolonged duration of action

- **Dr.’s Doug Jackson and Peter Milgrom**
- Evaluated the sedation level of ten patients administered a stacked dose of triazolam
- J Clin Psychopharmacol 2006;26(1):4-8

- Total dose = 1mg

Time-Dependent Changes in Plasma Concentrations of Triazolam by Subject



Tizanidine

- Tizanidine is an **agonist at α2-adrenergic** receptor sites and presumably **reduces spasticity by increasing presynaptic inhibition of motor neurons.**

Tizanidine Pharmacodynamics

- The absolute oral bioavailability of tizanidine is approximately 40% (CV = 24%), due to **extensive first-pass hepatic metabolism**
- Tizanidine is approximately **30% bound to plasma proteins**

Tizanidine Pharmacokinetics and Metabolism

- *Tizanidine has a **half-life of approximately 2.5 hours.***
- *Approximately 95% of an administered dose is metabolized.*
- *The primary cytochrome P450 isoenzyme involved in tizanidine metabolism is CYP1A2.*
- ***Tizanidine metabolites are not known to be active**; their half-lives range from 20 to 40 hours.*

Tizanidine Administration

- Following oral administration of either the tablet or capsule (in the fasted state), tizanidine has **peak plasma concentrations occurring 1.0 hours after dosing** with a half-life of approximately 2 hours.

Tizanidine Drug Interactions

- The effect of fluvoxamine on the pharmacokinetics of tizanidine was studied in 10 healthy subjects. The Cmax (peak concentration), AUC (bioavailability), and half-life of tizanidine increased by 12-fold, 33-fold, and 3-fold, respectively. These changes resulted in **significant decreases in blood pressure, increased drowsiness, and psychomotor impairment.**

Cipro and Tizanidine

- The effect of ciprofloxacin on the pharmacokinetics of tizanidine was studied in 10 healthy subjects. The Cmax and AUC of tizanidine increased by 7-fold and 10-fold, respectively. These changes resulted in **significant decreases in blood pressure, increased drowsiness, and psychomotor impairment**

CYP1A2 Inhibitors

- Interaction between tizanidine and either fluvoxamine or ciprofloxacin is most likely due to inhibition of CYP1A2.
- Other CYP1A2 inhibitors, such as zileuton, other fluoroquinolones, antiarrythmics (amiodarone, mexiletine, propafenone and verapamil), cimetidine, famotidine, oral contraceptives, acyclovir and ticlopidine, may also lead to substantial increases in tizanidine blood concentrations

Tizanidine and Oral Contraceptives

Retrospective analysis of population pharmacokinetic data following single and multiple dose administration of 4 mg tizanidine, showed that women concurrently taking oral contraceptives had **50% lower clearance of tizanidine compared to women not on oral contraceptives**

Tizanidine V. Clonidine

- The **imidazoline** chemical structure of tizanidine is related to that of the anti-hypertensive drug clonidine and other α2-adrenergic agonists.
- Tizanidine was found to have **one-tenth to one-fiftieth (1/50) of the potency of clonidine in lowering blood pressure**

Deep Sedation; context and examples

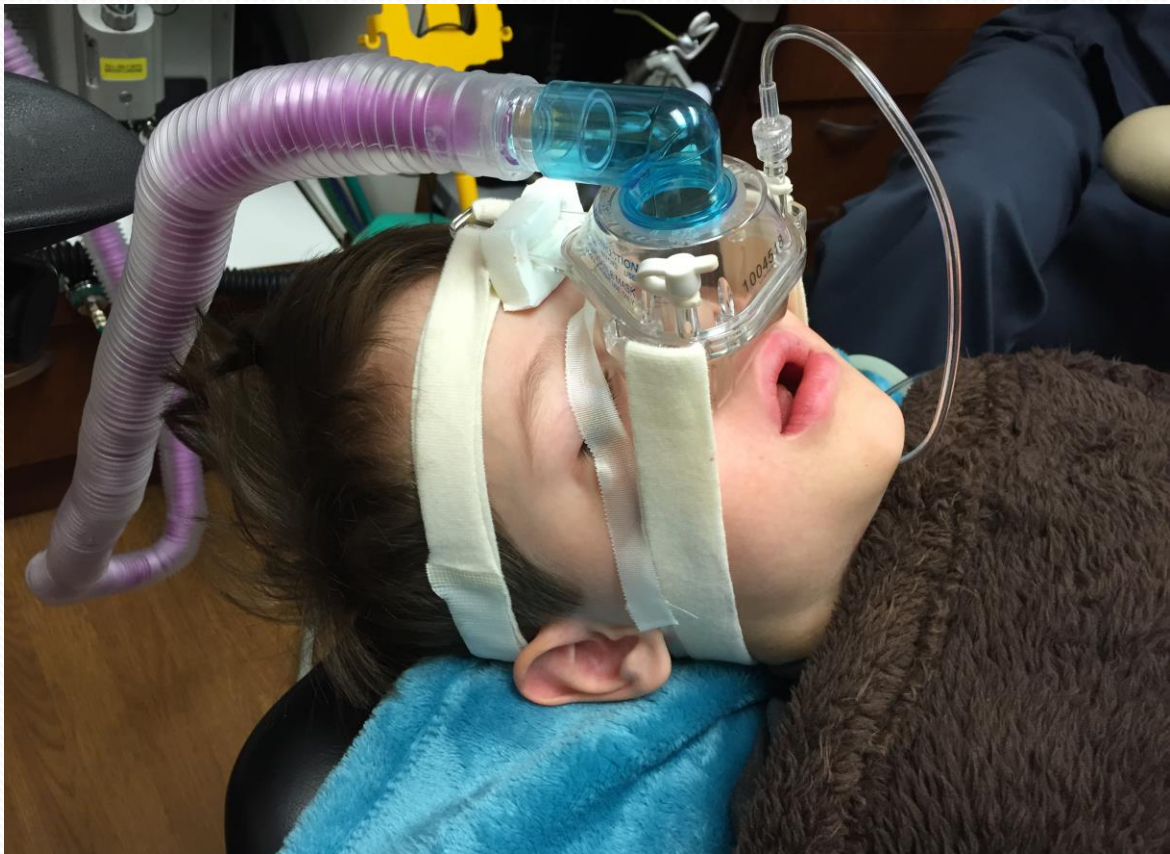
- Majority of office anesthetics include oral sedatives, the open airway, operator anesthesia and CPAP/SIMV to support ventilation
- Oral Sedatives
  - Midazolam-sedative, anxiolytic
  - Tizanidine-minimally respiratory depressant, anesthetic sparing, analgesic, supports good sedative conditions
  - Triazolam-provides the perception of general anesthesia
  - Ketamine-deep oral sedation to facilitate IV placement

Deep Sedation/GA; Pediatrics

- Induction with Sevoflurane may be needed to facilitate IV placement for children, convert quickly to TIVA
  - Tell, Show, Do in the OR
  - Propofol/Remifentanil infusions starting at 75 mcg/kg/min
    - 5mcg Remifentanil into 10mg Propofol
- IM inductions-not common
  - Ketamine 3mg/kg
  - Midazolam generally not used 0.1-0.2 mg/kg
  - Glycopyrulate 0.1-0.2mg
- Open Airway cases with CPAP works well
  - Patients as young as 4

Peds Open Airway Setup for Deep Sedation

- Circle System
- CO_2 Absortion
- Gas Monitoring
- Ability to Support Ventilation
- TIVA preferred
  - Fentanyl preload
  - Remi .5mcg/ Prop 1 mg



Deep Sedation; Examples and Dosages

- IV Midazolam 2-10mg
  - Non-responders proceed to Ketamine 25-50 mg or directly to Propofol/Remi infusion
- Prop/Remi infusion
  - Remi 1 mcg/ Prop 1 mg
  - Remi 0.5 mcg/ Prop 1 mg for elderly/debilitated

Remifentanil Infusions; Auto-titration

- Infusion started with 100-200 ug/kg bolus, followed by infusion at 25 mcg/kg/min.
- If repeat boluses are required, usually an hour into procedure then infusion rate increased by 10 mcg/kg/min until patient evidences greater respiratory depression or work in maintaining the airway.
- Then back off 10 mcg/kg/min

Remifentanil Infusions;

Interaction Characteristics

- CNS depression
- Anticholinergic-like effects
- Serotonergic effects-weak
  - Serotonin Syndrome-Accumulation of Serotonin
    - Mild-Shivering, diarhea, agitation, restlessness, sweating, headache
    - Severe-Muscle rigidity, fever, seizures, irregular heartbeat
  - Be very careful on patients on SSRI/SNRI, MAO inhibitors
    - Cymbalta, citalopram, buproprion, selegiline, tramadol, Effexor, fluoxitine, fluvoxamine, Lexapro, Parnate, Paxil, ondansetron, Pristiq
    - Seen this with Pristiq, Lexapro?, Effexor?

Pre-Op Agents for Acute/Chronic/Neuropathic Pain Management with Oral or IV Sedation

- Hydrocodone
  - Oral Sedation only
  - Only with ondansetron odt 4-8mg
  - Opiates not great for neuropathy
- Tizanidine
  - Oral or IV sedation 2-4 mg
  - Watch for hypotension; orthostatic or intra-op
    - May relate to CPAP
- Ketamine
  - Oral for needlephobia prior to IV
  - IV for complex regional pain syndrome 25-50 mg
  - IV for midazolam non-responders 25-50 mg
  - Occasional psychic phenomena
    - Not a “good head,” or pleasant mental state
    - Context of slow IV induction

Intra-Op Agents for Pain Management

- Peripheral/Acute/Inadequate Local Anesthesia
  - Local Anesthetics
    - Buffered LA such as Anutra or Onset
  - Remifentanil infusion
  - Dexamethasone 5-10mg (.2mg/kg)
  - Dexmedetomidine
    - 20mcg increments, up to 1mcg/kg
    - Front loaded small boluses at least 1 hr before the end of procedure
  - Ketamine 25-50 mg
  - Fentanyl 25-100 mcg in divided doses

Role of Alpha 2 Agonists

- Found to be morphine sparing at 24 hours post op
  - Dexmedetomidine (half life 2h)
  - Clonidine (half life 6-20h)
- Overall decrease in pain intensity at 24 hours
- Dexmedetomidine
  - 10-20mcg increments, up to 1mcg/kg
  - Front loaded small boluses at least 1 hr before the end of procedure
  - Infusion at .6mcg/kg/hr
  - Bradycardia with oxymetazoline
- Tizanidine
  - 2-4 mg orally
  - Half life 2.5h

Intra-Op Agents for Pain Management In Addition to First Line Medications

- Chronic/ Neuropathic Pain
  - Dexmedetomidine
    - Effective in opioid tolerant patients
  - Ketamine.2 mg on induction, then 2 ug/kg/hr

Post-Op Pain Management Strategy; Enough opiod substances were prescribed in the U.S. in 2011 to medicate every adult with hydrocodone 5mg every 4 hours for a month. Doherty 11/2015

- PO Strategy
  - NSAIDS
  - Acetaminophen
- Opiates
  - Oxycodone
  - Hydrocodone
  - Codeine
  - Tramadol
    - Norepi/serotonin reuptake inhibition (5 days-for the SNRI effect)

- IV Strategy
  - IV Ketoralac .5 mg/kg up to 30 mg
  - Dexamethasone 4-10 mg
  - IV Fentanil (with IV Ondansetron 4 mg)
    - 10-20 ug until significant break in pain score
  - No IV Morphine

Opioid Induced Hyperalgesia

- Chronic administration of opioids may lead to compensatory changes that result in nocioception
- From NMDA activation (N-methyl-D-aspartate)
- Can be seen acutely after remifentanil

Post-Op Pain Management; Opioid Tolerance

- Opioid Tolerance is innate or acquired
- Acquired tolerance can be
  - Pharmacokinetic
  - Pharmacodynamic
  - Learned
- Tolerance can be chronic in as little as two weeks
- Tolerance can be acutely developed with remifentanil
- Remifentanil induced hyperalgesia can be attenuated with ketamine
- **Ketamine can be a useful adjunct in opioid tolerant patients**

Post-Op Management Strategy

- Positive Reinforcement
- Reduction in PTSD postulated by LS

References

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- Angst et al. Short Term Infusion of Remifentanil Causes Hyperalgesia. Pain. 2003. November;106(1-2):49-57
- De Oliveira et al. Perioperative Single Dose Dexamethasone for Post Op Pain. Anesthesiology 2011; 115:575-588